May 22, 2020

DRAFT—Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Gravel Pit Solar

Application for Certificate of Environmental Compatibility and Public Need

SUBMITTED TO

Connecticut Siting Council

PETITIONER

Gravel Pit Solar I, LLC
Gravel Pit Solar II, LLC
Gravel Pit Solar III, LLC
Gravel Plt Solar IV, LLC

PREPARED IN ASSOCIATION WITH

Pullman & Comley, LLC
Vanasse Hangen Brustlin, Inc.
Heritage Consultants, LLC
Environmental Design & Research | PDC

Gravel Pit Solar

120 MW Solar Photovoltaic Energy Generation Project in East Windsor, Connecticut

DRAFT

PREPARED FOR

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

1166 Avenue of the Americas, 9th Floor
New York, NY 10036

PREPARED BY

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109

MAY 22, 2020

APPLICATION OF GRAVEL PIT SOLAR

APPLICATION FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED FOR THE CONSTRUCTION, OPERATION AND MAINTENANCE OF A 120 MW-AC SOLAR PHOTOVOLTAIC PROJECT NEAR APOTHECARIES HALL ROAD, PLANTATION ROAD, WAPPING ROAD, AND WINDSORVILLE ROAD IN EAST WINDSOR, CONNECTICUT

MAY 22, 2020

DRAFT

Table of Contents

1 **Introduction** **1**

2 **Applicant** **3**

3 **Proposed Project** **5**

3.1 Project History 5
3.2 Project Purpose and Need 6
3.3 Site Selection 8
3.4 Property Description 10
3.5 Project Description 11
Interconnection 13
3.6 Electrical Interconnection 14
3.7 Project Schedule 14
3.8 Project Costs 15

4 **Project Benefits** **17**

5 **Local Input and Public Notice** **19**

5.1 Public Involvement and Outreach 19

6 **Affected Environment** **21**

6.1 General Site Description 21
6.2 Wetlands 21
Wetland 1 22
Wetland 2 22
Wetland 3 22
Wetland 4 23
Wetland 5 23
Wetland 6 23
Wetland 7 23
Wetland 8 23
Wetland 9 23
Wetland 10 24
Wetland 11 24
Wetland 12 24
Wetland 13 24
Wetland 14 24
Wetland 15 25
Wetland 16 25

DRAFT

6.3 Wildlife and Habitat 25
Vegetation Cover Types 25
Rare Threatened and Endangered Species 29
Breeding Bird Inventory and Surveys 31
Vernal Pool Survey 32
Mammals 32
Plant Community Resources 33
6.4 Surface and Groundwater Resources 33
Surface Water and Floodplain 33
Groundwater Resources and Aquifer Protection 34
6.5 Stormwater 34
6.6 Scenic Values 36
6.7 Cultural Resources 36
6.8 Aeronautical Facilities 37
6.9 Air Quality 37
6.10 Noise 38
6.11 Public Health and Safety 39
6.12 Land Use 40
Municipal Zoning 40
Future Land Use 41
Agriculture 41
Other Environmental Considerations 42

7 Environmental Consequences 43

7.1 Tree Clearing and Vegetation Management 43
Tree Clearing 43
Vegetation Maintenance 44
7.2 Wetlands 44
7.3 Wildlife and Habitat 45
Potential Mitigative Actions 46
7.4 Surface and Groundwater Resources 47
7.5 Stormwater 48
7.6 Scenic Values 48
Visibility Analysis 48
Visual Mitigation 49
7.7 Cultural Resources 49
7.8 Aeronautical Facilities 50
7.9 Air Quality 50
7.10 Noise 50
Noise Impact Regulatory Criteria 50
Receptor Locations 51
Future Conditions Model 52
Results of the Acoustical Study 53
Construction Activities 56

DRAFT

7.11 Public Health & Safety....56
Fencing....57
Signage....57
Vegetation Management....57
Fire Prevention....57
Emergency Access/Training....58
Electric and Magnetic Fields....58
Environmental Justice....58
7.12 Land Use....59
Agriculture....60
Minimizing Grading and Construction Effects....60
Soil Health....61

8 **Conclusion....63**

9 **References....65**

DRAFT

List of Exhibits

Exhibit No.	Description
Exhibit A	Figures
Exhibit B	DESRI Renewables, LLC Company Resumes
Exhibit C	Site Plans
Exhibit D	Public Information Session Information
Exhibit E	Abutting Property Owner List and Notice
Exhibit F	List of Municipal Officials and Government Agencies and Notice
Exhibit G	Visibility Assessment
Exhibit H	Soil Scientists Report
Exhibit I	Wildlife Evaluations Technical Memorandum
Exhibit J	CT DEEP NDDB Correspondence
Exhibit K	Vernal Pool Survey Technical Memorandum
Exhibit L	Stormwater Management Report
Exhibit M	SHPO Correspondence and Cultural Resources Survey
Exhibit N	Acoustical Study
Exhibit O	Carbon Debt Analysis
Exhibit P	Operations & Maintenance Plan
Exhibit Q	FAA Notice of Proposed Construction
Exhibit R	GPS Emergency Management and Evacuation Plan
Exhibit S	Decommissioning Plan

DRAFT

List of Tables

Table No.	Description	Page
Table 1.	Public Meetings and Consultation	19
Table 2.	State-listed species Potentially occurring within or adjacent to the Project Site	30
Table 3.	Existing Ambient Sound Levels, DB(A)	39
Table 4.	Parcel Zoning Designations	40
Table 5.	Cover Types with Project Parcels: Existing Area and Areas to be Altered (Acres)	46
Table 6.	CT DEEP Noise Zone Standards	51
Table 7.	Sound Levels at Receptor Locations, DB(A)	53

DRAFT

List of Acronyms and Definitions

AC	Alternating Current
ASTM	American Society for Testing and Materials
ATV	All-terrain vehicle
BFE	Base Flood Elevations
BMP	Best Management Practices
CECPN	Certificate of Environmental Compatibility and Public Need
CGS	Connecticut General Statutes
CO_2	Carbon Dioxide
COC	Contaminants of Concern
CT ESA	Connecticut Endangered Species Act
CT DEEP	Connecticut Department of Energy and Environmental Protection
CLEAR	Center for Land Use Education and Research
CRP	Conservation Reserve Program
CWAP	Connecticut Wildlife Action Plan
dB	Decibels
dB(A)	A weighted decibels
DEEP	Department of Energy and Environmental Protection
DESRI	D.E. Shaw Renewable Investments
EDR	Environmental Design & Research PDC
EMF	Electric and Magnetic Fields
ESA	Federal Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FCA	Forward Capacity Auction
FCM	Forward Capacity Market
GCN	Greatest Conservation Need
GWh	Gigawatt Hour

DRAFT

IWWA	Inland Wetlands and Watercourses Agency
IPaC	Information for Planning and Conservation
ISO-NE	Independent System Operator of New England
IWWC	Inland Wetlands and Watercourse Commission
kV	Kilovolt
LLC	Limited Liability Company
MW	Megawatt
MWh	Megawatt Hour
MT	Metric Tons
NAAQS	National Ambient Air Quality Standards
NAVD 88	North American Vertical Datum of 1988
NDDB	Natural Diversity Data Base
NEMA	National Electrical Manufacturers Association
NESC	National Electric Safety Code
NFPA	National Fire Protection Association
NLEB	Northern long-eared bat
NRCS	Natural Resource Conservation Service
O&M	Operation and Maintenance
PPA	Power Purchase Agreement
POCD	Plan of Conservation and Development
ppb	Parts Per Billion
PVP	Potential Vernal Pool
RCSA	Regulations of Connecticut State Agencies
REC	Recognized Environmental Condition
RFP	Request for Proposals
ROW	Right of way
SFHA	Special Flood Hazard Area
SHPO	State Historic Preservation Office
SOM	Soil Organic Matter
URA	Upland Review Area

DRAFT

US EPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Services
VHB	Vanasse Hangen Brustlin, Inc.
WAP	Wildlife Action Plan
XLPE	Cross-linked polyethylene

DRAFT

1

Introduction

This is an application for a Certificate of Environmental Compatibility and Public Need (CECPN) for the construction, operation and maintenance of 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 (each, an Applicant, and, collectively Gravel Pit Solar or the Applicants) in the Town of East Windsor, Connecticut. The Project includes the development of a 120 megawatt (MW) alternating current (AC) ground-mounted solar photovoltaic system. The Project will encompass approximately 485 acres (the Project Area) and will be sited on eight parcels of land totaling approximately 726 acres (the Project Site) located near Apothecaries Hall Road, Plantation Road, Wapping Road, and Windsorville Road (Refer to Project Location Map provided at Exhibit A).

Pursuant to Section 16-50k and Section 4-176(a) of the Connecticut General Statutes (CGS) and Section 16-50j-38 *et seq.* of the Regulations of Connecticut State Agencies (RCSA), the Applicant hereby petitions the Connecticut Siting Council (the Siting Council) for issuance of a CECPN for the Project.

CGS § 16-50k provides, in relevant part:

> *(a) Except as provided in subsection (b) of section 16-50z, no person shall exercise any right of eminent domain in contemplation of, commence the preparation of the site for, commence the construction or supplying of a facility, or commence any modification of a facility, that may, as determined by the council, have a substantial adverse environmental effect in the state without having first obtained a certificate of environmental compatibility and public need, hereinafter referred to as a "certificate", issued with respect to such facility or modification by the council. Any facility with respect to which a certificate is required shall thereafter be built, maintained and operated in conformity with such certificate and any terms, limitations or conditions contained therein.*
>
> *Notwithstanding the provisions of this chapter or title 16a, the council shall, in the exercise of its jurisdiction over the siting of generating facilities, approve by declaratory ruling (A) the construction of a facility solely for the purpose of generating electricity, (B) the construction or location of any fuel cell, unless the council finds a substantial adverse environmental effect, or of any customer-side distributed resources project or facility or grid-side distributed resources project or facility with a capacity of not more than sixty-five megawatts, as long as*

DRAFT

such project meets air and water quality standards of the Department of Energy and Environmental Protection, and (C) the siting of temporary generation solicited by the Public Utilities Regulatory Authority pursuant to section 16-19ss.

As described more fully below, the construction, operation and maintenance of the proposed Project satisfies the criteria of CGS § 16-50k and will not have a substantial adverse environmental effect.

This Report has been prepared by Vanasse Hangen Brustlin, Inc. (VHB) under the direction of the Applicant. The description of the affected natural and social environments, and impact analyses were prepared by VHB and other consultants to the Applicant including Heritage Consultants, Inc. (Heritage) for cultural resources and Environmental Design & Research, P.D.C. (EDR) for visual resources.

DRAFT

2

Applicant

The Applicants (Gravel Pit Solar, LLC, Gravel Pit Solar II, LLC, Gravel Pit Solar III, LLC and Gravel Pit Solar IV, LLC) are affiliates of D.E. Shaw Renewable Investments, L.L.C. (DESRI) and are Delaware limited liability companies headquartered at 1166 Avenue of the Americas, 9th Floor, New York, NY 10036. DESRI, through its affiliates, is a leading developer, owner, and operator of renewable energy projects across North America, including two commercial solar projects in Connecticut: Tobacco Valley Solar and Fusion Solar.

Since its formation in 2011, DESRI has had a successful track record developing and owning high-quality, commercial wind and solar power plants, including 30 projects with more than 1.5 gigawatt (GW) of capacity in the last six years. The DESRI team (Refer to DESRI Renewables, LLC Company Resumes at Exhibit B) has significant experience financing renewable projects and has raised more than $10 billion in project financing, tax equity, mezzanine debt, corporate debt, equity, and other capital for its affiliates' projects over the last ten years. DESRI's strategic development partners in New England include North Light Energy, LLC and Bask Energy, LLC. Correspondence and/or communications regarding this petition should be addressed to:

Aileen Kenney, Principal
Bask Energy, LLC
c/o D.E. Shaw Renewable Investments
180 Linden St, Wellesley, MA 02482
(617) 852-7031
Kenney.aileen@gmail.com

A copy of all such correspondence or communications should also be sent to the Applicant's attorney:

Lee D. Hoffman
Pullman & Comley, LLC
90 State House Square
Hartford, CT 06103-3702
(860) 424-4315 (office)
(860) 424-4370 (fax)
lhoffman@pullcom.com

DRAFT

This page intentionally left blank.

DRAFT

3

Proposed Project

3.1 Project History

The Project was developed to provide cost effective, stably priced, renewable energy to Connecticut, Massachusetts and Rhode Island customers. The Project leverages economies of scale to deliver low cost renewable energy to nearby electricity demand centers, including Hartford, Providence, and western Massachusetts. The Project interconnects to a robust section of the existing ISO New England (ISO-NE) Pooled Transmission Facility system, which allows electricity to be delivered seamlessly to offtakers throughout New England.

The Project Site was targeted for development after an analysis of other possible locations for commercial solar generation facilities in New England. The site selection criteria for commercial project sites included but were not limited to; avoiding impacts to sensitive natural and cultural resources, minimizing impacts to host communities, access to existing transmission system with capacity, minimizing environmental impact, and close proximity to large energy load centers.

The Project Site is currently used primarily for active sand and gravel mining, as well as for tobacco farming. The Project Site is adjacent to a landfill, two existing solar energy projects, and other gravel mining operations. The Project is crossed by two existing Eversource 115 kilovolt (kV) lines (the 1100 Line and 1200 Line) right-of-way (ROW) and a Connecticut Department of Transportation (CT DOT) railway ROW. Refer to Figure: USGS Project Location Map and Site Location Map provided at Exhibit A.

In 2018, a portion of the Project was bid into the Zero Carbon Request for Proposals[1], and was selected by the Connecticut Department of Energy and Environmental Protection (CT DEEP) and Connecticut's investor owned utilities to provide renewable energy to Connecticut's rate payers. A portion of the Project's generation was subsequently approved by the Connecticut Public Utilities Regulatory Authority[2] (PURA). A portion of the Project's generation was also selected and contracted for under the highly competitive Rhode Island Long-Term Contracting

1 Connecticut Legislature Special Session Public Act 17-3, An Act Concerning Zero Carbon Solicitation and Procurement

2 Docket No. 18-05-04, PURA Implementation of June Special Session Public Act 17-3, Final Decision, November 27, 2019.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Standard RFP, and subsequently approved by the Rhode Island PUC [3]. The balance of the Project's capacity will provide energy to a number of New England's municipal light departments and/or other utilities.

3.2 Project Purpose and Need

The Project will provide a new source of renewable energy to help meet Connecticut's, and the greater New England region's, emission reduction goals. The Project is consistent with the vision for Connecticut's clean energy future described in Governor Lamont's Executive Order 3. The GPS Project will meaningfully reduce carbon emissions by offsetting energy generation from more carbon intensive energy sources while helping grow Connecticut's green economy. Connecticut currently has approximately 464 MW of installed solar generation capacity, much of it in small-scale projects and on roof tops, this is less than 30 percent of Massachusetts' installed solar capacity. The Project will increase Connecticut's installed solar energy capacity by approximately 25 percent at a single location, maximizing efficiencies of scale and reducing the cost of energy over smaller installations by a significant margin. Well-sited and effectively developed projects like GPS will help Connecticut meet its decarbonization goals, while boosting the local and state economy.

Consistency with State Long Range Plan

As the Council is aware, the 2008 Global Warming Solutions Act (GWSA) and the 2018 Act Concerning Climate Change Planning and Resiliency call for the State to reduce its total greenhouse gas (GHG) emissions to 10 percent below 1990 levels by 2020, to 45 percent below 2001 levels by 2030, and to 80 percent below 2001 levels by 2050. Similarly, Connecticut's Renewable Portfolio Standards (RPS) require electric providers to purchase an increasing percentage of electric power from Class I renewable resources. Under current law, providers must obtain at least 24 percent of their retail loads from Class I renewable energy sources by January 1, 2022 and 40 percent by January 1, 2030. However, these levels of required renewable energy sourcing will likely increase in the ensuing years if the recommendations of Governor Lamont's Energy Policy Committee are followed. That Committee recommended revising the Class I RPS goals to 35 percent by 2025, 50 percent by 2030, 80 percent by 2040 and 100 percent by 2050, and those recommendations were subsequently embodied in Governor Lamont's Executive Order 3.

As part of Connecticut's 2014 Integrated Resources Plan (IRP) and the 2018 IRP Notice of Proceedings, Scoping Meeting, and Opportunity for Public Comment, CT DEEP has proposed several electric generating capacity and renewable resource procurement strategies that it believes will help the State of Connecticut reach the goal of achieving a reliable, clean, and cost-effective pool of energy supply. The development of GPS supports these strategies by adding 120 MW of renewable electricity generation. GPS will assist Connecticut in meeting its 80 percent greenhouse gas reduction goal by the year 2050.

3 R.I. Gen. Laws § 39-26.1-5(e)Long-Term Contracting Standard for Renewable Energy

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

The purpose of GPS is to respond to the New England region's need for new sources of electric generating capacity and renewable energy as established the Procurement Statutes described below and a growing need for capacity generally in New England.

Need for New Sources of Electric Generating Capacity

ISO-NE estimates more than "5,200 MW of oil, coal, and nuclear power plants will have retired from 2013 to 2022, and another 5,000 MW of coal- and oil-fired generation could be retiring in coming years." If all retire, ISO-NE estimates that approximately 6,300 MW of new or repowered capacity will be needed to maintain reliability in the region.

ISO-NE acquires new sources of electric generating capacity for reliability via the Forward Capacity Market (FCM) capacity procurement mechanism, approved by the Federal Regulatory Commission (FERC) in 2006. As members of ISO-NE, Connecticut load-serving entities rely upon ISO-NE's FCM capacity procurement mechanism to meet projected peak electricity demand plus a target amount of reserves (i.e., extra capacity ISO-NE determines the reliability-driven need for new capacity resources like GPS using the FCM).

Under the FCM, system-wide and localized needs for both existing and new capacity are determined through competitive declining auction processes called Forward Capacity Auctions (FCAs). Prior to the auction, ISO-NE identifies zones within ISO-NE based on a variety of factors including transmission constraints and participating capacity resources. Capacity resources that clear the FCA in their zone become ISO- NE system-wide capacity resources and zonal capacity resources, for the period covered by the FCA. Therefore, capacity resources that clear the FCA are, by definition, needed for reliability.

GPS will participate in FCA over the term of its Power Purchase Agreements (PPA) and is expected to clear each year. If GPS clears in any FCA, then ISO-NE (and, by proxy because GPS will be in a zone that includes Connecticut, Connecticut load-serving entities that are participants in ISO-NE) will have determined GPS to be needed for the reliability of Connecticut and the wider New England market.

GPS has Demonstrated that it has Met the Burden of Demonstrating Public Need

As the Council is also aware, GPS was selected through a competitive bidding process as authorized by Public Act 17-3. This process involved selection of the Project by both the CT DEEP and the Connecticut electric distribution companies as well as review and approval by the PURA. In order for GPS to be approved under this process, it had to demonstrate that the Project met all of the requirements of CGS § 16a-3m(e)(3), which provides, in pertinent part:

> *Any agreement entered into pursuant to subdivision (2) of this subsection shall be subject to review and approval by the Public Utilities Regulatory Authority. The electric distribution company shall file an application for the approval of any such agreement with the authority. The authority's review shall commence upon the filing of the signed power purchase agreement with the authority. The authority shall approve agreements that it determines (A) provide for the delivery of adequate and reliable products and services, for which there is a clear public need, at a just and reasonable price, (B) are*

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

prudent and cost effective, and (C) that the respondent to the solicitation has the technical, financial and managerial capabilities to perform pursuant to such agreement.

After its selection by CT DEEP and the electric distribution companies, GPS submitted the contract that forms the basis of its offtake by the Connecticut electric distribution companies to PURA for its review and approval in Docket No. 18-04-04, *PURA Implementation of June Special Session Public Act 17-3*. PURA went to great lengths to examine the GPS Project and issued an Interim Decision on the matter on November 22, 2019. On page 5 of that Interim Decision, PURA found that the agreement for the GPS Project, along with other agreements: "1) procure electricity that the State needs and uses; 2) advance the State's carbon goals; 3) improve air quality and 4) reduce the electric system's reliance on natural gas, which improves winter reliability." PURA went on to state that the GPS project, along with the other projects that were the subject of that docket "meet a clear public need." *Id.* at page 6.

PURA issued a Final Decision in that docket one week after it issued its Interim Decision. The Final Decision approved some minor changes to the underlying power purchase agreements. With those edits having been approved, PURA re-affirmed its findings in its prior Interim Decision and found that the GPS Project "met all the requirements of Conn. Gen. Stat. §§ 16a-3m(e)(3)(A), (B) and (C)." Final Decision, Docket No. 18-04-04, *PURA Implementation of June Special Session Public Act 17-3*, November 27, 2019, at page 2. As such, PURA ruled that the GPS Project:

- Provided for the delivery of adequate reliable products and services;
- That there was a clear public need for such a project;
- That the project would provide its products at a just and reasonable price;
- That the project was prudent and cost-effective; and that,
- GPS had the "technical, financial and managerial capabilities" to complete such a project.

3.3 Site Selection

The Applicant undertook an intensive two-year site selection process before finally selecting the Project Site. The GPS team began prospecting suitable renewable energy project locations in anticipation of increasing demand caused by new RPS state mandates, as well as recent and planned traditional generator unit retirements. The team began by conducting a review of reasonably viable utility solar project locations throughout the ISO-NE market. Property considered suitable for a utility solar project met the following characteristics:

- Sufficient parcel size (i.e., ideally over 700 contiguous acres),
- No- or readily avoidable environmental (e.g. Wetlands, rare species, etc.) Resource constrains,
- Few cultural resources, generally level topography,
- Compatible land use regulation, and
- Proximity to existing transmission voltage electrical infrastructure with sufficient capacity to accommodate a utility generator.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

The GPS team's site selection process included an iterative approach where prospective project locations were identified and accepted or rejected based on increasingly stringent criteria. The process relied on an intensive Geographic Information System (GIS) assessment and the team's experience siting, developing, constructing and operating utility projects in New England, and elsewhere. The first step was to locate large parcels of land within 2 miles of existing transmission lines and substations throughout New England. Broad areas of the region were immediately ruled out due to topography (e.g., core forest, mountains, rivers, streams), land-uses (e.g., cities and residential suburbs), and transmission constraints (e.g., congested portions of the ISO-NE grid including rural parts of Maine, New Hampshire, and Vermont).

A subset of parcels that met the criteria for suitable topography, land uses, and transmission were then reviewed for known environmental constraints using readily available local, state, and federal GIS databases. Those sites with few environmental constraints were analyzed further to vet community compatibility, regulatory approval viability, and cost of construction. Parcels with dense residential development adjacent to the site were considered not viable. Locations where regulatory authorities have created onerous restrictions on development were also ruled out. Construction drivers such as shallow soils (e.g., bedrock near the surface) and required transmission upgrades, were also evaluated. Concurrently, property owners of suitable project locations were then approached to determine interest in selling or leasing their property. The result of this site selection process was a selection of a potentially viable locations that met the Project's financial, logistical, and regulatory viability requirements.

Most prospective locations were ruled out early in the vetting process. Ultimately, GPS was the only site that met all of the aforementioned criteria for a viable utility solar project of approximately 120 MW. Many other sites were investigated, as during the process described above. The three sites that came closest to meeting applicable criteria, but that were ultimately rejected were:

Alternative 1: Halifax/Middleborough, Massachusetts

- **Criteria Met:** Alternative 1 was in close proximity to an existing 345-kV transmission system with known capacity, had sufficient already cleared acreage to support a utility project, and was generally flat.
- **Cause for Rejection:** Alternative 1 was rejected because of the cost required to cut a 345-kV transmission line and build a new substation. The site was also vetted for the occurrence of wetlands and rare species and was found to have a large percentage of wetlands and to support rare wildlife species. Further, the site was in close proximity to, and highly visible from, a number of residential areas.

Alternative 2: Swanton and St. Albans area, Vermont

- **Criteria Met:** Alternative 2 was in close proximity to existing 46-kV and 115-kV transmission systems, had sufficient acreage to support a utility project, was generally flat, and was in an area with little residential development.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

› **Cause for Rejection:** Alternative 2 was rejected because of transmission constraints associated with the Sheffield Highgate Export Interface. The alternative site was also partially under a long-term agricultural easement, and thus not available for solar.

Alternative 3: Torrington, Connecticut

› **Criteria Met:** Alternative 3 was in close proximity to an existing 115-kV transmission system, had sufficient acreage to support a utility project and was generally not visible to abutting residential areas.

› **Cause for Rejection:** Alternative 3 would require a 115-kV line cut, similar to GPS, but the existing 115-kV line did not cross the property. Additionally, although Alternative 3 had sufficient acreage, it was entirely forested, had shallow soils, and had significant wetland areas.

The proposed location for GPS was deemed to be the most suitable alternative. Once that selection was made, GPS began negotiating with landowners. Once negotiations with the landowners were completed, GPS initiated site characterization studies at the Project Site. Concurrently, GPS began discussing the concept of a solar project with the Town of East Windsor. The Town was receptive to the idea of a solar project on the Project Site for a variety of reasons. The Town immediately saw the economic value of having a new taxpayer and new development in the community.

As stated above, the Project Site is currently an active tobacco farm as well as an active sand and gravel mining operation. The Project Site is also adjacent to other gravel mining operations. Additionally, there have been frequent complaints about noise, truck traffic, and dirt on the roads near the gravel mines. The area also experiences illicit and extensive all-terrain vehicle (ATV) traffic. The ATV traffic is a source of complaints from local residents and causes environmental damage to the landscape, in particular to Ketch Brook which is crossed by a number of improvised ATV trails. By developing a solar project on the Project Site, GPS would be eliminating the gravel mining operations and securing the Project Site with a perimeter fence, thereby limiting the ATV activity.

In addition to reducing noise pollution and further degradation to the land from current operations and ATV traffic, this proposed location provides access to existing electrical infrastructure required, as two Eversource 115-kV transmission ROWs currently traverse the Project Site. Furthermore, Eversource has agreed to work with GPS to develop a Project Switchyard and Transmission Owner (Eversource) Switchyard within the Project Site. The location of these facilities would be not be visible from abutting properties and would share a fenced enclosure.

3.4 Property Description

The Project Area consists of a 485-acre portion of the eight Project Site parcels, located near Apothecaries Hall Road, Plantation Road, Wapping Road, and Windsorville Road in the Town of East Windsor. Refer to Figure: Site Location Map provided in Exhibit A.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Parcel ID	Acreage[4]
057-65-001	98.0
057-65-002	3.0
048-65-007	124.8
037-65-005A	14.63
025-49-017C	86.5
025-49-017A	124.22
016-49-007	118.66
016-50-001	156.24
Total Area	**726.27**

4 Acreage as reported by the Town of East Windsor Tax Assessor

The Project Site is situated in the Connecticut River Valley and is generally characterized by sand and gravel quarries, tobacco fields, and forested land. The Project Site is located in the southern part of the Town of East Windsor. The Project Site is bounded by Windsorville Road on the south, Wapping Road on the east, Apothecaries Hall Road on the north, and Ketch Brook on the west.

The Project Site primarily contains areas of sand and gravel mining operations, tobacco fields, and wooded areas. Unimproved dirt farm roads interconnect the fields and provide access from public roadways. In addition, the Eversource 1100 Line and 1200 Line 115-kV electrical transmission line ROW crosses the northern portion of the Project Site from northwest to southeast, and a CT DOT railroad ROW extends north to south through the center of the Project Site. 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. The southern Project Site boundary abuts the town boundary between East Windsor and South Windsor.

3.5 Project Description

The Project includes the construction of solar photovoltaic arrays across an approximate 485-acre Project Area. The solar panels will be mounted on a mix of single-axis tracker mechanisms and fixed-tilt metal racking systems. Approximately 29 percent of the Project Site will be comprised of fixed-tilt metal racking systems, 20 percent single-axis tracker mechanisms, and 1 percent will be utilized for access roads. This equates to coverage of approximately 213 acres for fixed-tilt systems, 152 acres for single-axis tracker systems and 10 acres for access roads. Solar photovoltaic panels of approximately 450 watts (W), approximately 3.5 feet wide and 7 feet tall. Spacing between panels will be approximately 8.8 feet for fixed-tilt and 15.2 feet for single-axis trackers. There will be approximately 15-foot wide access roadways, with space provided for associated equipment and safety fencing. The fixed tilt panels will be arranged in east-west rows facing due south and will be supported on pile foundations. These solar panels will be fixed at a tilt of approximately 20 percent and will be approximately 9 feet total height above grade. The tracker systems are oriented in north-

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

south strings and will be elevated a minimum of 3 feet above grade with a maximum height of approximately 14.7 feet above grade.

The photovoltaic panels are composed of crystalline silica cells supported in anodized aluminum frames. The panels are designed to have low irradiance (reflectance), and are approximately 97 percent efficient, meaning that very little light is reflected off the surface. The proposed array system is designed to absorb energy directly from the sun and should not be confused with the reflector-concentrator type systems that have been constructed in the western United States. The panels will be connected with cross-linked polyethylene (XLPE) cables which connect the panel arrays to electrical equipment pads.

Twenty-three concrete equipment pads spaced throughout the Project footprint will contain transformers, inverters and electrical panels. This equipment is anticipated to have a height above adjacent grade of approximately 10 feet. The solar array will connect to the Switchyard described above via a buried XLPE electrical cable.

The facility will be surrounded by 7-foot-high chain link fence for security. The chain-link fence is required to be posted with safety signage providing the warning that high voltage equipment is stored inside the fence. The National Electric Safety Code (NESC) dictates the height of the fence and the signage. The NESC also dictates the distance between the fence and electrified equipment to minimize arcing, as well as grounding requirements for the fence itself for the safety of those potentially contacting the fence. The security fence is not an electric fence. Outside the fence, an approximately 100-foot-wide zone around the east, west and south sides will be cleared of vegetation and managed as meadow for the lifetime of the facility operation.

Generally, the Project will conform to existing surface grades. Within the fence line, where steep slopes are present, grading will be required to achieve maximum slopes of 15 percent. Limited grading will be necessary around the Project perimeter to meet existing grades. Proposed array foundations will be driven piles, either steel H-piles or pre-drilled concrete. Any direct buried XPLE cable will be trenched in approximately 3 to 4 feet below grade.

Operational phase access to the Project Site will be provided off Plantation Road and Windsorville Road. The Project access roadways will connect to the public roadway at these locations. Locked gates will be installed at the entrances to discourage driving along the access roads by unauthorized individuals. Signage identifying the facility will be provided at each of these locations and will include contact information for personnel and/or a designated operator in charge of managing the facility. These signs will be designed with consideration of the signage guidance provided in the Town of East Windsor Zoning Regulations.

Visual screening for the Project will include a combination of landscape plantings, architectural fencing and meadow or grass seeding. Proposed screening is described in Section 7.6.

The Project layout is depicted on Figure: Project Layout Map provided at Exhibit A and the Site Plans are provided in Exhibit C.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Construction of the Project is expected to begin as soon as the third quarter of 2021 and will likely be completed in the fourth quarter of 2022 or early in 2023. Refer to Section 7.10 for information on construction work hours.

Interconnection

Consistent with the terms of the PPA, the Project will connect into a Project (GPS) Switchyard and a Transmission Owner (Eversource) Switchyard, which will be constructed within the Project Site, Switchyard locations are depicted on the Site Plans located at Exhibit C. The GPS Switchyard serves to step up the project generation output from 34.5-kV to the transmission owner's system interconnection voltage of 115-kV. The GPS Switchyard will abut and connect to the Eversource Switchyard, which connects the GPS Switchyard to the existing 115-kV transmission lines/system.

The GPS Switchyard will include:

- Main power transformer and secondary containment
- Circuit Breakers and disconnect switches
- Electrical bus and conductors
- Steel structures and concrete foundations for equipment support
- Masts for lightning protection and lighting
- Equipment enclosure containing protective relaying and monitoring systems

The Eversource Switchyard includes:

- Circuit breakers and disconnect switches
- Revenue metering equipment
- Electrical bus and conductors
- Steel structures and concrete foundations for equipment support
- Masts for lightning protection and lighting
- Equipment enclosure containing protective relaying and monitoring systems

Ketch Brook Crossing Cable Route. The Project array areas and inverters south of Ketch Brook will be electrically connected to the northern section via medium voltage Collector Lines (34.5-kV). The Collector Lines will bring AC electricity from the 23 inverters south of Ketch Brook to the GPS Switchyard. The Collector Lines will be routed beneath Ketch Brook to avoid direct and indirect impacts to the stream. Despite the added construction costs, the Applicant concluded that a jack and bore or horizontal direction drill (HDD) method would be the least environmentally impactful method to install the Collector Lines across Ketch Brook. Boring will avoid the need for an overhead crossing of the brook, which would require tree clearing and permanent vegetation management near the stream. The Collector Lines will also be routed beneath the railroad, using either a jack and bore, horizontal directional drill, or cut and cover installation method. There will likely be at least two jack and bore section to completely install the Collector Lines, and thus a temporary staging and bore pit location between Ketch Brook and the railroad is proposed (Refer to: Project Layout Map at Exhibit A and Site Plans at Exhibit C). A temporary access road is proposed for installed

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

from the northern array, through the Project Site and over the railroad ROW to the bore staging area.

Plantation Road Crossing Cable Route. The Project array areas and inverters south of Plantation Road will be electrically connected to the northern section via medium voltage Collector Lines (34.5 kV). The Collector Lines will bring AC electricity from the 13 inverters to the array areas north of Plantation Road and ultimately to the GPS Switchyard. The Collector Lines will be conveyed across Plantation Road either overhead on traditional wooden utility poles, or underground using either a cut and cover construction method or by boring.

3.6 Electrical Interconnection

On June11, 2019 Gravel Pit Solar submitted an interconnection request to the ISO-NE for 50 MW to be connected at the Eversource 1200 Windsor Locks to Barbour Hill 115-kV line, this request was assigned queue position ("QP") 892. A second interconnection request was filed on November 28, 2019 for an additional 25 MW at the same location as QP 892, and this request was assigned QP 940. Concurrently Gravel Pit Solar had an independent engineering group, Enerzinx, LLC, conduct a thermal and steady state analysis of the capacity of the 1200 line. This analysis indicated capacity for at least 120 MW of new generation. Gravel Pit Solar then filed a third interconnection request on March 18, 2020 to increase the total interconnection request to 120 MW. This third request has not been assigned a queue position to-date but is expected to receive one in the near future.

Results from the System Impact Study are expected as soon as June 2020. Gravel Pit Solar expects to enter into an interconnection agreement with Eversource for the Project in early 2021. In the interim, Gravel Pit Solar is coordinating closely with Eversource's interconnection and engineering team to design and permit the required interconnection facilities for the both the GPS Switchyard and the Eversource Switchyard.

3.7 Project Schedule

GPS has already ordered certain equipment for the Project including transformers, the remaining equipment including panels, racking, and inverters will be procured approximately three to nine months prior to construction. Procurement will occur concurrent with financial closing of construction term debt followed closely by contracting with the construction contractor. Construction of the Project will occur over an approximately 14 to 20-month period. Assuming the Project receives full approvals in early 2021, then construction of access roads, installation of stormwater controls, grading, and stabilization may occur starting late summer 2021. Seeding with temporary and permanent vegetation may occur in fall 2021 and late winter or spring 2022. Panel racking and panel installation would likely start in spring 2022, with the installation of collector line and combiner boxes occurring concurrent to panel installs. Inverters will likely be installed in summer 2022. Construction of the GPS Switchyard and Eversource Switchyard will start as soon as late-summer 2021. Commissioning, testing, back-feed, and in-service of the facility are planned for late-summer and fall 2022. Commercial operation of the Project is targeted for between November and

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

December of 2022, if not sooner. Final minor construction punch list items and completion of certain minor features of the facility may not occur until spring or early summer 2023.

3.8 Project Costs

The estimated costs associated with the Project is considered protected confidential information and has been filed with the Siting Council pursuant to a motion for protective order.

DRAFT

This page intentionally left blank.

DRAFT

4

Project Benefits

Pursuant to CGS § 16-50p(c)(3), a project provides a public benefit if a project "is necessary for the reliability of the electric power supply of the State or for a competitive market for electricity and a public need exists." The Project will generate the bulk of its power during the summer electrical peak, thereby providing peaking resources when the New England grid has its greatest need. Moreover, the Project will help foster the State's goal of developing "renewable energy resources, such as solar and wind energy, to the maximum practicable extent" pursuant to CGS § 16a-35k.

The Project will provide substantial additional benefits to the State of Connecticut and the Town of East Windsor, including:

- Generation of 100 percent renewable energy;
- Energy generation without any air emissions, including greenhouse gas emissions;
- Energy generation without any water consumption or pollution;
- Enhancement of existing farmland soils by use of long-term cover crops such as cool season grasses that sequester atmospheric carbon in the soil and improve soil health;
- Promote soil fertility by including species such as alfalfa and white clover that fix atmospheric nitrogen into forms available to grasses in the seed mix;
- Conversion of gravel pit and high traffic ATV nuisance areas to a quieter and safer land use;
- Potential displacement of older fossil fuel generation, either in totality or through offsetting when such fossil fuel generation will place electricity into the grid;
- Increased distribution of generation resources in the State;
- Decreased reliance on the importation of fossil fuels;
- A reliable source of energy that diversifies the State's generation portfolio mix and contributes Class I renewable energy as articulated in the State's RPS; and,
- Numerous economic benefits to the Town and the area, including significant tax revenue to the Town of East Windsor.

Based on the United States Environmental Protection Agency (US EPA) conversion factors, a capacity of approximately 120 MW capacity factor, the Project is anticipated to generate

DRAFT

over 253 million megawatt-hours ("MWh") of Class I renewable energy in its first year of operation. The estimated annual emissions avoided by the Project is anticipated to be 107,463.6 metric tons (MT) of carbon dioxide (CO_2). To put this into perspective, the Project is anticipated to provide sufficient power to supply the electricity needs of approximately 23,000 households. The estimated annual emissions avoidance is equivalent to greenhouse gas emissions from:

- 23,217 passenger vehicles driven for one year
- 266,658,933 miles driven by an average passenger vehicle

The estimated carbon emissions are equivalent to the following:

- 12,401 homes' energy use for one year
- 18,194 homes' electricity use for one year
- 12,092,219 gallons of gasoline consumed
- 10,556,341 gallons of diesel consumed
- 118,410,089 pounds of coal burned

In summary, the Project is an exciting, state-of-the-art project that offers significant economic, environmental, and societal benefits to the citizens of the Town of East Windsor and the State of Connecticut. The Project will generate 100 percent clean, green, renewable zero-carbon generation adding much needed solar-generated electricity to Connecticut's fuel mix and increased access to renewable electricity in the region.

DRAFT

5

Local Input and Public Notice

5.1 Public Involvement and Outreach

This section documents the consultation process and design development based on the Applicant's interaction with state and municipal individuals. The following table presents a listing of the coordination and consultation meetings held prior to the filing of this Application.

Table 1. Public Meetings and Consultation

Date of Meeting	Location	Attendees	Matter Discussed
August 20, 2019	Telephone Conference	Ruben Flores-Marzan, Aaron Svedlow	Introduction of project concept and location.
December 9, 2019	Town of East Windsor, Town Hall	Jason Bowsza, Ruben Flores-Marzan, Amanda Calve, Melissa LaBelle, Judi Mosso, Aaron Svedlow	Permitting, community relations, general schedule for project.
December 23, 2019	Telephone Conference	Jason Bowsza, Aaron Svedlow	Project schedule, updates and economic development
December 27, 2019	Town of East Windsor, Town Hall	Jason Bowsza, Len Norton, Aaron Svedlow	Project schedule, updates and economic development
January 7, 2020	Town of East Windsor, Town Hall	Jason Bowsza, Len Norton, Aaron Svedlow	Project schedule, updates and economic development

DRAFT

Date of Meeting	Location	Attendees	Matter Discussed
January 23, 2020	Town of East Windsor, Town Hall	Jason Bowsza, Len Norton, Ruben Flores-Marzan, Aileen Kenney, Aaron Svedlow	Project schedule, updates and economic development
March 5, 2020	Telephone Conference	Jason Bowsza, Aileen Kenney, Aaron Svedlow	Project schedule, updates and economic development
April 23, 2020	Telephone Conference	Jason Bowsza, Aileen Kenney, Aaron Svedlow	Project schedule, updates and economic development

As required by RCSA § 16-50j-40(a), the Applicant has provided notice of its intent to file this Petition to: (a) those adjacent property owners listed on Exhibit E and (b) the municipal officials and government agencies listed on Exhibit F prior to the Petition filing. The Applicant provided a copy of the Petition to the Towns of East Windsor and South Windsor on May 22, 2020. The Town of South Windsor is within 2,500 feet of the Project Site, and consequently must receive notice of this Project. Refer to Figure: Site Radius Map provided at Exhibit A.

DRAFT

6

Affected Environment

The Applicant performed an assessment of existing environmental and social resources in the vicinity of the Project Area. In accordance with the Siting Council Application Guide for a Renewable Energy Facility (April 2010), environmental considerations evaluated included air emissions, water consumption and discharge, floodplains, aquifers, and groundwater classification, Federal Aviation Administration (FAA) air hazard determination, trees and tree clearing, state and federal regulated rare, threatened and endangered species, wetlands and watercourses, vernal pools, carbon sequestration, and visual impacts. Gravel Pit Solar has also included additional information in this Application regarding wildlife and habitat, stormwater runoff, cultural resources, acoustical analyses, public health and safety, and land use.

The following sections provide affected environmental evaluations.

6.1 General Site Description

The Project Site is approximately 726 acres consisting of eight separate parcels of land near Apothecaries Hall Road, Plantation Road, Wapping Road, and Windsorville Road in the Town of East Windsor. The Project Area is a 485-acre portion of the Project Site.

The Project Site is relatively flat and situated at elevations ranging from approximately 100 feet above mean sea level (AMSL) to 222 feet AMSL. The Project Site is primarily comprised of land zoned for manufacturing and agriculture. Currently the Project Site is used for active sand and gravel quarries and tobacco farming operations. A small portion of the Project Site, approximately 15 acres, is vacant commercial land. The Project Site is also crossed by a transmission line ROW and an active freight railway. Visible development adjacent to the Project Site includes a gun club, additional sand and gravel quarries, closed landfills, and solar arrays.

6.2 Wetlands

A delineation of inland wetlands and watercourses as regulated under the Connecticut Inland Wetlands and Watercourse Act (Sections 22a-36 through 22a-45 of the CGS) was completed within the Project Site between November 2019 and April 2020. The delineation

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

identified16 wetland systems within the Project Site, 13 of which are within in the Project Area, as well as one perennial watercourse, one intermittent watercourse, and six vernal pools. Refer to Figure: Wetland Delineation Map provided at Exhibit A. A Soil Scientists Report is provided at Exhibit H.

Wetland 1

Wetland 1 is a scrub-shrub and forested riparian wetland located along Ketch Brook, a perennial (cold water fishery) watercourse and tributary to the Scantic River (a stocked trout stream). Wetland soils within the delineation include the poorly drained Walpole and Raypol series on low terraces, and the poorly drained Rippowam, moderately well-drained Pootatuck, and well-drained Occum series in the active floodplain. Parts of the brook flow through deep valleys cut into glaciolacustral deposits. The woodlands in these cool valleys are typically dominated by eastern hemlock (*Tsuga canadensis*), red maple (*Acer rubrum*), and sycamore (*Platanus occidentalis*). Where the canopy is closed, the shrub stratum is sparse with spicebush (*Lindera benzoin*) and winged euonymus (*Euonymus alata*). Common herbaceous species include evergreen woodfern (*Dryopteris intermedia*), false hellebore (*Veratum viride*), jewelweed (*Impatiens capensis*) and skunk cabbage (*Symplocarpus foetidus*).

Beaver activity was noted along Ketch Brook, with several impoundments creating pools in the northern reaches of the stream. Additionally, a vernal pool was identified in backwater channel abandoned by Ketch Brook. The wetland buried by sediment remains jurisdictional, and its limits were approximated by digging several holes with a tile spade and classifying the soil beneath the one to four feet of sandy sediment.

Wetland 2

Wetland 2 is a scrub-shrub and forested wetland located along the low terrace above the Ketch Brook floodplain. Soil within this wetland is similar to the poorly drained Raypol series. The small wetland is characterized by the presence of green ash (*Fraxinus pennsylvanica*), red maple, and sycamore tree species, as well as shrub and herbaceous strata dominated by jewelweed, multiflora rose (*Rosa multiflora*), skunk cabbage and spicebush but is shaded by upland trees growing outside of the wetland. This wetland drains by sheet flow into the downgradient intermittent watercourse which leads to the Ketch Brook floodplain.

Wetland 3

Wetland 3 occupies the head of a steeply sloping swale. This scrub-shrub and forested wetland area hosts red maples and several umbrella-trees (*Magnolia tripetala*). This uncommon species is considered naturalized from the southeastern United States. Jewelweed, multiflora rose, and spicebush are also present in this small wetland.

Wetland 3 is a small discharge wetland that drains to an intermittent watercourse carved into a steep swale in the southwestern part of the Project Site.

DRAFT

Wetland 4

Wetland 4 is a scrub-shrub and forested groundwater discharge wetland that drains to an intermittent watercourse carved into a steep swale that drains from the top of the terrace in the southwestern part of the Project Site to the Ketch Brook floodplain. Wetland 4 is formed on the opposite side of the intermittent watercourse from Wetland 2. The vegetation includes multiflora rose, red maple, and spicebush. Soils in this small wetland were identified as Raypol silt loam.

Wetland 5

Wetland 5 is a scrub-shrub and forested wetland that drains into the same large swale carved into the outwash terrace as Wetland 3 and Wetland 4. Primary vegetation includes multiflora rose, red maple, and spicebush. Soils in this wetland are Raypol silt loam.

Wetland 6

Wetland 6 is a forested, depressional wetland that held water, estimated at 2 feet deep, at the time of the investigation. Soils observed were identified as Raypol silt loams and the very poorly drained Scarboro series. Wetland 6 provides two vernal pool habitats critical to amphibians and several invertebrates. The vegetation within this wetland is dominated by red maple and white pine (*Pinus strobus*) with highbush blueberry (*Vaccinium corymbosum*), spicebush and winterberry (*Ilex verticillata*) as common shrubs. Cinnamon fern (Osmunda cinnamomea) and skunk cabbage are common herbaceous components.

Wetland 7

Wetland 7 is a small depressional forested wetland with Raypol silt loam soils. This wetland is unlikely to have a hydroperiod long enough to function as a vernal pool in most years, and an ATV trail runs through the middle of this feature. Highbush blueberry, red maple, and white pine are common in this wetland.

Wetland 8

Wetland 8 is a forested and open water, kettle hole depression. Wetland 8 was inundated during the investigation and provides vernal pool habitat. Soils observed were similar to the Raypol and Scarboro series. Vegetation in this wetland is characterized by eastern hemlock, pin oak (*Quercus palustris*), red maple and white pine tree species and cinnamon fern, sensitive fern (*Onoclea sensibilis*), and winterberry in the shrub and herbaceous layers.

Wetland 9

Wetland 9 is an emergent, disturbed wet meadow near the eastern boundary near the railroad grade. It was likely created as a sediment basin for the adjacent closed landfill and is isolated from the adjacent Ketch Brook floodplain by an earthen berm. Soils observed in this area would be classified as Aquents due to the level of soil disturbance. Vegetation within

DRAFT

this wetland consists of cattail (*Typha latifolia*), climbing false buckwheat (*Polygonum scandens*), multiflora rose, and species of willow (*Salix sp*.).

Wetland 10

This isolated emergent wetland occurs as a depression in compacted soils of an agricultural field. The wetland is a nearly circular depression and held 1 to 2 feet of water in its deepest portions on the day of the delineation. Soils around the perimeter of the wetland consist of saturated sandy loam and would be classified as Aquents. Vegetation includes cattail, soft rush (*Juncus effusus*), and woolgrass (*Scirpus cyperinus*). This wetland was heavily rutted by illicit ATV operation.

Wetland 11

Wetland 11 was created as part of the gravel pit reclamation plan. The wetland is a scrub-shrub, depressional wetland created with fill. Vegetation in this wetland includes common reed, multiflora rose, sensitive fern, and willow.

Wetland 12

Wetland 12 is a small, scrub-shrub and forested depressional wetland, located adjacent to the CT DOT railroad. Drainage patterns in this area were changed when the railroad grade was constructed by filling and ditches directed water to low lying land impounded by the rail grade. Soils in each of these depressions were similar to the Walpole series. Wetland 12 is sparsely vegetated, with the fringes including a somewhat disturbed mix of vegetation including Buttonbush (*Cephalanthus occidentalis*), jewelweed, royal fern (*Osmunda regalis*), multiflora rose, poison ivy (*Toxicodendron radicans*), red maple, and spicebush. A vernal pool was identified in the northern part of Wetland 12.

Wetland 13

Wetland 13 is a scrub-shrub and forested wetland that occupies a depression adjacent to the fill section of the CT DOT railroad. The slopes above this depression have accumulated sediment from years of farmland erosion. Soils in this depression were identified as Raypol and Scarboro series. Vegetation in the wetland was somewhat disturbed and includes American elm (*Ulmus Americana*), red maple and red oak (*Quercus rubra*) within the tree strata. The shrub and herbaceous layer were comprised of cottonwood (*Populus deltoides*), jewelweed, silky dogwood (*Cornus amomum*), spicebush, skunk cabbage, and wood-reed grass (*Cinna latifolia*).

Wetland 14

Wetland 14 is a scrub-shrub wetland dominated by red maple and willow. Wetland hydrology is driven by surface runoff and discharge from the landfill slope cover and may be off-site.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Wetland 15

Wetland 15 is a forested depression where this reflow enters the ground again and recharges the groundwater. This wetland likely formed in uplands after the adjacent landfill was capped. Water infiltrates into the friable soils above the impervious landfill cap and flows above the liner (through-flow) to the toe of slope where it breaks out onto the ground surface (reflow). The soil in this feature is similar to the Scarboro series as it has a thin muck surface tier above sand and gravel. Vegetation in this wetland was comprised of red maple and white pine with poison ivy and sensitive fern in the herbaceous stratum.

Wetland 16

Wetland 16 occupies a kettle hole depression that intercepts the groundwater table. The wetland wraps around the east side of a kame knob with the wettest areas north and south of the kame. No watercourse enters or leaves this wetland. The wetland is forested, with red maple identified as the dominant species. Additional tree species present include eastern hemlock, silver maple (*Acer saccharinum*), white pine, and yellow birch (*Betula alleghaniensis*). Common shrubs include arrowwood viburnum (*Viburnum dentatum*), highbush blueberry and winterberry. Cinnamon fern, evergreen wood fern, jewelweed and sensitive fern were the dominate herbaceous species apparent during the early spring investigation.

An inundated depression, with elevation below 122 feet, in the southwest part of the wetland was determined to be a vernal pool. This pool was observed being utilized by wood frogs (*Lithobates sylvaticus*), spotted salamanders (*Ambystoma maculatum*) and fairy shrimp (*Eubranchipus vernalis*).

6.3 Wildlife and Habitat

VHB performed a wildlife evaluation of the Project Site. Wildlife resources were characterized through a series of surveys, including bird surveys, vernal pool surveys, mammal and reptile observations, and searches for host-plant species for State-listed Lepidoptera. These field efforts were conducted between late fall of 2019 and April 2020. Surveys for State-listed species will be conducted through July 2020. A detailed description of investigation methods and a Conservation Measures Plan is provided in Exhibit I.

Vegetation Cover Types

The existing cover types within the Project Site were evaluated to develop an understanding of the wildlife habitat function provided. The cover types were then used to identify anticipated species likely to be found in the available habitat types.

Sand and Gravel Quarries

These earth material mines are grouped under the Manmade designation of Key Habitat 10, Sub-habitat Urban and Man-made Features in the Connecticut Wildlife Action Plan (CWAP). Approximately 76 acres of the Project Site are occupied by sand and gravel quarries.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Recently mined open areas within the quarries generally do not support vegetation or function as wildlife habitat. These quarries attract illicit recreational use by ATV users and dirt bikers. The southern pit is also used for firearm target practice.

Very little wildlife activity was noted in the floor and walls of the open pits. However, the early succession margins and partially restored areas attract species such as field sparrow (*Spizella pusilla*), song sparrow (*Melospiza melodia*) (Greatest Conservation Need (GCN) species), and wild turkey (*Meleagris gallopavo*).

Agricultural Fields

In the CWAP, farmland corresponds to the Manmade designation portion of Key Habitat 10, Sub-habitat Agricultural Lands. Farmland occupy broad level terraces that consist of sandy outwash and or deltaic deposits capped by an aeolian mantle all resting on glacio-lacustral lakebed deposits. The Project Site is primarily farmed in shade tobacco. Farmland along Plantation Road in the southern part of the Project Site have traditionally been used to produce shade-grown wrapper tobacco which is cured in one of the twenty tobacco barns around the field perimeters. Field margins and grounds associated with the tobacco barns and other outbuildings provide some edge habitat. Cover crops including annual rye grass and oats are sown in the fall after tobacco harvest provide a limited habitat for wintering songbirds and small mammals.

Along Plantation Road, three small fields were not planted in tobacco; one was planted in gourds, one in vegetables and a third was planted in seed corn that was not harvested. Similarly, the field between the gravel quarry was planted in seed corn that was not harvested. In the northern Project Site two fields along Apothecaries Hall Road were planted in seed corn and cut leaving only stubble in the fields.

The fields managed as a monoculture of tobacco provide little wildlife value. The two fields with corn stover and two with stubble provide forage for Canada goose (*Branta canadensis*), common grackle (*Quiscalus quiscula*), European starling (*Sturnus vulgaris*), and mourning dove (*Zenaida macroura*). Small mammals, such as southern red-backed vole (*Myodes gapperi*) and white-footed mouse (*Peromyscus leucopus*), along with some larger mammals, such as racoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), and white-tailed deer (*Odocoileus virginianus*), may also utilize these fields for foraging.

Disturbance associated with tillage, weed control, and insect pest control precludes utilization of farm fields by grassland birds. Barn swallow (*Hirundo rustica*), chipping sparrow (*Spizella passerina*), tree swallow (*Tachycineta bicolor*) and song sparrow were observed foraging over fields or along field edges. Barn swallows, European starlings, house sparrows (*Passer domesticus*), and tree swallows (*Tachycineta bicolor*) were observed following a tractor tilling the winter cover crop, presumably to forage on insects flushed or exposed by the tractor.

At least two pairs of American kestrels (*Falco sparverius*), a state species of special concern, were observed along field margins and early successional habitats around gravel mines and off-site capped landfills in the southern Project Area. A northern harrier (*Circus cyaneus*),

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

likely a migrant and a GCN species according to the CWAP, was identified along field margins north of Plantation Road.

Early Successional Grassland and Shrubland

These cover types correspond to the Upland Shrub designation portion of Key Habitat 2, Sub-habitat Reverting Field and Early Successional Shrubland. Approximately 61.6 acres of the Project Area are occupied by early successional habitat consisting of grassland with patches of shrubs, shrubland, or open woodland with low tree cover. These areas occur in partially reclaimed quarry areas, along the margins of agricultural fields (primarily tobacco), within the Eversource overhead electric transmission ROW, along the adjacent to the CT DOT railroad line, off-site on adjacent closed landfills and gravel pits, and as patches in recently harvested forest areas.

The vegetation in these areas is variable and may be dominated by cool season grasses such as fescues (*Festuca* spp.) and rye (*Lolium perenne*). Shrub and low tree species that are early colonizers include alder (*Alnus* sp.), autumn olive (*Elaeagnus umbellata*), black cherry (*Prunus serotina*), blackberry (*Rubus occidentalis*), multiflora rose. Cleared woodland patches are often quickly colonized by black birch (*Betula lenta*).

The early successional shrub and grass cover established around a process water pond in the northern gravel pit provided foraging habitat for a spotted sandpiper (*Actitis macularius*) in breeding plumage observed on April 28, 2020.

Depending on habitat size and the proportion of grass versus shrub cover, these areas provide nesting and foraging grounds for American goldfinch (*Spinus tristis*), eastern bluebird (*Sialia sialis*), eastern towhee (*Poecile atricapillus*), field sparrow, prairie warbler (*Setophaga discolor*) (GCN species), song sparrow, and yellow warbler (*Setophaga petechia*).

Wildlife that may utilize this scrub-shrub cover include mammals such as mice, voles, red fox (*Vulpes vulpes*), and striped skunk (*Mephitis nigra*). These areas also provide wintering habitat for songbirds including dark-eyed junco (*Junco hyemalis*) and white-throated sparrow (*Zonotrichia albicollis*).

Mixed Deciduous and Coniferous Upland Forests

The cover types within the upland forested portion of the Project Site correspond to the Upland Forest Key Habitat and includes the Mixed Hardwood Forest and Coniferous Forest Sub-habitats listed in the CWAP.

Forest and woodland are present throughout the Project Site and mostly occupy irregularly sloping ice-contact stratified drift deposits and terrace escarpments that are too rugged to farm. The forests comprised of approximately 317 acres of the Project Site and approximately 124 acres of the Project Area. The forests can be generally classified as upland broad-leaved deciduous, accounting for approximately 262.8 acres of the Project Site, and upland coniferous evergreen, which comprises approximately 26.7 acres of the Project Site.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Upland deciduous forests mostly fall into the *Northern red oak / Maple-leaf viburnum* community[4] along terrace escarpments and low ice-contact stratified drift terraces. Kame summits support a community similar to the *Northern red oak-Black oak / Blue ridge blueberry* community proposed by the same authors. American beech (*Fagus grandifolia*), pignut hickory (*Carya glabra*), red maple, and sugar maple (*Acer saccharum*) are common tree. Most of these forests have been selectively cut, but still contain numerous standing snags and large trees with defects that provide nesting cavities and mast.

The most common evergreen forest type is *Eastern hemlock* which occupies much of the steep terrace escarpment along Ketch Brook in the southern part of the Project Site. Other components of this forest include black oak (*Q. velutina*), pitch pine (*Pinus rigida*), red maple, red oak, sugar maple, and white pine. This community is deeply shaded and supports little understory.

The forests provide habitat for several year-round resident and neo-tropical migrant songbirds as well as several other classes of fauna, including mammals such as white-tailed deer, reptiles and amphibians, and invertebrates. Species commonly encountered include American red squirrel (*Tamiasciurus hudsonicus*), black-capped chickadee (*Poecile atricapillus*), downy woodpecker (*Dryobates pubescens*), eastern gray squirrel (*Sciurus carolinensis*), northern flicker (*Colaptes auratus*), pileated woodpecker (*Dryocopus pileatus*), red-bellied woodpecker (*Melanerpes carolinus*) and wild turkey. Potential summer breeding species, including magnolia warbler (*Setophaga magnolia*) and yellow-rumped warbler (*Setophaga coronata*) and suspected migrant species, including blackpoll warbler (*Setophaga striata*) were also observed.

Mixed Deciduous and Coniferous Wetland and Floodplain Forests

The forested wetland portion corresponds to the Forested Inland Wetland Habitat Key Habitat, Sub-habitats Floodplain Forest and Red Maple Forest Sub-habitats.

Wetland deciduous forests outside of the floodplain are typically dominated by red maple with American elm and pin oak often present. Spicebush and winterberry are common shrubs, with cinnamon fern, skunk cabbage and sensitive fern common herbaceous species. Sloping and discharge wetlands support associations similar to *Red Maple / Northern Spicebush* community and wetlands in kettle hole bottoms forests similar to the *Red Maple / Pin Oak* community. Both of these wetland forests may include eastern hemlock, pitch pine and white pine. Some of the kettle holes contain vernal pools which are special habitats described later in this section.

While Ketch Brook is a relatively small, high-gradient stream, parts of its floodplain are broad in southern reaches within the Project Site. Floodplain levees with moderately well drained alluvium support a forest association similar to the *American sycamore-Boxelder* community. Dominant trees include American elm, eastern cottonwood (*Populus deltoides*), red maple, and occasional silver maple. The understory is largely colonized by the invasive winged euonymus with occasional spicebush and witch-hazel (*Hamamelis virginiana*). Well drained portions of the floodplain include Christmas fern (*Polystichum acrosticoides*) and round-

[4] Community types in italics are taken from The Vegetation of Connecticut (Metzler and Barrett, 2006)

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

leaved pyrola (*Pyrola americana*) in the herbaceous layer along with poison ivy. A garter snake (*Thamnophis sirtalis*) was observed in this floodplain forest. These wetland forests support several resident and neotropical migrant songbirds including common yellowthroat (*Geothlypis trichas*) and warbling vireo (*Vireo gilvus*).

These very poorly drained floodplain forests do not fit well into the floristic descriptions provided in by Metzler and Barrett (2006). The shrub layer is typically dominated by species such as arrowwood, silky dogwood, winterberry. Fowl mana (*Glyceria striata*), jewelweed and skunk cabbage are common in the herbaceous stratum.

ATV and dirt bike trails wind through the forested areas and create serious erosion on steep slopes and poorly drained. This degradation contributes to high turbidity within the brook.

Ketch Brook

Ketch Brook corresponds to the Freshwater Aquatic Key Habitat with Cold Water Stream as the Sub-habitat type in the CWAP. Ketch Brook is a perennial watercourse and tributary to the Scantic River. It flows north to south through three of properties that make up the Project Site and forms the northwestern boundary of a fourth. The corridor associated with the brook is forested, generally with a closed canopy. The Brook has a stony bottom throughout most of the Project Site with a strong preponderance of shallow riffles and only a few quiet pools. Beaver have constructed several impoundments creating pools in the northern most reaches of the stream. Painted turtle (*Chrysemys picta*) were observed in a backwater impoundment near the Eversource electric transmission line crossing of Ketch Brook.

The southern reaches of the brook meander more and in places undercut floodplain banks and even terrace escarpments. Ketch Brook is thought to support a diverse collection of aquatic fauna, including brown trout (*Salmo trutta*), beaver (*Castor canadensis*), fallfish (*Semotilus corporalis*), and invertebrates such as caddisflies, mussels, odonates (damselflies and dragonflies), and stoneflies. Belted kingfisher (*Megaceryle alcyon*) and red shouldered hawk were observed above the stream.

The high aquatic habitat values attributed to this stream are diminished by uncontrolled use of ATVs within the stream channel and floodplain. These illicit activities contribute to bank erosion and turbid water conditions in the brook.

Rare Threatened and Endangered Species

The Connecticut Endangered Species Act (CT ESA), passed in 1989, was enacted to protect Connecticut's rare plant and animal species from threats that could lead to their extirpation. The goal of the CT ESA is to conserve, protect, restore and enhance endangered or threatened species and their essential habitats. Under the CT ESA, species are listed according to their level of risk for extirpation. Their status is reviewed every five years by CT DEEP. Species are listed in one of three designations:

- **"Endangered Species"** means any native species documented by biological research and inventory to be in danger of extirpation throughout all or a significant portion of its range within the state and to have no more than five occurrences in the state, and any species

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

determined to be an "endangered species" pursuant to the federal Endangered Species Act (ESA).

- **"Threatened Species"** means any native species documented by biological research and inventory to be likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range within the state and to have no more than nine occurrences in the state, and any species determined to be a "threatened species" pursuant to the ESA, except for such species determined to be endangered by the Commissioner of the CT DEEP in accordance with section 4 of the CT ESA.
- **"Species of Special Concern"** means any native plant species or any native non-harvested wildlife species documented by scientific research and inventory to have a naturally restricted range or habitat in the state, to be at a low population level, to be in such high demand by man that its unregulated taking would be detrimental to the conservation of its population or has been extirpated from the state.

VHB initiated consultation with the CT DEEP Natural Diversity Data Base (NDDB) in December 2019 and February 2020 (refer to NDDB Correspondence provided at Exhibit J.) The CT DEEP NDDB species record information for the Project Site lists 15 State-listed species that have the potential to occur. The CT DEEP NDDB performs environmental reviews as part of the CT ESA to determine the impacts of proposed development projects on State-listed species to help conserve Connecticut's biodiversity.

Table 2. State-listed species Potentially occurring within or adjacent to the Project Site

COMMON NAME	SCIENTIFIC NAME	STATE-LISTED STATUS	HABITAT TYPE(S)[1]
BIRD SPECIES			
American kestrel	*Falco sparverius*	Special Concern	Open country, farmland, cities, wood edges
Brown thrasher	*Toxostoma rufum*	Special Concern	Suburban and rural areas, particularly in thickets, brushy hillsides and woodland edges; open areas with patches of bare ground
Horned lark	*Eremophila alpestris*	Endangered	Beaches and open areas along the coast as well as open grassland and fallow agricultural fields
Red-headed woodpecker	*Melanerpes erythrocephalus*	Endangered	Forest edges, orchards, open pine woods, groves of tall trees in open country
Savannah sparrow	*Passerculus sandwichensis*	Special Concern	Grassy fields with damp soils and upland areas bordering on salt marshes
Short-eared owl	*Asio flammeus*	Threatened	Tundra, prairies, marshes, farmland. In winter also found in stubble fields, small meadows, coastal dunes, shrubby areas

DRAFT

COMMON NAME	SCIENTIFIC NAME	STATE-LISTED STATUS	HABITAT TYPE(S)[1]
HERPETOFAUNA			
Wood turtles	*Clemmys insculpta*	Special Concern	Riparian habitats bordered by floodplain, woodland, or Meadow
MAMMALS			
INVERTEBRATES			
Big sand tiger beetle	*Cicindela formosa generosa*	Special Concern	Exposed sandy substrates
Bronze copper	*Lycaena epixanthe*	Special Concern	Wet meadows, mud flats, and moist fields
Scribbled sallow moth	*Sympistis perscripta*	Special Concern	associated with infertile, droughty, open habitats
FRESHWATER MUSSELS			
Eastern pearlshell mussel	*Margaritifera*	Special Concern	Most often found in streams and small rivers that support trout or salmon populations (cold water fishery)
VASCULAR PLANTS			
American climbing Fern	*Lygodium palmatum*	Special Concern	Forest edges, forests, and swamps
Dwarf huckleberry	*Gaylussacia bigeloviana*	Threatened	Bogs, fens, sandplains and barrens
Purple milkweed	*Asclepias purpurascens*	Special Concern	Lower slopes of hill prairies, meadows in wooded areas, thickets and woodland borders, bluffs and open woodlands
Short-awned meadow foxtail	*Alopercurus aequalis*	Threatened	Meadow, ditches, shorelines and wet sandy places

1 Habitat types based on descriptions from Bevier, ed. 1994, The Atlas of Breeding Birds of Connecticut

VHB developed a Conservation Measures Plan and will submit this to NDDB for review during the consultation process (Refer to Exhibit J.) VHB has performed a series of surveys for the state-listed species and reported findings to NDDB.

The Official Species List generated by the United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) tool indicates the that the federally threatened northern long-eared bat (*Myotis septentrionalis*) has the potential to occur in the Project vicinity.

Breeding Bird Inventory and Surveys

An inventory of potential breeding birds was developed based on information from field observations, the Atlas of Breeding Birds of Connecticut (Bevier ed. 1994) and New England Wildlife (DeGraaf and Yamasaki 2001), and NDDB data. Line transect surveys using call back

DRAFT

surveys for State-listed species will be conducted during the appropriate time of year, May and June 2020, as specified through NDDB consultation.

Bird surveys were conducted by VHB biologists on April 28, 2020 and May 8, 2020. Surveys were based on visual observations and auditory identification of calls and songs. All birds within visual and auditory range were recorded. The surveys were conducted on clear days with low wind speeds that minimized interference with acoustic observations.

Habitat types that were most closely monitored included the perimeters of the agricultural fields and the early successional scrub-shrub cover within the recovering sand and gravel quarries and the capped landfills adjacent to the Project Site boundary. Observers separated to observe a pair of American kestrels south of Plantation Road and a second pair hunting over the southern gravel pit and off-site closed landfills simultaneously to confirm that two pairs. No other state-listed bird species were detected during the surveys.

Sharp-shinned hawk (*Accipiter striatus*) are common migrants in Connecticut in the spring and fall and recent records for short-eared owl (*Asio flammeus*) are only for wintering individuals. Call back surveys using recordings from the Audubon Birds Application amplified with Bluetooth speakers were played for short-eared owl and savannah sparrow (*Passerculus sandwichensis*) at early successional habitats around the gravel pits.

Surveys for red-headed woodpecker (Melanerpes erythrocephalus) and sharp-shinned hawk will be conducted in late May and mid-June.

Vernal Pool Survey

VHB biologists conducted vernal pools surveys of the Project Site on March 13, 24, 26, April 7, and May 6, 2020. Six vernal pools were identified during field investigation. Each of the pools were found to meet the criteria for vernal pool designation, which includes but is not limited to containing amphibian populations, lacking fish populations, and exhibiting the presence of one or more obligate species.

All the pools were observed within the forested wetlands. These included classic vernal pools formed in kettle holes and cryptic pools within larger wetland systems. Obligate species identified within the pools included adult wood frogs (*Lithobates sylvaticus*), wood frog egg masses, wood frog larvae, spotted salamander (*Ambystoma maculatum*) egg masses, and fairy shrimp (*Eubranchipus vernalis*). Vernal pools are critical habitat essential for obligate species to complete part of their life cycle. They provide habitat to facultative species such as gray tree frog (*Dryophytes versicolor*), green frog (*Lithobates clamitans*), and spring peeper (*Pseudacris crucifer*) and invertebrates such as caddisfly, predacious diving beetles, and water striders.

Further details concerning the vernal pool surveys are provided in a separate memo dated May 18, 2020, provided in Exhibit K.

Mammals

VHB biologists documented observations of mammals during the several field investigations performed within the Project Site between November 2019 and May 2020. Additional

DRAFT

surveys for state-listed species and/or species of Special Concern will be conducted within the appropriate and specified time of year windows, primarily end of May through July of 2020. Direct and indirect observations, along with species that may utilize the Project Site, and notable observations were made during field investigations were described above in habitat discussions and are documented in Exhibit I.

Plant Community Resources

East Windsor is situated in the Lower Connecticut River Valley subsection of the Eastern Broadleaf Forest Province (Keys et al., 1995). Aside from the gravel pit operation, the Project Site has two principle cover types, open agricultural lands (primarily tobacco fields) and forest lands. Forest types include stands dominated by mixed deciduous hardwoods, evergreen coniferous trees, and mixed stands containing coniferous and broad-leaved deciduous trees.

In summation, areas of the Project Site not currently utilized for tobacco farming or sand and gravel mining operations contain approximately 317 acres of forest or woodland. Within the 485-acre Project Area, there are approximately 124 acres of forest or woodland. The forests can be generally classified as upland broad-leaved deciduous, approximately 262.8 acres, upland coniferous evergreen which comprises approximately 26.7 acres, and forested wetland, largely along the floodplain of the Ketch Brook riparian corridor, which comprises approximately 27.5 acres of the Project Site. There is evidence of recent selective tree harvest within the forested areas, including marked trees, cut stumps, and logging roads.

ATV and dirt bike use throughout the forested area and particularly within the forested wetland has been observed throughout the Project Site. Continued use by these recreational vehicles within the forested floodplain of Ketch Brook has undermined the stream embankment in several areas which contributes to erosion and high turbidity within the brook. There are also several areas within the forested wetland that have been deeply rutted by tire tracks which have inhibited the growth of emergent wetland vegetation and created highly turbid pools that run off into the brook. Refer to Exhibit I for a detailed evaluation of plant communities.

6.4 Surface and Groundwater Resources

Surface Water and Floodplain

Ketch Brook is the only principal surface water present in the vicinity of the Project Site. Ketch Brook headwater originates in Ellington Connecticut and flows westerly into East Windsor where it is impounded at Windsorville Pond in the vicinity of Wapping Road. Discharge from the pond flows westerly across the Project Site where two separate crossings exist. The easterly crossing is a culvert conveying an existing gravel road over the brook. The second crossing is a stone arch bridge that conveys the CT DOT railroad across the brook. Ketch Brook ultimately discharges in the Scantic River southeast of the Project Site. Within the Project Site, Ketch Brook flows through woods and wetlands along the base of a steep terrace escarpments.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Ketch Brook is identified as a Class A Surface Water by the CT DEEP in the Connecticut Water Quality Standards (RCSA 22a-426-1 et seq.) The designated uses for Class A waters are habitat for fish and other aquatic life and wildlife; potential drinking water supplies; recreation; navigation; and water supply for industry and agriculture.

The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map for the Town of East Windsor (Panel numbers 09003C0239F and 09002C0245F, effective date September 26, 2008) identifies a Zone A Special Flood Hazard Area (SFHA) along Ketch Brook. Zone A is defined as areas subject to inundation by the 1% annual chance flood event where base flood elevations (BFE) have been determined. Flood elevations along the stream gradient are approximately 127 feet above the North American Vertical Datum of 1988 (NAVD 88) where the Brook leaves the Project Area.

Floodway is also mapped associated with Ketch Brook. FEMA defines Floodway as "the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height."

Refer to Figure: Floodplain, Surface & Groundwater Resources Map provided at Exhibit A.

Groundwater Resources and Aquifer Protection

The Town of East Windsor and CT DEEP share responsibility for managing Aquifer Protection Zones, although CT DEEP is responsible for the overall program administration and establishing the land use regulations. The East Windsor Zoning Regulations (effective June 26, 2018) recognize Aquifer Protection Areas. The CT DEEP defines aquifer as any soil or rock formation that is capable of yielding usable amounts of water to a water supply well.

A Level A Aquifer Protection Area is present in the northern portion of the Project Site, within parcels 057-65-001, 057-65-002 and 057-65-007. In accordance with RCSA Section 22a-354i-1 through 10, aquifer protection areas are designated around well fields in stratified drift used by water systems serving over 1000 people. The protected area encompasses the area of contribution and recharge area of the well field. Designation as an Aquifer Protection Zone by the CT DEEP allows protection of these designated areas by the municipality in accordance with local regulations. A groundwater GAA zone extends onto parcel 057-65-001 in the northeast portion of the lot adjacent to Apothecaries Hall Road. GAA groundwater zones designate public drinking water supply well recharge and public drinking water supply reservoir watershed. Additionally, portions of parcel 037-65-005A and 027-49-017C are mapped as groundwater quality zone GB. GB groundwater zones are presumed to have some degradation and are not suitable for drinking without treatment

6.5 Stormwater

VHB performed an analysis of surface water runoff conditions in accordance with the Connecticut Stormwater Quality Manual (CT Department of Environmental Protection, 2004) (the Stormwater Manual). The Stormwater Manual defines stormwater runoff as "surface flow

DRAFT

from precipitation that accumulates in and flows through natural or man-made conveyance systems during and immediately after a storm event or upon snowmelt." In some situations, runoff is a cause for concern because it may convey pollutants from a source, such as a parking lot, to sensitive receiving areas such as streams and wetlands. In other cases, runoff may cause soil erosion if the runoff flow rate is very high or the runoff flows over disturbed areas. Eroded soil would be transported downslope and deposited in the same sensitive streams and wetlands.

The Stormwater Manual outlines the process for modelling existing and future runoff characteristics by evaluating such parameters as surface topography, vegetation, soil properties, surficial geology, drainage patterns and area. Taking these characteristics into account, the model can be used to determine existing runoff flow rates and volumes discharging from a site into receiving waters or "design points". A similar process is undertaken for the proposed future conditions to determine future runoff rates and volumes.

The Stormwater Manual requires that changes to runoff rates, volumes or patterns cannot be caused by any proposed developments, and consequently, if the analysis described above identifies a change to drainage patterns or an increase in the rate of stormwater runoff, project developers are required to mitigate these alterations. Mitigation alternatives include detention basins, infiltration systems, swales, etc.

The Project Area is primarily managed as active mining and tobacco farming operations or as forested area with little existing impervious surface, beyond the farming buildings (greenhouses, tobacco sheds) and unimproved packed dirt farm roads. The soils within the Project Area are mostly derived from outwash and have high internal permeability rates. Under existing conditions precipitation can infiltrate into the ground or flow overland as runoff.

In agricultural fields, the rate and volume of runoff are influenced by conditions in the soil and by the cover on the soil. Runoff rates would be highest when the soil is frozen or thoroughly saturated and there is little vegetative cover or stubble in the fields protecting the soil surface. Storm events during such periods would lead to accelerated soil erosion rates with the higher levels of suspended solids in stormwater runoff. In addition to fine soil separates, runoff from agricultural fields may contain higher levels of plant nutrients and other pollutants associated with crop management.

In forested areas, the tree canopy intercepts precipitation and the litter layer protects the mineral soil surface from the forces of rain drop impact. Forested parts of the Project Area with near level or gentle slopes favor infiltration. Runoff from forested areas is generally considered to be of higher quality as there is little opportunity for soil erosion and sediment transport in runoff.

VHB's analysis of existing conditions determined that stormwater runoff from the northern gravel pit portion of the Project Area is generally contained on-site and discharged to groundwater. Untreated stormwater runoff from the southern gravel pit generally flows overland to the wetland systems of Ketch Brook. Lastly, the agricultural fields portions of the

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Project Area are generally at a higher elevation than surrounding areas and drain to a variety of discharge areas including kettle holes, wide valleys, and pocket wetland systems.

The results of the existing conditions analysis are provided in the Stormwater Report Exhibit L.

6.6 Scenic Values

VHB has engaged EDR, a firm with 41 years of experience providing visualization, visibility assessment, and visual impact analysis services. EDR has conducted an extensive assessment of the Project Site and abutting areas to:

- Describe the visible components of the proposed Project.
- Evaluate the potential visibility of the Project within the visual study area.
- Identify key views for visual assessment.
- Assess the potential visibility of the proposed Project.
- Identify potential mitigation measures to minimize Project visibility.

In order to conduct this analysis, EDR defined a visual study area of 0.5-mile buffer around the Project Site. Within that area, the existing visual character and the general land use were documented. The existing visual character of this area can be defined by gently rolling topography, tobacco fields and an active mining operation in the northern portion of the Project Site interspersed with residential and farming buildings interspersed with mature woodlots. Land use within the visual study area consists primarily of active tobacco fields, an active mining operation and woodlands with low density residential development scattered throughout.

These characteristics were used as the baseline conditions for the visual study area for use in the proposed conditions analysis. The proposed conditions analysis is discussed in Section 7.6. The Visual Impact Analysis is provided at Exhibit G.

6.7 Cultural Resources

VHB retained Heritage to conduct a Phase IA Cultural Resources Assessment (the Heritage survey) of the Project Site. The Heritage survey was prepared by conducting a contextual overview of the area's prehistory, history, and natural setting; literature search to identify and discuss previously completed cultural resources surveys and previously recorded cultural resources in the region encompassing the study area; a review of readily available historic maps and aerial imagery depicting the study area in order to identify potential historic resources and/or areas of past disturbance; a pedestrian survey and photo-documentation of the Project Area in order to determine its archaeological sensitivity; and preparation of the survey report. The Phase 1A Cultural Resource Survey Report is provided at Exhibit M. Refer to Figure: Phase 1A Cultural Resource Survey at Exhibit A.

The Heritage survey identified several potentially historically significant above ground structures at the Project Site and abutting areas including: 32 tobacco sheds, three barns, three residential buildings, a water tower, and two ancillary structures. Additionally, Heritage

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

identified 19 more modern buildings within the Project Site, including: 11 greenhouses, five steel sheds, and three tobacco sheds. Lastly, Heritage used combined data from the historic map and aerial image investigations, chain of title research, and a pedestrian survey to stratify the proposed study area into zones of no/low, moderate, and high archaeological sensitivity. These results are presented on Figure: Phase 1A Cultural Resource Survey.

Heritage recommended a combination of further investigation into the moderate to high archeologically sensitive areas as well as additional investigation of the tobacco barns to determine whether they are historically significant. This investigation will allow accurate determination of the approximate age and document current conditions of the barns. Consultation with SHPO in regard to investigation and mitigation methods is on-going.

6.8 Aeronautical Facilities

There are three airports in the general vicinity of the Project Site: Bradley International Airport in Windsor, Ellington Airport in Ellington and Skylark Airpark in East Windsor. The airports are located in the FAA New England Region, and are subject to FAA regulation. Refer to the Aeronautical Resources Figure provided at Exhibit A.

Bradley International Airport (BDL) is located approximately 36,960 feet (7 miles) northwest of the Project Site. The airport has three runways (Runway 6/24, Runway 15/33, and Runway 1/19), approximately 9,510 feet, 6,847 feet, and 4,268 feet in length respectively. The airport is publicly-owned and operated by the Connecticut Airport Authority and supports 64 based aircraft. Bradley International Airport is operated with an ATCT and is used for commercial, military, and general aviation purposes.

Ellington Airport (7B9) is located approximately 26,400 feet (5 miles) northeast of the Project Site. The airport has one asphalt runway approximately 1,800 feet in length and 50 feet in width. The airport is privately owned and is operated by the Bridgeport Flight Service Station. The Ellington Airport is used by the public for general aviation purposes.

The Skylark Airpark (7B6) is located within approximately 14,520 feet (2.75 miles) north of the Project Site and 6 miles from Ellington Airport. Skylark has two hard surface runways approximately 2,642 feet in length and 60 feet in width. This airport is privately owned and operated by the Experimental Aircraft Association (EAA) Chapter 1310 of East Windsor. Skylark is attended during daylight hours and does not have an Air Traffic Control Tower (ACTC). Skylark is used for training and general aviation purposes.

Notice of Proposed Construction or Alteration (Form 7460-1) was filed with the FAA on May 8, 2020.

6.9 Air Quality

The National Ambient Air Quality Standards (NAAQS) are established by the (US EPA for pollutants considered harmful to public health and the environment. Under the NAAQS, six principal pollutants, also called "criteria pollutants", are required to be monitored by the CT DEEP on yearly, daily and hourly intervals dependent on the pollutant. The six principal

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

pollutants are: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide.

The US EPA 2012 Annual Report on Air Quality in New England identifies Connecticut as an ozone 8-hour non-attainment zone. The US EPA 2012 Annual Report includes monitoring data at the East Hartford monitoring station that showed exceedances of the 75 parts per billion (ppb) ozone standard. The EPA report indicated compliance with standards for the remaining criteria pollutants. Although a more recent Air Quality Report for East Hartford was not located or identified, the State of Connecticut submitted a design report to the EPA for approval in 2015. No actual values were recorded in this document.

Operation of the GPS Project will not result in generation of any air pollution or greenhouse gases.

6.10 Noise

Noise is defined as unwanted or excessive sound. Sound becomes unwanted when it interferes with normal activities such as sleep, communication, work, or recreation. How people perceive sound depends on several measurable physical characteristics, which include the following:

- **Intensity** – Sound intensity is often equated to loudness.
- **Frequency** – Sounds are comprised of acoustic energy distributed over a variety of frequencies. Acoustic frequencies, commonly referred to as tone or pitch, are typically measured in Hertz. Pure tones have all their energy concentrated in a narrow frequency range.

Sound levels are most often measured on a logarithmic scale of decibels (dB). The decibel scale compresses the audible acoustic pressure levels which can vary from the threshold of hearing (zero dB) to the threshold of pain (120 dB). Because sound levels are measured in dB, the addition of two sound levels is not linear. Adding two equal sound levels creates a 3 dB increase in the overall level. Research indicates the following general relationships between sound level and human perception:

- A 3 dB increase is a doubling of acoustic energy and is the threshold of perceptibility to the average person.
- A 10 dB increase is a tenfold increase in acoustic energy but is perceived as a doubling in loudness to the average person.

The human ear does not perceive sound levels from each frequency as equally loud. To compensate for this phenomenon in perception, a frequency filter known as A weighted [dB(A)] is used to evaluate environmental noise levels.

VHB conducted an Acoustical Study for the Project which involved measuring existing condition sound levels at sensitive receptor locations surrounding the Project and calculating Project-generated sound levels using manufacturer's sound data and the principles of acoustical propagation of sound over distance. The Acoustical Study is provided at Exhibit N.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

The sound levels were compared to the CT DEEP noise control regulations (RCSA, Title 22a, Section 22a-69-1 to 22a 69-7).

A monitoring program was developed to measure existing ambient sound levels. The existing sound levels were measured using Type 1 sound analyzers (Larson Davis SoundExpert LxT and 831). Measurements were conducted for a 24-hour period from approximately 10:00 AM on March 2, 2020 to approximately 10:00 AM on March 3, 20120. During the daytime period, the measured sound levels data under existing conditions were composed of noise from vehicles on local roadways in the vicinity of the monitoring locations, the nearby gravel pit and wildlife. The existing measured sound level data are presented in Table 3.

Table 3. Existing Ambient Sound Levels, DB(A)

	CTDEEP Residential Zone Noise Standard		Measured L90[3] Sound Levels	
Monitoring Location[1]	Daytime[2]	Nighttime[3]	Daytime	Nighttime
M1 – Windsorville Rd	55	45	36-45	32-39
M2 – Wapping Rd	55	45	36-46	34-41
M3 – Rye St	55	45	32-41	35-41
M4 – Plantation Rd	55	45	36-43	33-42
M5 – Napoleon Dr	55	45	35-41	35-39
M6 – Apothecaries Hall Rd	55	45	34-45	33-39

1 Daytime is from 7:00 AM to 10:00 PM.
2 Nighttime is from 10:00 PM to 7:00 AM.
3 L90 is the A-weighted sound level, which is exceeded for 90 percent of the time during the time period. The L90 is generally considered to be the background sound level. It should be noted that the L90 eliminates the highest 10 percent of the sound levels that occur in the study area

Based on measurements collected, the L90 sound levels range from 32 dB(A) to 46 dB(A) during the daytime period and from 32 dB(A) to 42 dB(A) during the nighttime period. The result of the monitoring program indicates that the daytime and nighttime sound levels within the study area are currently below the CT DEEP's daytime and nighttime standard of 55 dB(A) and 45 dB(A), respectively.

6.11 Public Health and Safety

GPS prioritizes safety and the Project incorporates several elements to promote safety and security to comply with applicable regulations and industry practices. This includes (but is not limited to) appropriate fencing, signage, vegetation management, and fire prevention measures.

Under current conditions, there is generally unrestricted access to the Project Area. Public accessing the property are exposed to various hazards such as small arms and rifle fire, large kettle holes and steep, uneven terrain, high ATV use, dumping of garbage, wind-borne dust, trip hazards associated with irrigation equipment, and natural hazards such as insects, steep banks, and natural toxins, such as poison ivy. Much of the property is remote, uneven terrain

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

and not readily accessible by emergency vehicles. Additionally, heavy ATV use has caused significant alteration of the existing terrain and disturbance to the property and adjacent landowners.

6.12 Land Use

Municipal Zoning

A review of the Zoning Ordinance for East Windsor, Connecticut (2018) was performed to identify and understand the Town's intended use for the Project Site parcels.

The following table identifies the Zoning District for each parcel in the Project Site (Site Location Map in Exhibit A):

Table 4. Parcel Zoning Designations

Parcel ID	Zoning Designation
057-65-001	R-M-1, and A-1
057-65-002	R-3
048-65-007	R-3, M-1, and A-1
037-65-005A	A-2
025-49-017C	R-3
025-49-017A	R-3
016-49-007	M-1
016-50-001	M-1

Zoning designations are depicted on Figure: Site Location Map provided at Exhibit A.

Zone A-1 is defined in the Zoning Ordinance as an Agricultural/Residential District.

Zone A-2 is defined as an Agricultural/Residential (floodplain and steep slopes) District.

Zone M-1 is defined as a Manufacturing Zone and is intended to provide area for small to large scale manufacturing, warehousing, wholesale, and other forms of commercial and industrial activities.

Zone R-3 is defined in the Zoning Ordinance as a Single-Family Residential District.

Per Chapter IV of the Town of East Windsor's Zoning Regulations, public utilities are a permitted use in any zoning district with the except of the R-2 Zone, which would require a Special Use Permit. All Zones, with the exception of the M-1 Zone, have the same maximum lot coverage allowance of 15% for buildings and 25% impervious surfaces. The maximum height in these Zones (A-1, A-2, and R-3) is 30 feet; with accessory structure height requirements varying from 35 feet in Zones A-1 and A-2 to 20 feet in Zone R-3. The M-1 Zone allows for 35% maximum coverage for buildings and 75% impervious surface as well as a maximum height requirement of 60 feet.

DRAFT

There are no daycare centers, schools, hospitals or group homes within a half mile of the Project Site.

Future Land Use

VHB reviewed the Town of East Windsor Plan of Conservation and Development (2016) (POCD) to identify the Town's future land use plans for the Project Area and vicinity. Generally, related to renewable energy, the Town states their future plans include "encouraging energy conservation, the use of solar and other renewable forms of energy; and energy efficient patterns of development."

Primary Strategies of the POCD include:

- Protecting rural, village, agricultural and business characteristics;
- Preservation of open space;
- Protecting environmental quality; and
- Economic Development.

Encouraging development that provides economic benefits it one of the basic visions of the POCD. Under this Plan, the Town recognizes the importance of an "economic balance" and proposes to consider new approaches for commercial development.

Key planning elements highlighted in the POCD include:

- Preserving open space, preservation of local assets and protection of environmental quality. The Project Area brings new purpose to a heavily disturbed industrial and manufacturing areas.
- The Business and Commercial Development Plan includes increasing the tax base and regional economic vitality.
- Future Land Use of the POCD identifies the Project Area as targeted areas for farmland preservation, dedicated open space, and railroad industry.
- The POCD highlights protection of rivers, streams, wetland, lakes, and major ground water sources.
- The POCD prioritizes preservation of wildlife habitats.
- Protecting scenic roads and proposing scenic road ordinances.

Agriculture

Portions of the Project Area are designated as Prime Farmland (Refer to Farmland Soils Figure in Exhibit A). Prime Farmland is defined as Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses.[5] Several criteria such as slope, surface stoniness, texture, climate and the availability of irrigation factor into this designation. The Natural Resource Conservation Service (NRCS) assigns Prime Farmland designations to specific map

[5] Soil Survey Manual, USDA Handbook No. 18, October 1993

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

units in the cooperative soil survey. A map unit generally consists of one or more named soil series and unnamed inclusions along with phase modifiers for surface texture and slope.

Approximately 233.1 acres of Prime Farmland that was planted or fallow in 2019 are mapped within the 726-acre Project Site. Approximately 5,783 acres of Prime Farmland are mapped within the Town of East Windsor.

Other Environmental Considerations

As directed in the Siting Council's Application Guide for a Renewable Energy Facility, VHB reviewed available databases for consideration of impacts to additional environmental concerns. None of the following were found to be present within the Project Site.

- Coastal Consistency Analysis (CGS §22a-90)
- Connecticut Heritage Areas (CGS §16a-27)
- Ridgeline Protection Zones (CGS §8-1aa)
- DOT Scenic Lands (CGS §13a-85a)
- State Parks and Forests (CGS §23-5)
- Wild and Scenic Rivers (CGS §25-199)
- Protected Rivers (CGS §25-200)

DRAFT

7

Environmental Consequences

Utilizing the Project design data and the results of the Affected Environment Analysis, VHB prepared an analysis of the environmental consequences potentially resulting from the Project.

7.1 Tree Clearing and Vegetation Management

Tree Clearing

As required by the Siting Council, VHB performed a carbon debt analysis for the Project. The Project will cumulatively result in 124 acres of new tree clearing across the entire Project Area. The purpose of this analysis was to determine whether the Project can have a net improvement in carbon reduction compared to the loss of 124 acres of trees. Approximately 317 acres of the 726-acre Project Site is forested. Proposed tree clearing represents 23 percent of the total forested area within Project Site parcels (see Figure: Tree Clearing Plan at Exhibit A).

The analysis relied upon a US EPA conversion factor to identify the amount of carbon sequestered in one year by one acre of average United States forest: 0.77 metric tons (MT) CO_2 (US EPA, 2020). As the Project requires the removal of approximately 124 acres of trees, the associated "carbon debt" is estimated to be 2,864.4 MT CO_2 over 30 years with a one-time release of carbon stock of 10,538.1 MT CO_2. Further, cropland conversion has an associated "carbon debt" of 1,030.5 MT CO_2 30-year emission avoidance and 30-year sequestration. The one-time release of carbon stock is estimated at 5,212.7 MT CO_2. Upstream activities of the solar PV system are 212,520.0 MT CO_2.

The Project is expected to produce approximately 253,000 MWh of energy in its first year of operation. Using an emission factor specific to the Project's eGrid region: NPCC New England (US EPA, 2018), the estimated annual carbon offset of the Project is 107,463.6 MT CO_2. Greenhouse gas equivalencies for this estimated offset, could include:

- 23,217 passenger vehicles driven for one year; and,
- 12,401 homes' energy use for one year.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Anticipating an annual "carbon debt" of 230,104.8 MT CO_2 and an annual production benefits of 107,463.6 MT CO_2, it would take the Project approximately 2.1 years (or 25.7 months) to have a net improvement in greenhouse gas emissions.

The Carbon Debt Analysis is provided at Exhibit O.

Vegetation Maintenance

Outside of the gravel perimeter road and security fence, the Project requires an approximately 100-foot zone (buffer area) maintained free of tall vegetation so that sunlight reaches the solar panels un-obstructed. Much of this area is already cleared and where necessary, existing trees will be removed as described above. In this buffer area, it is not necessary to remove or "grub" tree stumps. Consequently, the Applicant is proposing to cut trees so that stumps are nearly level with the ground and leave them in place to limit the disturbance of the Prime Farmland that may be present. This buffer area will be planted with a combination of grass and meadow seed mixtures to promote soil stabilization and provide some wildlife habitat. This area will be mowed once or twice annually to discourage the establishment of woody species. Refer to the Operations and Maintenance Plan provided at Exhibit P.

Within the array area inside the perimeter roadway, the ground surface will be stabilized with a permanent grass cover to reduce erosion and promote infiltration. These grassed areas will be mowed periodically to eliminate the establishment of woody vegetation and reduce the accumulation of dry grasses and vines. These actions will minimize the probability of brush fires spontaneously igniting.

7.2 Wetlands

The Project has been designed to minimize direct impacts to wetlands. One exception is Wetland 10, an isolated, poorly developed wetland that has been subject to routine disturbance during farming and gravel mining operations. The Project proposes to eliminate this wetland. The Town of East Windsor Conservation Commission / IWWA regulates activities with 150 feet of wetlands and watercourses which is referred to in the East Windsor Inland Wetlands Regulations [6] as the Upland Review Area (URA). The Project avoids impact to the URA to the extent practicable. The Project extends into some URA areas which were previously developed and are currently used for agriculture. The Project will result in new development within URA. Refer to Figure: Wetland Delineation Map provided at Exhibit A. A Soil Scientists Report is provided at Exhibit H.

In addition to avoidance and/or minimization of wetland impacts, GPS is proposing horizontal directional drilling (HDD) under the wetland area location near the CT DOT railway property as well as along Ketch Brook.

[6] Town of East Windsor Inland Wetlands and Watercourses Regulations, 2013. http://www.East Windsor-ct.gov/conservation-commission-inland-wetlands-agency/links/inland-wetlands-watercourses-regulations

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Prior to construction, GPS will describe the application of best management practices (BMPs) to avoid and minimize indirect wetland impacts and natural resource impacts during construction. This will likely consist of several components, including:

- Appropriate erosion control measures;
- Temporary crossing guidelines,
- Protective measures for wildlife;
- Contractor and sub-contractor education,
- Construction equipment storage and material staging requirements/restrictions; and
- Periodic monitoring and reporting.

7.3 Wildlife and Habitat

As documented in Section 6.3, existing vegetative cover types were mapped on the Project Area. Cover types are an indicator of the various wildlife habitats provided and are linked to the habitat needs of individual species. VHB analyzed the ecological integrity and alteration of vegetative cover types resulting from the Project as an indicator of potential impacts to wildlife utilizing the Project Area. The Wildlife Evaluations Technical Memorandum is provided at Exhibit I.

The Project Area is primarily comprised of industrial and manufacturing zones and is subject to significant disturbance as a result of the active mining operations. In addition to this scarified land that will be regraded and utilized for solar panel placement, approximately 229 acres of primarily tobacco fields will be converted to host solar arrays. Both of these current land uses will undergo alteration and improvement as a result of Project activities. For instance, permanent grass cover will be established under the array and along the perimeters of the arrays. The grassland cover will be mown approximately one to two times per year to prevent establishment of woody vegetation. Additionally, approximately 124 acres of deciduous-coniferous and successional/reclaimed forest will be cleared. These cleared areas will also be planted in grasses and legumes.

Approximately 57.4 acres of forested upland will be converted for the Project, which will result in some habitat loss for forest-dwelling species. The CT DEEP GIS coverage for East Windsor indicates that the Project does not contain Core Forest.

No streams or forested wetlands will be impacted by the Project and BMPs will be employed during construction to prevent sedimentation and/or runoff from entering the ponds, streams, or wetlands.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Table 5. Cover Types with Project Parcels: Existing Area and Areas to be Altered (Acres)

Cover Type	Existing Area	Area to be Altered	Area not Altered
Agricultural Fields	438	229	209[1]
Deciduous Forest	262.8	42.2	220.6
Coniferous Forest	26.7	15.2	11.5
Forested Wetland	27.5	0	27.5
Shrubland	61.6	23.9	37.7

1 The acreage supporting the solar array panels will all be managed as cool season grassland. Agricultural fields not occupied by solar arrays will also be converted to grassland or other landscape area.
2 Primarily Public Utility Transmission Corridor.

Aside from habitat conversion, a review of the literature indicated the potential for direct collisions with the solar arrays by birds presumably caused by confusing the panels with water.

Pre-construction wildlife usage patterns are anticipated to resume after the construction period is completed.

Potential Mitigative Actions

To avoid the potential impacts to wildlife during construction, the Applicant proposes the following measures:

- If construction activities are to occur during the nesting period (between early May and mid-August), vegetation removal, including forest tree removal and agricultural clearing, should be conducted before May 1 and after August 15.
- If vegetation removal must occur within the May 1 to August 15 avoidance window, areas to be cleared should first be surveyed to determine if breeding birds would be disturbed. If the survey concludes that breeding birds would be disturbed, a modified vegetation removal schedule will be implemented.
- Install nest boxes for American kestrel in suitable areas.
- Environmental monitoring during construction in potential State-listed reptile habitats will be conducted by a qualified inspector to ensure avoidance of impacts to these organisms, to the extent practicable.
- Any State-Listed species encounters will be reported to the CT DEEP NDDB.
- To minimize the possibility of "incidental take" of roosting bat species, the Applicant will follow the guidance provided in the USFWS Final 4(d) Rule issued for the northern long-eared bat on January 14, 2016 (USFWS, 2017). The Applicant will not perform any tree removal activities during the bat pupping season between June 1 and July 31 (USFWS, 2017).
- Plant surveys for the State-listed plants for which there is suitable habitat within the Project Area will be performed during the blooming period for each plant. Any observed occurrences of the state-listed plant species will be cordoned off with protective flagging

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

to prevent disturbance to these areas during construction. If avoidance is impracticable, additional coordination will be undertaken to comply with the CT ESA.

7.4 Surface and Groundwater Resources

The CT DEEP has mapped an Aquifer Protection Area within the northern portion of the Project Site. The East Windsor Zoning Regulations restrict development of certain new land use activities that use, store, handle or dispose of hazardous materials and requires existing regulated land uses to register and follow best management practices. Although the panels, transformers and inverters contain hazardous oils and/or chemicals, it cannot be released into the environment or removed unless the equipment is broken. Hazardous materials will not be stored on the Project Area but may be present during the construction phases. A Spill Prevention Control and Countermeasures (SPCC) Plan will be developed as well as a separate SPCC plan during the operation of GPS. Furthermore, a solar facility in comparison to the current land use within the Aquifer Protection Area (active sand and gravel mining operations) poses less risk of spill or leak fuel storage.

The Project will not utilize on-site water sources, leaving more water available for base flow in streams. Once in operation, GPS will be unstaffed and does not require potable water uses or result in sanitary discharges. Portable sanitary facilities will be required on-site during construction and will be the responsibility of the company or firm which undertakes the construction phase work associated with the Project.

The FEMA Flood zones were established to promote public health, safety, and general welfare and to minimize losses caused by periodic flooding. While these areas are present along Ketch Brook, no work or obstruction is proposed to be placed in the flood zone.

Ground and surface water quality can also be affected by land management. Soil erosion and sedimentation can contribute to the degradation of surface water quality and may become a public nuisance if tracked onto area roadways or allowed to become airborne. Standard BMPs provided in the 2012 Connecticut Guidelines for Soil Erosion and Sediment Control will be incorporated in the Stormwater Pollution Control Plan and construction documents. Structural measures such as sediment traps, anti-tracking stone construction exits, erosion control blankets, hydraulically applied mulch, perimeter and intermediate sediment control silt fence and wattles will be employed during construction. Any sediment that gets past these treatments and is tracked off-Site during construction will be swept at the end of each workday. Disturbed areas associated with construction activities will be graded, covered with topsoil, and permanently stabilized with conservation grasses and legumes.

Long term grass cover will reduce the hazard of wind and water erosion in agricultural fields by eliminating the periods when the soil surface is exposed after cultivation and seed bed preparation. Inputs of fertilizer and pesticides will also be reduced under grassland management. These factors can improve the quality of ground and surface waters.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

7.5 Stormwater

The stormwater management system design will adhere to the guidelines provided within the 2004 Connecticut Stormwater Quality Manual. The Project creates little new impervious surface as the solar arrays are elevated above the ground on racking so that permanent grass cover is established beneath the racks. This vegetation not only protects the soil from erosion, but long-term management as grassland will increase the organic matter content of the soils and enhance soil structure.

Improved soil structure increases the infiltrative capacity at the soil surface and the internal permeability of the soil reducing the percentage of precipitation converted to runoff.

Based on the engineering analysis provided in the Stormwater Management Report (Refer to Exhibit L), implementation of the Project will not increase peak discharge rates or volumes generated by the design storms modeled. These rates will be maintained at or below existing levels at all design points studied.

7.6 Scenic Values

EDR performed a Visibility Assessment (VA) for the Project, a copy is provided in Exhibit G. The VA consisted of viewshed analysis, field verification, and visual simulations. Generally, the VA used lidar topographic point cloud information, topographic data, Project data and ESRI ArcGIS® software with the Spatial Analyst extension to identify where views into the Project Site exist within the study area. Field verification was performed to confirm these viewpoints, obtain photographs for use in visual simulations, and further document the character of the study area. The visual simulations were prepared utilizing aerial photographs, LIDAR data, and GPS data collected in the field to create an AutoCAD Civil 3D® drawing. The VA is provided at Exhibit G.

Several viewpoint locations were selected as particularly sensitive for abutters and the public travelling on area roadways. These viewpoints were photo-documented and used for visual simulations. By simulating the future viewshed conditions proposed conditions, specific needs for screening such as vegetation or fencing were identified. The simulations were then remodeled with proposed screening features.

Visibility Analysis

The results of the visibility assessment are summarized as follows:

- The viewshed analysis suggests that potential views of the Project will be contained within the Project Area, with the exception of some public roads and properties directly abutting the Project property. Approximately 3.9 percent of the half mile visual study area (VSA) could have potential views of some portion of the Project (i.e. 96.1% of the VSA is fully screened from view). Most visible areas are actually contained within the boundaries of the Project Area.
- Field review indicated that the viewshed results were generally accurate, and existing structures and vegetation will be effective in screening views of the Project in most

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

locations. However, where forest vegetation is thin and/or understory vegetation is lacking, some visibility may be experienced from public roads and homes directly abutting the Project Area.

- Homes along Apothecaries Hall Road directly adjacent to the Project Area may experience some level of visual impact due to the introduction of the solar panels and perimeter fencing. Vegetative mitigation may be effective in reducing impacts to these residential areas.
- Homes located along Plantation Road may have some limited views into the Project Area through an existing hedgerow and may also benefit from some supplemental screening to minimize Project visibility.
- A few homes along Rye Street have some limited views into the Project Area and may experience some level of visual impact resulting from visibility of portions of the Project. Selective plantings may be effective in reducing or eliminating visibility from these locations.

Four visual simulations illustrate representative views of the Project from various foreground locations within the visual study area.

Visual Mitigation

Potential vegetative screening mitigation treatments for several of the aforementioned locations that may experience minor visual impacts may be sufficient. However, additional mitigation measures would also minimize visual impacts; the following may be considered for inclusion in the Project:

- Burial of interconnection cables to minimize visibility.
- The use of non-specular materials to reduce potential visual impacts from adjacent areas, i.e. black vinyl coating can minimize light reflection and thus visibility of the fence.
- Increased setbacks from residences and known sensitive locations to minimize visibility of solar facilities.
- Positioning inverters and transformers within solar arrays and away from public vantage points.

Some of these mitigation measures have already been included in the Project design; however, the feasibility and practicability of all measures has not been determined at this time.

7.7 Cultural Resources

The Heritage survey report described in Section 6.7 was submitted to the Connecticut State Historic Preservation Office (CT SHPO) to initiate consultation on May 13, 2020. The Applicant, VHB and Heritage have scheduled a meeting with the CT SHPO on May 19, 2020 to discuss additional studies to be conducted and opportunities for preservation and mitigation of identified cultural resources. Additional field studies that were proposed by Heritage and require confirmation by CT SHPO were still in progress at the time of this filing. Refer to Exhibit M.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

7.8 Aeronautical Facilities

On behalf of GPS, VHB filed 19 Notice of Proposed Construction or Alteration - Off Airport (Form 7460-1) notifications with the FAA. Copies of the 7460-1 filings are provided at Exhibit Q. The filings were made on May 8, 2020 and provided required information about the Project such as the type of activity/construction, the latitude and longitude of the facility, the height of equipment above ground, and ground elevations. Response from FAA has not been received to date, copies of correspondence have been included at Exhibit Q. A determination of whether the Project will exceed obstruction standards or have negative impacts on flight patterns will be provided by the FAA within 45 days of filing. A determination of no hazard or Determination of No Effect (DNE) is anticipated for the GPS Project based on previous determinations with similar project types and elevations within closer proximity to aeronautical facilities. Once a determination has been received for the Project, the Certificate will be updated accordingly. It is anticipated that FAA will require that GPS file the FAA Form 7460-2, Notice of Actual Construction or Alteration, following construction of the facility.

7.9 Air Quality

Minor construction related impacts to air quality could include emissions produced by the operation of construction machinery or fugitive dust emissions, but such impacts would not be expected to be greater than the use of agricultural and gravel mining equipment that is currently taking place. In order to reduce and mitigate such potential impacts to air quality, exposed soils will be periodically sprayed with water as necessary during construction and that crushed stone aprons be installed at access road entrances for dust control. Additionally, the quantity of earth to be moved or disturbed during construction will be minimized to comply with state guidelines.

The Project will have minimal emissions of regulated air pollutants and greenhouse gases during the construction phase and no emissions during operation. Therefore, an air permit is not required for the construction or operation of the solar facility.

7.10 Noise

VHB conducted an acoustical study to evaluate the sound levels from the mechanical equipment associated with the Project. The Project-related noise sources consist of the electrical inverters and transformers used to convert the solar energy to electricity and motors associated with the trackers. The Project-generated sound levels were calculated using manufacturer's sound data and the principles of acoustical propagation of sound over distance. An Acoustical Analysis is provided at Exhibit N.

Noise Impact Regulatory Criteria

The CT DEEP has developed noise impact criteria that establish sound level thresholds deemed to result in adverse impacts. The acoustic analysis for the Project used these criteria to evaluate whether the Project will generate sound levels that result in adverse impacts.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

The CT DEEP's noise control regulations identify the limits of sound that can be emitted from specific premises and what activities are exempt. The noise control regulations (Title 22a, §§ 22a-69-1 to 22a 69-7) are contained in the RCSA. Even though the proposed Project would be considered a Class C (Industrial) emitter, the acoustic analysis for the Project assumed the more stringent noise standard for a Class B (Commercial) Emitter Zone and a Class A (Residential) Receptor Noise Zone for the receptor locations. A Class C land use is defined as generally industrial where protection against damage to hearing is essential, and the necessity for conversation is limited. The land use for Class B is defined as generally commercial in nature, where human beings converse, and such conversations are essential to the intended use of the land. The land use in Class A is defined as generally residential where human beings sleep or areas where serenity and tranquility are essential to the intended use of the land.

The CT DEEP policy states that a source (emitter) located in the various zones shall not emit noise exceeding the levels stated in Table 6 at the adjacent noise zones.

Table 6. CT DEEP Noise Zone Standards

	Receptor Noise Zone			
Emitter Zone	**Class A (Daytime)**	**Class A (Nighttime)**	**Class B**	**Class C**
Class A (Residential)	55	45	55	62
Class B (Commercial)	55	45	62	62
Class C (Industrial)	61	51	66	70

Source: Control of Noise (Title 22a, Section 22a-69-1 to 22a-69-7.4), RCSA, Revised 2015-3-6.

Receptor Locations

Fifty-six receptor locations were identified in the vicinity of the Project Area and represent residential parcels that surround the Project. The receptor locations were selected based on their proximity to the Project Area and their land use. These receptor locations represent the most sensitive locations in the immediate area that may experience changes in sound levels once the Project is in operation. They include:

- R1 – 363 Rye Street
- R2 – 359 Rye Street
- R3 – 357 Rye Street
- R4 – 353 Rye Street
- R5 – 351 Rye Street
- R6 – 349 Rye Street
- R7 – 345 Rye Street
- R8 – 341 Rye Street
- R9 – 20 Plantation Road
- R10 – 25 Plantation Road
- R11 – 281 Rye Street
- R12 – 281 Rye Street
- R29 – 87 Apothecaries Hall Road
- R30 – 89 Apothecaries Hall Road
- R31 – 91 Apothecaries Hall Road
- R32 – 93 Apothecaries Hall Road
- R33 – 95 Apothecaries Hall Road
- R34 – 97 Apothecaries Hall Road
- R35 – 99 Apothecaries Hall Road
- R36 – 142 Windsorville Road
- R37 – 145 Windsorville Road
- R38 – 147 Windsorville Road
- R39 – 153 Windsorville Road
- R39A – 159 Windsorville Road

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

- R13 – 271 Rye Street
- R14 – 265 Rye Street
- R15 – 263 Rye Street
- R16 – 259 Rye Street
- R17 – 257 Rye Street
- R18 – 247 Rye Street
- R19 – 169 Rye Street
- R20 – Rye Street
- R21 – 30 Apothecaries Hall Road
- R22 – 45 Apothecaries Hall Road
- R23 – 47 Apothecaries Hall Road
- R24 – 51 Apothecaries Hall Road
- R25 – 53 Apothecaries Hall Road
- R26 – 57 Apothecaries Hall Road
- R27 – 141-79 Windsorville Road
- R28 – 85 Apothecaries Hall Road
- R40 – 166 Windsorville Road
- R40A – 169 Windsorville Road
- R41 – 176 Windsorville Road
- R42 – 22 Wapping Road
- R43 – 36 Wapping Road
- R44 – 20 Wapping Road
- R45 – 40 Wapping Road
- R46 – 60-134 Wapping Road
- R47 – 80 Wapping Road
- R48 – Rye Street
- R49 – Rye Street
- R51 – 140 Wapping Road
- R52 – 223-169 Wapping Road
- R53 – 46 Plantation Road
- R54 – Plantation Road

Future Conditions Model

The acoustical analysis evaluated the potential sound level impacts associated with the Project's proposed mechanical equipment at the nearby sensitive receptor locations. This analysis evaluated the potential sound level impacts from the 36 inverters, two transformers, and 1,133 tracking system motors operating simultaneously.

Project-generated sound levels were calculated for each sensitive receptor location based on manufacturer-provided reference sound level data. The reference sound level data included the following:

- TMEiC Solar Ware Ninja Inverters - 82.5 dBA at 3.3 feet;
- Transformers – 79 dB to 80 dB at 6 feet; and
- NEXTracker's Horizon Single Axis Tracker motor – 69.6 dB at 3.3 feet.

The reference sound levels for transformers are based on data obtained from National Electrical Manufacturers Association (NEMA) TR1 publication. These reference sounds levels were adjusted to reflect the distances -generated sound levels were projected to the receptor locations using the properties of sound propagation for soft ground terrain in the acoustic modeling software CadnaA (Computer Aided Noise Abatement).

Finally, the existing and proposed Project-generated sound levels were added together to determine the proposed mechanical equipment's' potential impact on existing sound levels. These results were compared to the CT DEEP noise impact criteria for determining compliance.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Results of the Acoustical Study

The potential sound level impact associated with the Project was determined by comparing existing and future sound levels to the CT DEEP's noise standards. The existing sound levels were based upon sound level measurements. The future sound levels were calculated by combining existing sound levels and sound levels from the proposed equipment. The sound levels were adjusted based upon distance, properties of sound propagation over terrain, applicable blockage, and, if necessary, noise attenuation measures, which may include an acoustical wall.

The results of the acoustical analysis demonstrated that the operation of the proposed equipment will comply with CT DEEP's noise standards at the sensitive receptor locations. The sound levels attributed to the proposed equipment ranges from approximately 14 dB(A) to 42 dB(A). During the daytime period, the receptor locations will experience overall sound levels (ambient plus project contributions) ranging from approximately 33 dB(A) to 46 dB(A). These sound levels are below CT DEEP's daytime criteria of 55 dB(A). Due to the nature of the project, the equipment will not be operating during the nighttime period.

Table 7 summarizes the sound levels at the receptor locations.

Table 7. Sound Levels at Receptor Locations, DB(A)

Receptor Locations	CT DEEP Noise Standard Daytime*	Project Generated Sound Levels	Overall Sound Levels
R1 – 363 Rye Street	55	27.0	33 - 41
R2 – 359 Rye Street	55	27.7	33 - 41
R3 – 357 Rye Street	55	28.1	33 - 41
R4 – 353 Rye Street	55	28.3	34 - 41
R5 – 351 Rye Street	55	28.3	34 - 41
R6 – 349 Rye Street	55	28.3	34 - 41
R7 – 345 Rye Street	55	28.3	34 - 41
R8 – 341 Rye Street	55	31.6	37 - 43
R9 – 20 Plantation Road	55	30.0	37 - 43
R10 – 25 Plantation Road	55	36.1	39 - 44
R11 – 295 Rye Street	55	40.4	42 - 45
R12 – 281 Rye Street	55	22.1	36 - 43

DRAFT

Receptor Locations	CT DEEP Noise Standard Daytime*	Project Generated Sound Levels	Overall Sound Levels
R13 – 271 Rye Street	55	14.1	36 - 43
R14 – 265 Rye Street	55	18.6	36 - 43
R15 – 263 Rye Street	55	18.3	36 - 43
R16 – 259 Rye Street	55	17.5	36 - 43
R17 – 257 Rye Street	55	22.2	36 - 43
R18 – 247 Rye Street	55	20.5	36 - 43
R19 – 169 Rye Street	55	20.6	36 - 43
R20 – Rye Street	55	27.5	36 - 42
R21 – 30 Apothecaries Hall Road	55	28.7	36 - 42
R22 – 45 Apothecaries Hall Road	55	30.6	36 - 46
R23 – 47 Apothecaries Hall Road	55	32.0	36 - 46
R24 – 51 Apothecaries Hall Road	55	33.3	37 - 46
R25 – 53 Apothecaries Hall Road	55	33.2	37 - 46
R26 – 57 Apothecaries Hall Road	55	31.3	36 - 46
R27 – 141-79 Windsorville Road	55	27.2	35 - 45
R28 – 85 Apothecaries Hall Road	55	25.9	35 - 45
R29 – 87 Apothecaries Hall Road	55	26.0	35 - 45
R30 – 89 Apothecaries Hall Road	55	26.1	35 - 45
R31 – 91 Apothecaries Hall Road	55	26.1	35 - 45
R32 – 93 Apothecaries Hall Road	55	26.2	35 - 45
R33 – 95 Apothecaries Hall Road	55	26.3	35 - 45
R34 – 97 Apothecaries Hall Road	55	26.3	35 - 45
R35 – 99 Apothecaries Hall Road	55	26.4	36 - 45
R36 – 142 Windsorville Road	55	26.3	36 - 45

DRAFT

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Receptor Locations	CT DEEP Noise Standard Daytime*	Project Generated Sound Levels	Overall Sound Levels
R37 – 145 Windsorville Road	55	26.2	36 - 45
R38 – 147 Windsorville Road	55	26.5	36 - 45
R39 – 153 Windsorville Road	55	26.7	36 - 45
R39A – 159 Windsorville Road	55	26.3	36 - 45
R40 – 166 Windsorville Road	55	26.5	36 - 45
R40A – 169 Windsorville Road	55	25.6	36 - 45
R41 – 176 Windsorville Road	55	28.9	37 - 45
R42 – 22 Wapping Road	55	23.3	36 - 45
R43 – 36 Wapping Road	55	24.9	36 - 46
R44 – 20 Wapping Road	55	23.3	36 - 46
R45 – 40 Wapping Road	55	23.8	36 - 46
R46 – 60-134 Wapping Road	55	25.7	36 - 46
R47 – 80 Wapping Road	55	27.1	36 - 46
R48 – Rye Street	55	27.2	36 - 46
R49 – Rye Street	55	29.0	37 - 46
R50 – Rye Street	55	31.1	37 - 43
R51 – 140 Wapping Road	55	36.4	39 - 44
R52 – 223-169 Wapping Road	55	31.9	37 - 46
R53 – 46 Plantation Road	55	28.7	34 - 41
R54 – 47 Plantation Road **	62	42.2	43 - 46

* Noise standard for Class B emitter and Class A receptor.

** Noise standard for Class B emitter and Class B receptor for commercial use location.

Since the model for the future sound level relied upon assumed transformer and inverter equipment which will be subject to change as the Project proceeds to construction, the Applicant commits to remodeling the projected sound levels once the specific equipment models and corresponding sound levels are identified. If this pre-construction analysis reveals any non-compliance with CT DEEP sound level criteria, sound mitigation will be employed in the final design. Sound mitigation typically consist of walls or other structure

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

that blocks the line of sight between the sound emitter and the sound receptor. Such screening would be positioned directly at the noise source.

Construction Activities

Construction activities may result in temporarily increases of nearby sound levels due to the intermittent use of heavy machinery. The Project is expected to generate typical sound levels associated with construction, including truck movements, heavy equipment operations, and general construction activities. Heavy machinery, such as front-end loaders, graders, bull dozers, and backhoes, would be used intermittently throughout construction.

Section 22a-69-1.8(g) of the CT DEEP's noise control regulation states that noise associated with construction activities are exempt from the regulation. However, even though construction noise is exempt from the regulation, construction activities such as excavation/grading and installation of the solar panel systems would typically be limited to normal daytime working hours. Construction activities beyond normal daytime work hours would be minimized to the extent practicable and would adhere to local noise regulations.

If noise concerns arise during construction, the Applicant will evaluate and implement appropriate noise abatement measures to reduce or minimize noise from the construction activities. Construction vehicles and equipment would be required to maintain their original engine noise control equipment. Specific mitigation measures may include, but not limited to, the following:

- Install and properly operate appropriate noise muffler systems on construction equipment;
- Implement appropriate traffic management techniques during the construction period to minimize roadway traffic noise impact;
- Implement procedures for proper operation and maintenance, and prohibition of excessive idling of construction equipment engines; and
- Install quieter-type (manually adjustable or ambient-sensitive) backup alarms on construction vehicles.

7.11 Public Health & Safety

GPS prioritizes safety and the Project incorporates several elements to promote safety and security and comply with applicable regulations and industry practices. For instance, the facility will be monitored remotely 24 hours a day, and transformers with alarms have been selected for installation at the Project Site. In addition to these engineered safety mechanisms, the Applicant will open dialogues with, and provide input and/or training for, area local responders. Appropriate protective gear as well as technical specifications for the equipment on-site will also be provided. Information pertaining to Project safety and emergency response considerations and procedures can be identified in the GPS Emergency Management and Evacuation Plan (Exhibit R) and the GPS Operation and Management Plan (Exhibit P).

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Fencing

The facility will be surrounded by 7-foot-high chain link fence for security. The chain-link fence is required to be posted with safety signage providing the warning that high voltage equipment is stored inside the fence. The NESC dictates the height of the fence and the signage. The NESC also dictates the distance between the fence and electrified equipment to minimize arcing, as well as grounding requirements for the fence itself for the safety of those potentially contacting the fence. The security fence is not an electric fence. In certain areas, architectural fencing and plantings are proposed for visual screening, see Exhibit G: Visibility Assessment.

Signage

Signage identifying the facility will be provided at each driveway location and will include contact information for GPS personnel in charge of managing the facility. These signs will be designed with consideration of the signage guidance provided in the Town of East Windsor Zoning Regulations. The chain-link fence will be posted with safety signage providing the warning that high voltage equipment is stored inside the fence.

Vegetation Management

Areas of the Project planted in grass or meadow cover will be mowed once or twice annually to discourage the establishment of woody species. Areas outside the limits of the Project footprint and buffer will be left in a natural state. Vegetation management is further outlined in the Operations and Management Plan provided at Exhibit P.

Fire Prevention

The facility will have an Emergency Management and Evacuation Plan coordinated with first responders prior to the completion of construction. Local emergency responders, including the police and fire departments for both the Town of East Windsor and Town of South Windsor, have been identified for their proximity to the Project.

- Town of East Windsor
  - East Windsor Police Department located at: 25 School St, East Windsor CT 06088
  - Broad Brook Fire Department located at: 125 Main St, Broad Brook CT 06016
- Town of South Windsor
  - South Windsor Police Department located at: 151 Sand Hill Rd, South Windsor CT 06074
  - South Windsor Fire Department located at: 1175 Ellington Rd, South Windsor CT 06074

Specifically, the Responders will have access to GPS through gates and the road system will ring the facility. Additionally, the gravel roads will also act as a fire break and be sufficient to support response for equipment rapidly and in a timely fashion. Fire prevention practices are further outlined in the Operations and Management Plan provided at Exhibit P.

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

Emergency Access/Training

Applicant will provide appropriate training and access to individuals with authorized or emergency access to the facility to allow for rapid response to individuals that have actual knowledge of the operation and risks associated with the facility. First responder training is further outlined in the Operations and Management Plan provided at Exhibit P.

Electric and Magnetic Fields

Electric and Magnetic Fields (EMF) is a term used to describe fields that are created by voltage (electric field) and electric current (magnetic field). These fields can be measured using instruments and can be calculated using a computer model.

Power frequency EMFs are present wherever electricity is used. Sources of these fields include utility transmission lines, distribution lines, switchyards, building wiring in homes, offices, and schools, and the appliances and machinery used in these locations.

Electric fields are present whenever voltage exists on a wire and are not dependent on the magnitude of the current flow. The magnitude of the electric field is primarily a function of the configuration and operating voltage of the line and decreases with the distance from the source. Electric fields are shielded (i.e., the strength is reduced) by conducting surfaces, including trees, fences, walls, buildings, and most types of structures.

Magnetic fields are present whenever current flows in a conductor and are not dependent on the voltage present on the conductor. The magnetic field strength resulting from a transmission line is a function of both the current flow on the conductor and the configuration of the transmission line. The strength of these fields also decreases with distance from the source. However, unlike electric fields, most common materials have little shielding effect on magnetic fields.

The National Institutes of Health (NIH) has developed a fact sheet summarizing the health concerns associated with EMF. The NIH reports that "No consistent evidence for an association between any source of non-ionizing EMF and cancer has been found."

Environmental Justice

Pursuant to CGS. §22a-20a, any "affecting facility" with a capacity of more than 10 MW that is proposed to be located in an "environmental justice community" and is seeking to obtain any certificate under PURA or a new or expanded permit or siting approval from the Siting Council or DEEP must file a "Meaningful Public Participation Plan." The definition of an "affecting facility" excludes facilities using non-emitting and nonpolluting renewable resources. As the proposed Project falls under this exclusion, being a solar energy farm, it is not required to file an Environmental Justice Public Participation Plan.

Moreover, the site of the proposed Project is not an environmental justice community as defined by CGS §22a-20a. Such communities include any United States census block group for which 30 percent or more of the population consists of low-income persons with income

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

below 200 percent of the federal poverty level or a "distressed municipality" as defined under CGS §32-9p.

The proposed Project is located in United States census block groups 090034842002 and 090034842003. According to the 2013-2017 American Community Survey 5-Year Estimates, the population of these geographies is 1,912 and 911, respectively. Among these populations, the portion of low-income individuals is 10 percent in block group 090034842002 and 0 percent in block group 090034842003, compared to the State of Connecticut at 23 percent. These values derive from the USEPA's EJSCREEN (Version 2019) tool, which uses a threshold for "low-income" that is consistent with the definition provided above relative to the federal poverty level.

Furthermore, based on annual lists compiled by the Department of Economic and Community Development, the Town of East Windsor is not a "distressed municipality" as defined under CGS §32-9p.

7.12 Land Use

GPS has reviewed and is compatible with the Town of East Windsor POCD. The Town's future land use plans for the Project Area and vicinity as well as the primary strategies of this plan

Primary Strategies of the POCD as they related to the Gravel Pit Solar Project:

- *Preserving open space, preservation of local assets and protection of environmental quality*. The Project Area brings new purpose to a heavily disturbed industrial and manufacturing areas. The proposed Project Area eliminates the need to create additional open space to accommodate renewable energy generation facilities, which are both an economic and environmental benefit.
- *The Business and Commercial Development Plan includes increasing the tax base and regional economic vitality.* The Project Area would bring consistent tax revenue to the Town. Furthermore, portions of the Project Area are targeted for industrial and/or manufacturing development, consistent with current zoning.
- *Future Land Use of the POCD identifies the Project Area as targeted areas for farmland preservation, dedicated open space, and railroad industry*. Use of the proposed Project Area enhances the land and minimizes future impacts and scarification. Additionally, the Project allows the Prime Farmland soils to rest during the life of the panel operation, which preserve the farmland long-term.
- *The POCD highlights protection of rivers, streams, wetland, lakes, and major ground water sources.* These resources are either not located within the Project Area or will not be impacted as a result of Project activities.
- *The POCD prioritizes preservation of wildlife habitats.* The majority of the Project Area is disturbed land and lacks pristine habitat for many species.
- *Protecting scenic roads and proposing scenic road ordinances.* The Project Area is not near designated scenic resources nor near identified scenic roadways.

DRAFT

Additionally, a Decommissioning Plan will be implemented at the end of the useful life of the Project and specifies how the Project components will be removed from the land and disposed of as waste or recycled as appropriate. Prior to decommissioning the Decommissioning Plan will be updated to be compliance with rules and regulations in effect at that time. As part of the Siting Council process, the Applicant must restore the property to the condition that it was found in. A Decommissioning Plan is included at Exhibit S.

Agriculture

The factors that make Prime Farmland ideal for agriculture also make these areas attractive to competing land uses such as residential, commercial, and Industrial development. The North Central lowlands of Connecticut with its large, near level, outwash terraces and glacial lakebed deposits have witnessed recent substantial losses of Prime Farmland most notably with larger professional office, industrial and commercial distribution developments such as Griffin Center, New England Tradeport, and Phoenix Crossing.

When residential, commercial or industrial developments occur on Prime Farmland, the soil resource is irretrievably lost. In contrast, the Project will occupy the Project Area for approximately 25 to 30 years. Once the useful life of the Project has been completed the site, including current Prime Farmland will be decommissioned in accordance with the plan provided in Exhibit S. Specific measures have been included in the Project layout, engineering design, and proposed management to avoid and minimize alteration of the existing farmland soil resources. These efforts were taken to facilitate a potential return to agricultural management after decommissioning. A summary of these considerations is provided below.

Minimizing Grading and Construction Effects

Prime Farmland soils are degraded when they are altered by cutting, filling or regrading. Since most of the soil fertility and soil/plant root interactions affecting productivity occur the topsoil layers, grade changes can influence productivity.

Wherever practicable, the Project has been designed to avoid grade changes in the agricultural fields that will be utilized for the solar development. Figure: Farmland Soils provided at Exhibit A depicts the extent of within the Project Site and within the currently active agricultural field.

The Project grading plan preserves the existing topography within Prime Farmland that is currently cropped to the furthest extent practicable. The farmland soils within the solar array layout will be planted with perennial grasses and legumes to minimize soil losses to erosion and will sequester atmospheric carbon that will be incorporated as soil organic matter (SOM) in the topsoil during the operational phase of the Project.

Farmland can also be degraded by excavation and mixing the topsoil with subsoil layers. The thickness of the topsoil in the farm fields was evaluated by VHB by digging shallow holes with a tile spade and with a soil auger. These observations found that the farm has been subject to repeated deep tillage. Unless eroded and lost, the thickness of the plow layer was typically between 14 and 20 inches. The solar panel foundations will consist of direct driven

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

piles or screw piles. Typical installations involve a pile installed approximately 8-foot on center along rows with 13-feet between rows. Installation and removal of these piles will result in little soil disturbance. Conduit interconnecting collectors along rows will be buried in a shallow trench. The backfill for these conduit trenches does not require excessive compaction. Larger conduit and direct buried lines used to interconnect rows to inverters can be installed in deeper trenches by segregating topsoil and placing it back on top of the trench during backfill.

Service roads will be constructed across Prime Farmland to inspect and service the solar fields. Typical road construction involves the removal of the topsoil layer and replacement with a processed gravel base. To preserve the topsoil in place, service roads will be constructed by installing a non-woven geotextile fabric on the ground surface and then spreading a layer of processed stone over the geotextile to provide soil separation. During decommissioning, the processed stone will be stripped exposing the geotextile. The geotextile will then be removed and disposed revealing the original soil surface. The compacted soil beneath the road fill may require ripping with a subsoiler plow to loosen it before it can be returned to crop production.

Soil Health

The Prime Farmland designation is assigned to certain map units developed by the Cooperative Soil Survey. Map units consist of similar natural soil groups based on parent material, mode of surficial geologic deposition, topography, drainage class and other physical and chemical factors. The concept of soil health considers factors beyond the mostly inherited abiotic soil characteristics used to identify Prime Farmland. Soil health recognizes the importance of maintaining the diverse biologically driven processes inherit in natural soils that make it productive. Soil health recognizes the importance that soil biodiversity plays in sustaining the fertility and productivity of the soils along with other ecological services provided by soils such as carbon sequestration, clean air, water infiltration and improvements to human and wildlife habitat.

One of the simplest predictors of soil health is the quantity of SOM in the soil. In general, higher levels of SOM and reduced levels of mechanical disturbance support greater soil biodiversity. In healthy soils, the exudates of microbes enhance soil structure by cementing individual soil particles together into relatively permanent aggregates called peds. This improved soil structure enhances infiltration of precipitation and the exchanges of gases necessary for microbial and root respiration. A well-structured soil with higher levels of SOM also improves the moisture holding capacity of the soil and the ability of crops to resist drought.

Stable forms of humified SOM improve soil fertility by providing charged exchange sites for nutrient cations and anions. Nutrients are also released by biological activity which mineralizes organic matter.

In agricultural settings, soil health is most strongly affected by management practices. Tillage is one of the practices that reduces the organic matter level in the soil. Each time the soil is tilled, it is aerated. As the decomposition of organic matter and the liberation of carbon are aerobic processes, the oxygen stimulates or speeds up the action of soil microbes, which

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

feed on organic matter. Decomposition increases liberation of CO2 to the atmosphere and reduces SOM. As levels of SOM decrease, so does biodiversity.

The United States Department of Agriculture (USDA) operates the Conservation Reserve Program (CRP) and the Conservation Reserve Enhancement Program which provides financial supports to farmers who remove farmland from production to implement long-term conservation measures, typically for 10 to 15-year time spans. Studies have examined the values of grasslands planted on these CRP and other agricultural lands for carbon sequestration. Acharya et al. (2012) compared agricultural lands converted in grasslands and found carbon sequestration rates increased with grassland age up to the study limit of 17 years. Swan et al. (2015) scored the potential carbon sequestration increases which would be anticipated for various standard NRCS conservation practices. For practice No. 327, converting marginal croplands to conservation cover, the value is an additional 0.42 to 0.94 Mg C ha-1 y-1 (360 to 820 lbs C ac-1 y-1) to be sequestered.

In addition to increased rates of carbon sequestration and enhancements to soil biodiversity, a long-term grassland cover will virtually stop the ongoing soil erosion that is occurring at different rates across the different farm fields.

The Applicant believes that farmland sites can be developed and managed as a renewable energy facility while preserving and enhancing farmland soils through grassland management during its operation. A return to an agricultural use after decommissioning will more likely be influenced by the economic conditions at decommissioning and whether they favor farmland operations or competing interests for residential, commercial or industrial development.

DRAFT

8

Conclusion

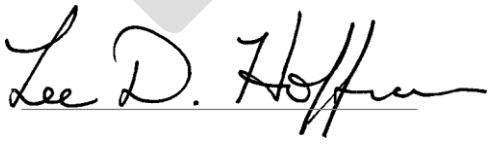
The Project will provide numerous benefits to the Town of East Windsor, the State of Connecticut, and its citizens. It will place the Town of East Windsor at the forefront of green energy development while producing sustainable environmental benefits with minimal environmental impacts. Pursuant to CGS § 16-50k(a), the Siting Council shall review this Application for authorization of a CECPN for the construction or location of a grid-side distributed resources project or facility with a capacity of more than sixty-five (65) MW. The GPS Project meets requirements of this request, as well as CT DEEP air and water quality standards criteria.

The Project will not produce air emissions, will not utilize water to produce electricity, was designed to minimize sensitive area and wetland impacts, will employ a stormwater management plan that will result in no net increase in runoff to any surrounding properties, will not generate significant noise, will not have substantial adverse impacts on visual resources, land use, recreation, cultural resources or the environment, and furthers the State's energy policy by developing and utilizing renewable energy resources. In addition, as demonstrated above, the Project will not have a substantial adverse environmental effect in the State of Connecticut.

For the foregoing reasons the Applicant requests that the Siting Council issue a CECPN for the construction, operation and maintenance of the Project.

Respectfully submitted, Gravel Pit Solar, LLC, Gravel Pit Solar II, LLC, Gravel Pit Solar III, LLC, and Gravel Pit Solar IV, LLC

By



Lee D. Hoffman Pullman & Comley, LLC
90 State House Square Hartford, CT 06103
Phone: (860) 424-4315
Fax: (860) 424-4370
Email: lhoffman@pullcom.com

DRAFT-Provided to the Towns of East Windsor and South Windsor pursuant to Conn. Gen. Stat. Section 16-50l(e). Subject to change.

This page intentionally left blank.

DRAFT

9

References

Bevier, L. R. (Ed.). Atlas of Breeding Birds of Connecticut. 1994. Bulletin 113. State Geological and Natural History Survey of Connecticut. 461 p.

Acharya, Bharat Sharma, Jim Rasmussen, Jørgen Eriksen. 2012. Grassland carbon sequestration and emissions following cultivation in a mixed crop rotation.

Agriculture, Ecosystems and Environment 153: 33–39

Swan, A., S.A. Williams, K. Brown, A. Chambers, J. Creque, J. Wick, and K. Paustian. 2015. COMET Planner. Carbon and greenhouse gas evaluation for NRCS conservation practice planning. A companion report to www.comet-planner.com. http://comet-planner.nrel.colostate.edu/COMET-Planner_Report_Final.pdf

Bowers-Altman, J. (undated). Freshwater Mussels of New Jersey. New Jersey Endangered and Nongame Species Program, New Jersey Department of Environmental Protection.http://www.conservewildlifenj.org/downloads/cwnj_657.pdf. Accessed April 21, 2020.

Bryant, D. M., Hails, C. J. and Tatner, P. (1984) 'Reproductive Energetics of Two Tropical Bird Species. 'The Auk. American Ornithologists' Union, 101(1) pp. 25–37.

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

Connecticut Department of Energy and Environmental Protection. 2003. A Field Guide to Freshwater Mussels of Connecticut. Bureau of Natural Resources.

Connecticut Department of Energy and Environmental Protection. 2015. Connecticut Wildlife Action Plan.

Connecticut Department of Energy and Environmental Protection. February 2016. Northern long-eared bat areas of concern in Connecticut to assist with Federal Endangered Species

DRAFT

Act Compliance.http://www.ct.gov/deep/lib/deep/endangered_species/images/nleb_approved2_16.pdf.Accessed April 21, 2020.

Connecticut Department of Environmental Protection, 2004. 2004 Connecticut Stormwater Quality Manual, Hartford, CT.

Cryan, P. M. Seasonal Distribution of Migratory Tree Bats (Lasiurus and Lasionycteris) In North America. Journal of Mammalogy, 84(2):579–593, 2003Fernald, M. L. 1970.

Gray's Manual of Botany, Eight Edition. D. Van Nostrand Co, New York, New York, 1632 pp.

DeGraaf, R.M. and Yamasaki, M. 2001. New England Wildlife: Habitat, Natural History, and Distribution. University Press of New England, Hanover, NH.

DeVault, T. L., Seamns, T.W., Schmidt J.A., Belant, J.L., Blackwell, B.F., Moores, N., Tyson, L.A., Van Pelnt,L. 2014. Bird use of solar photovoltaic installations at US airports: implications for aviation safety. Landsc. Urban Plan. 122**,** 122–128

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

Fernald, M. L. 1970. Gray's Manual of Botany, Eight Edition. D. Van Nostrand Co, New York, New York, 1632 pp.

Greif, S. and Siemers, B. M. 2010. Innate recognition of water bodies in echolocating bats. Nature Communications. Nature Publishing Group, 1, November, p. 107.

Haines, A. 2011. Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England. Yale University Press. New Haven and London.

Harrison, C., Llyod, H., and Field, C. 2016. Evidence review of the impact of solar farms on birds, bats, and general ecology. Manchester Metropolitan University. Natural England, 1st ed.

ISO New England, 06/14. "Infrastructure Needs: Electricity-Natural Gas Interdependencies." Prepared by ISO-NE President Gordon van Welie for the Regional Energy Forum. June 30, 2014. Online. Available: http://newenglandcouncil.com/assets/ISONE_June30_NewEnglandCouncil_FINAL.pdf

ISO New England, 09/14. "Managing the Reliability of the Electric Grid While the Power Industry Undergoes Rapid Transformation." Prepared by ISO-NE President Gordon van Welie for Massachusetts Restructuring Roundtable. September 19, 2014. Online. Available: http://www.iso-ne.com/static-assets/documents/2014/09/ma_roundtable_9_19_14_gvw_final.pdf

Keys, Jr., J. C., C. Carpenter, S. Hooks, F. Koenig, W. H. McNab, W. Russell, and M. L. Smith. 1995. Ecological units of the Eastern United States – first approximation. U.S. Department of Agriculture, Forest Service, Atlanta, GA.

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.

DRAFT

Kunz, T.H. (1982) Lasionycteris noctivagans. Mammalian Species, 172: 1-5.

Massachusetts Natural Heritage & Endangered Species Program. 2015. Rapids clubtail (Gomphus quadricholor) Species Description. http://www.mass.gov/eea/docs/dfg/nhesp/species-and conservation/nhfacts/gomphus-quadricolor.pdf. Accessed April 21, 2020.

Metzler, K., and J. Barrett. 2006. The vegetation of Connecticut: A preliminary classification. State Geological and Natural History Survey, Report of Investigations No. 12. Connecticut Natural Diversity Database, Hartford.

Michigan State University (MSU). (2017). *US Cropland Greenhouse Gas Calculator*. Retrieved 3 April 2017, from http://surf.kbs.msu.edu/

National Audubon Society. The Audubon Bird Guide Application. http://www.audubon.org/apps. Downloaded June 2, 2017.

Natural Resource Conservation Service. 2011. Pollinator Habitat Conservation Reserve Program Job Sheet No. CP42.

Nedeau, E. J. 2008. Freshwater Mussels and the Connecticut River Watershed. Connecticut River Watershed Council, Greenfield, Massachusetts. 132 pp.

New England Flower Society. 2003. New England Plant Conservation Program for Davis' Sedge (*Carex davisii*).

New York Natural Heritage Program. 2015. Online conservation guide for *Schinia spinosae*. http://www.acris.nynhp.org/guide.php?id=8172. Accessed April 21, 2020.

New York Natural Heritage Program. 2017. Synopsis for Scribble sallow (*Sympistis perscripta*). http://www.dec.ny.gov/docs/wildlife_pdf/spcnbuttermoths.pdf. Accessed April 20, 2020

Pollinator Health Task Force. June 2016. Pollinator Partnership Action Plan. Washington DC.

Shump, K.A. and Shump, A.U. 1982. Lasiurus borealis. Mammalian Species, 183: 1-6.

Shump Jr, K.A. and Shump, A.U. 1982a. Lasiurus cinereus. Mammalian Species, 185: 1-5.

East Windsor Zoning Commission, 2016. Zoning Regulations Town of East Windsor, Connecticut.

East Windsor Planning Commission, 2016. Plan of Conservation and Development.

State of Connecticut. 2016. Substitute Senate Bill No. 231/Public Act No. 16-17. An Act Concerning Pollinator Health. Enacted January 1, 2017.

The Climate Registry. (2015). 2016 Default Emissions Factors. Retrieved from https://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default- EF-April-2015-FINAL.pdf

University of Connecticut, Center for Land Use Education and Research. 2009. Forest Fragmentation in Connecticut: 1985-2006. http://clear.uconn.edu/projects/landscape/forestfrag/. Accessed March 28, 2020.

DRAFT

U.S. Department of Health and Human Services National Institutes of Health. Electromagnetic Fields and Cancer. https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/electromagnetic-fields-fact-sheet. Accessed April 21, 2020.

U.S. Environmental Protection Agency, 2013. 2012 Annual Report on Air Quality in New England. United States Environmental Protection Agency, Region 1, New England Regional Laboratory, North Chelmsford, MA 01863.

U.S. Environmental Protection Agency (US EPA). (2017). *Greenhouse Gases Equivalencies Calculator - Calculations and References*. Retrieved April 21, 2020, from https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator- calculations-and-references

U.S. Fish and Wildlife Service. 2015. Northern long-eared bat (*Myotis septentrionalis*) Fact Sheet. https://www.fws.gov/midwest/endangered/mammals/nleb/nlebFactSheet.html. Accessed May 5, 2020.

U.S. Fish and Wildlife Service. Official Species Consultation. Information for Planning and Consultation. https://ecos.fws.gov/ipac/. Accessed November 12, 2019.

U.S. Fish and Wildlife Service. May 2017. Northern long-eared bat (Myotis septentrionalis) status: Threatened with 4(d) Rule. https://www.fws.gov/Midwest/endangered/mammals/nleb/index.html. Accessed June 12, 2017.

Wagner, D. L., D. F. Schweitzer, J. B. Sullivan, and R. C. Reardon. 2008. Owlet Caterpillars of Eastern North America: Noctudiae).

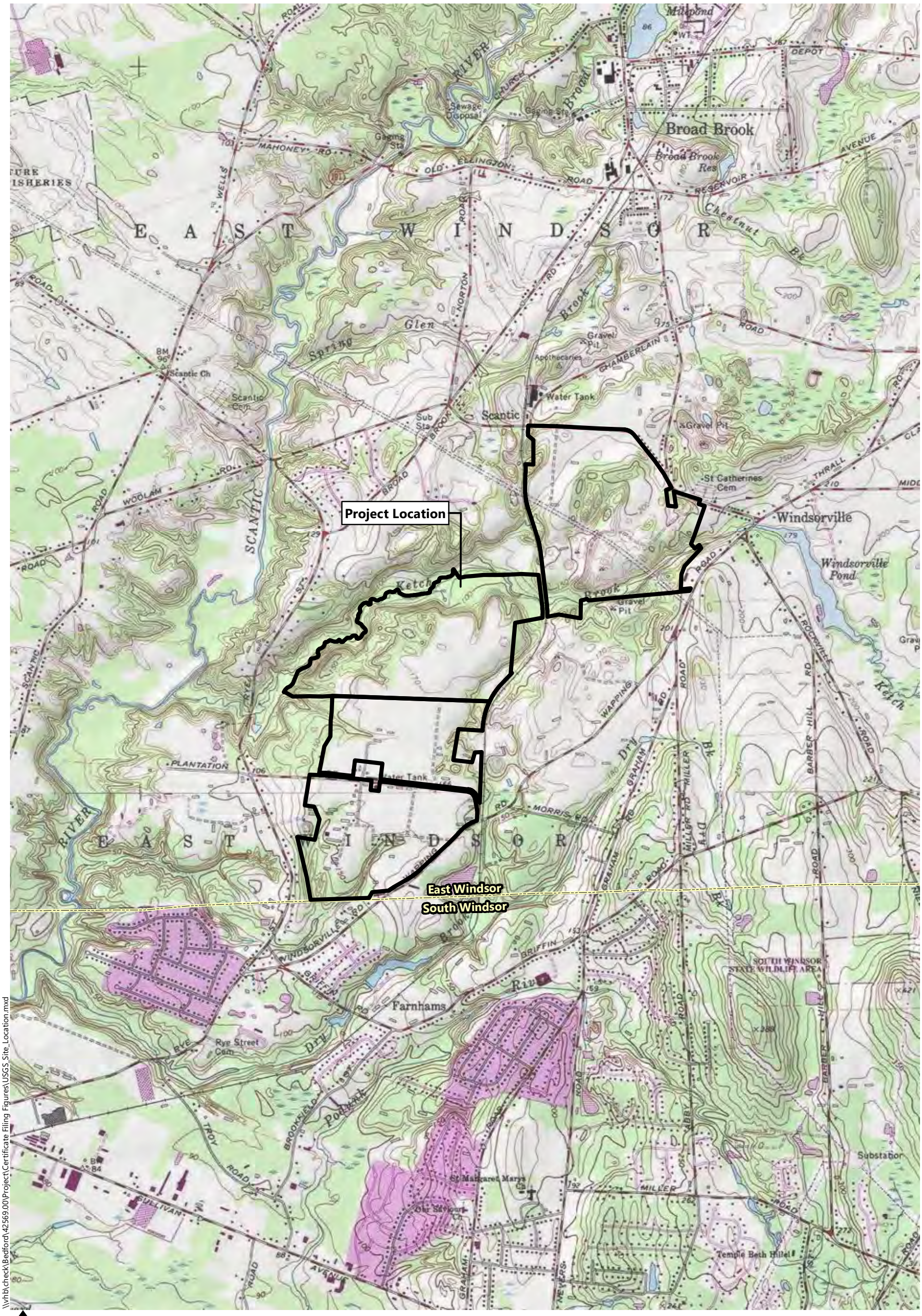
Wagner, D. L. 2015. Connecticut Expansion Project: Invertebrate Habitat Assessment. Prepared for AECOM. http://www.nae.usace.army.mil/Portals/74/docs/Topics/Tennessee%20Pipeline%20Project/Conecticut/Attachment%20K/Attachment%20K(D)%20Terrestrial%20Invertebrate%20Report.pdf. Accessed June 16, 2017.

Walston, L. J., Rollins, K. E., LaGory, K. E., Smith, K. P. and Meyers, S. A. 2016. A preliminary assessment of avian mortality at utility solar energy facilities in the United States. Renewable Energy, 92, July, pp. 405–414.

Whitworth, W. R. 1996. Freshwater Fishes of Connecticut. 2nd ed. State Geological and Natural History Survey of Connecticut Bulletin 114, Connecticut Department of Environmental Protection, Hartford, CT.

DRAFT

Appendix A
Figures



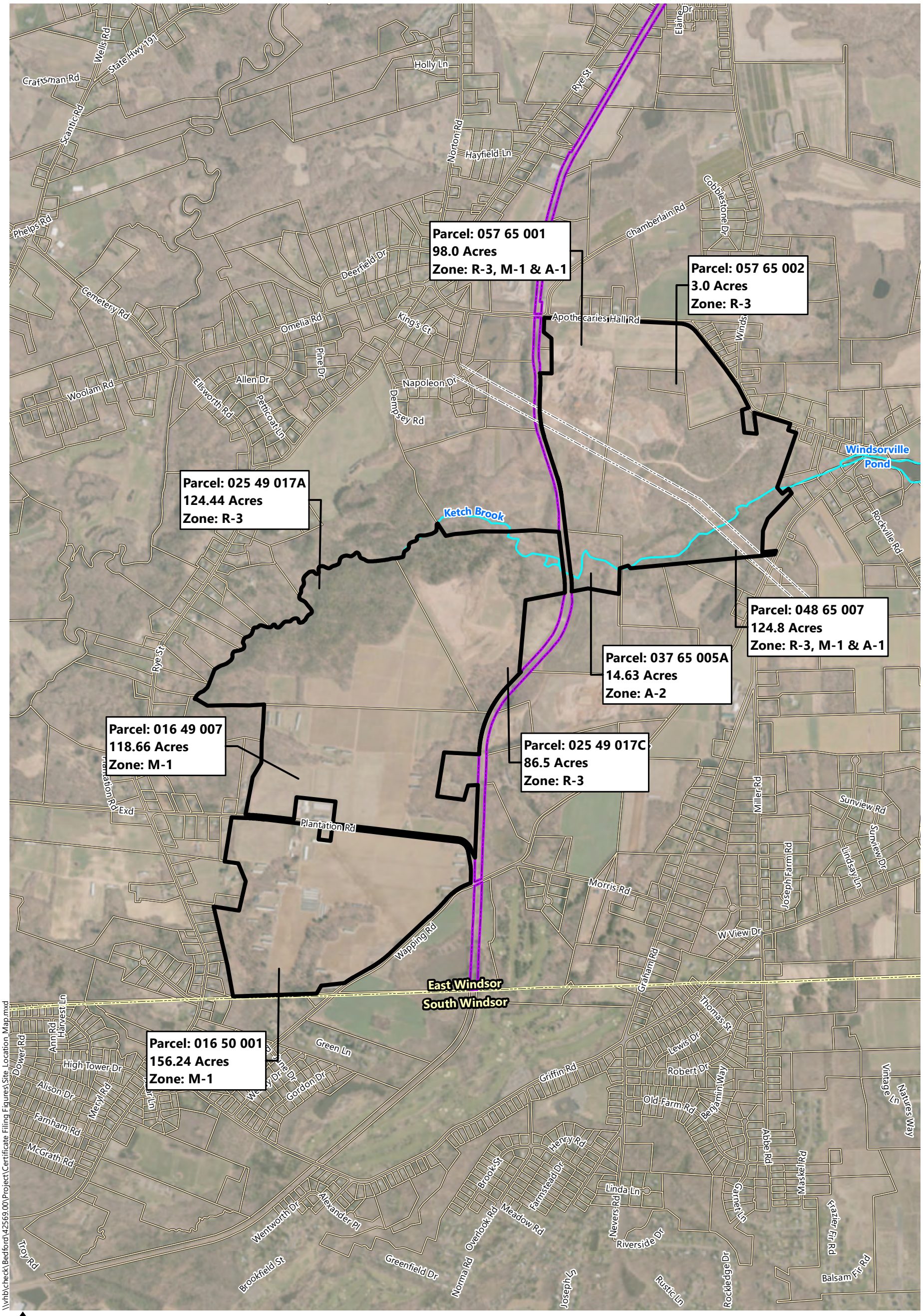
\\vhb\check\Bedford\42569.00\Project\Certificate Filing Figures\USGS_Site_Location.mxd

Gravel Pit Solar | East Windsor, Connecticut

USGS Project Location Map

Source: VHB, CTDEEP, ESRI

May 07, 2020



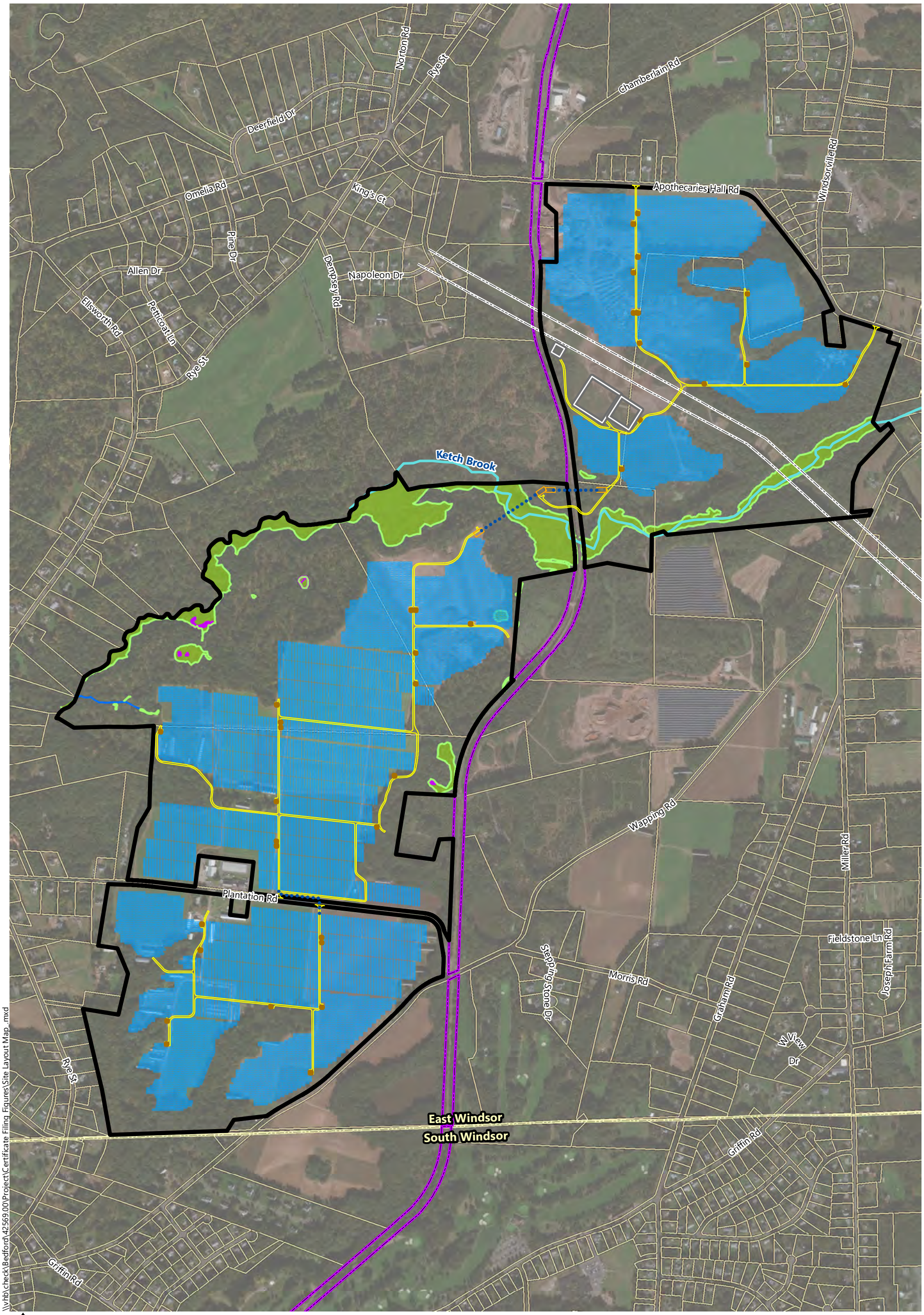
\\vhb\check\Bedford\42569.00\Project\Certificate Filing Figures\Site_Location_Map.mxd

Gravel Pit Solar | East Windsor, Connecticut

Site Location Map

Source: VHB, CTDEEP, ESRI

May 15, 2020



0 500 1000 2000 Feet

- Property Boundary
- Adjacent Parcels
- Town Boundary
- Approximate Railroad Boundary
- Approximate Eversource ROW
- Wetland Resource Areas
- Delineated Wetland Edge
- Vernal Pool
- Stream/River
- Delineated Intermittent Watercourse
- Solar Array
- Equipment Pad
- Substation
- Boring Pit
- Proposed Road
- Potential Cable Route

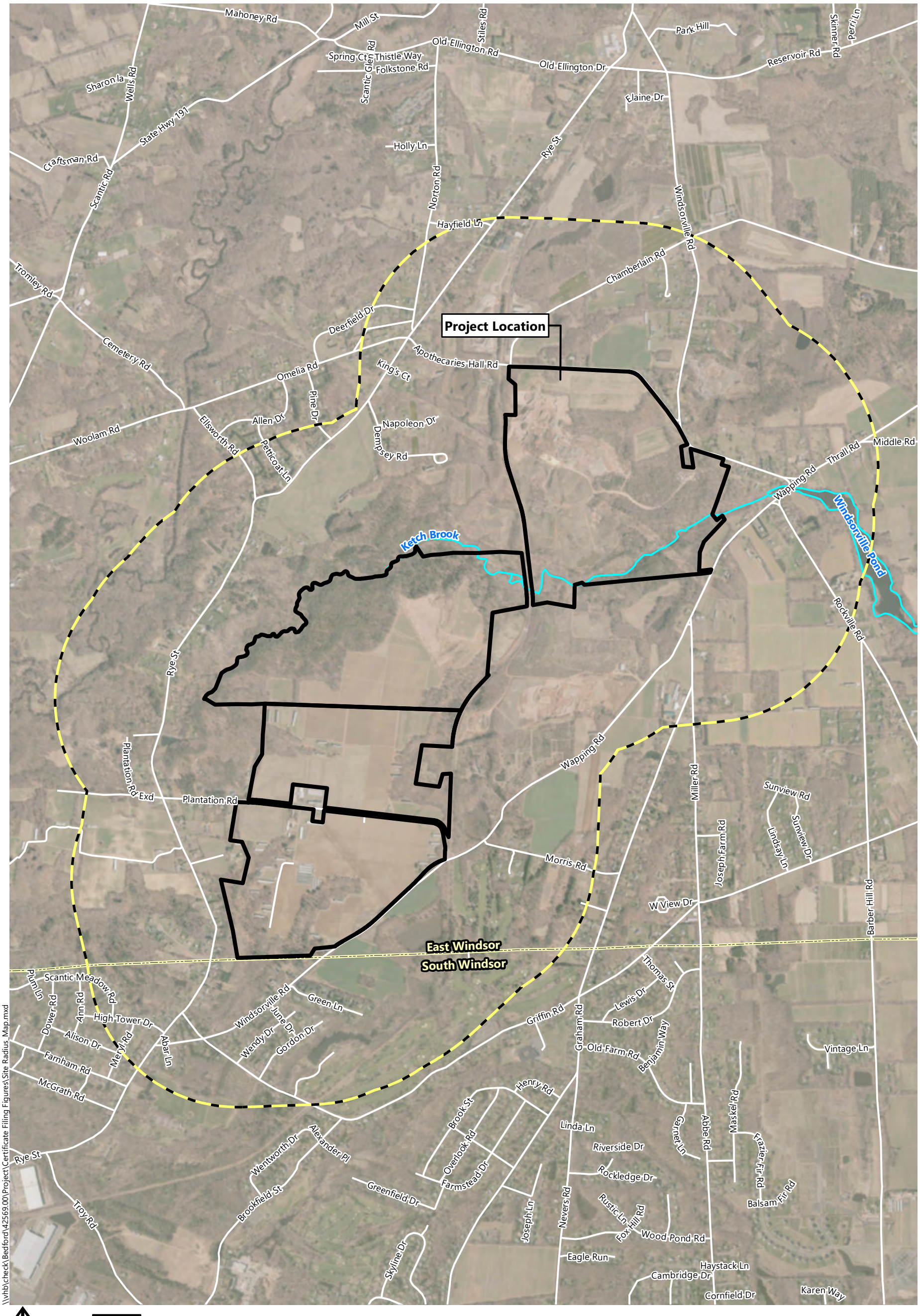
Gravel Pit Solar

East Windsor, Connecticut

Project Layout Map

Source: VHB, CTDEEP, ESRI

May 07, 2020



\\vhb\check\Bedford\42569.00\Project\Certificate Filing Figures\Site Radius_Map.mxd

0 800 1600 3200 Feet

Property Boundary

2500-Ft Property Boundary Radius

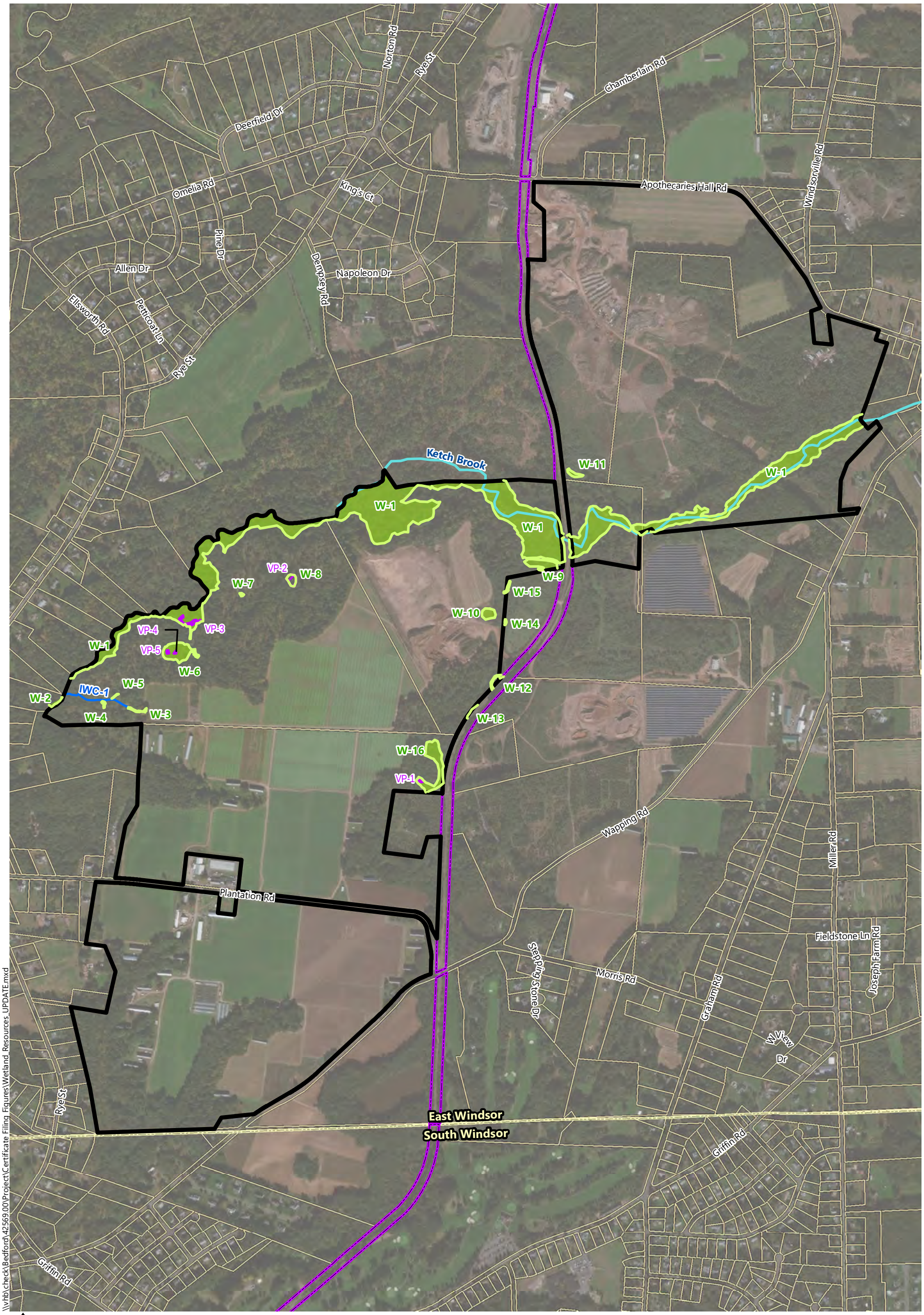
Town Boundary

Gravel Pit Solar | East Windsor, Connecticut

Site Radius Map

Source: VHB, CTDEEP, ESRI

May 15, 2020



\\vhb\check\Bedford\42569.00\Project\Certificate Filing Figures\Wetland_Resources_UPDATE.mxd

0 500 1000 2000 Feet

Property Boundary
Adjacent Parcels
Town Boundary
Approximate Railroad ROW
Connecticut Inland Wetlands
Delineated Wetland Edge
Vernal Pool
Stream/River
Delineated Intermittent Watercourse

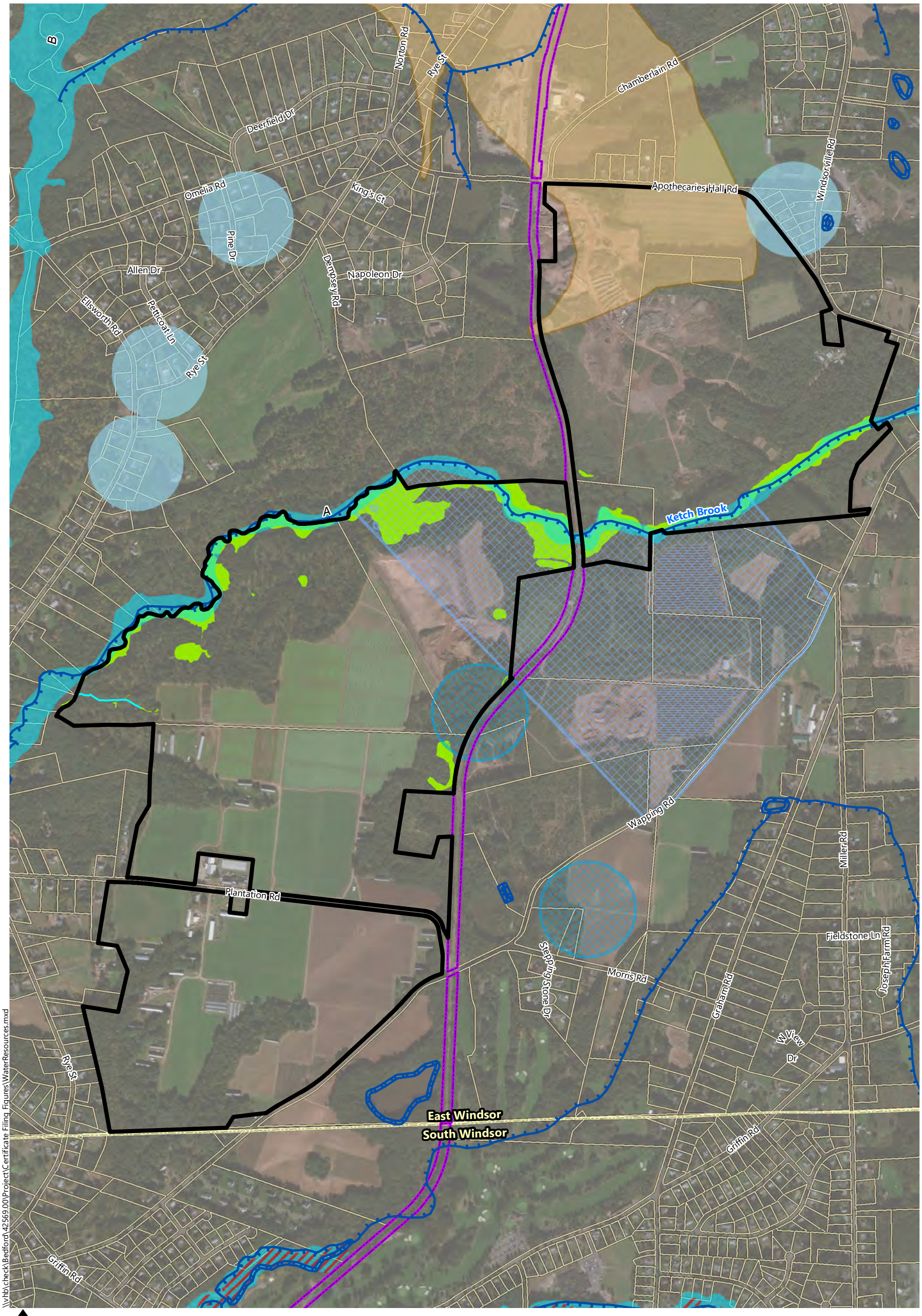
Gravel Pit Solar

East Windsor, Connecticut

Wetland Delineation Map

Source: VHB, CTDEEP, ESRI

May 14, 2020



0 500 1000 2000 Feet

- Property Boundary
- Adjacent Parcels
- Town Boundary
- Approximate Railroad ROW
- Wetland Resource Areas
- Delineated Wetland Edge
- Approximate Wetland Edge
- Approximate Delineation Buried Wetland
- Delineated Intermittent Watercourse
- Surface Water Quality - Class A
- Aquifer Protection Area
- Ground Water Quality - GAA, GAAs
- Ground Water Quality - GA, GAA May be impaired
- Ground Water Quality - GB
- 100-Year Floodplain (FEMA)
- Regulatory Floodway (FEMA)

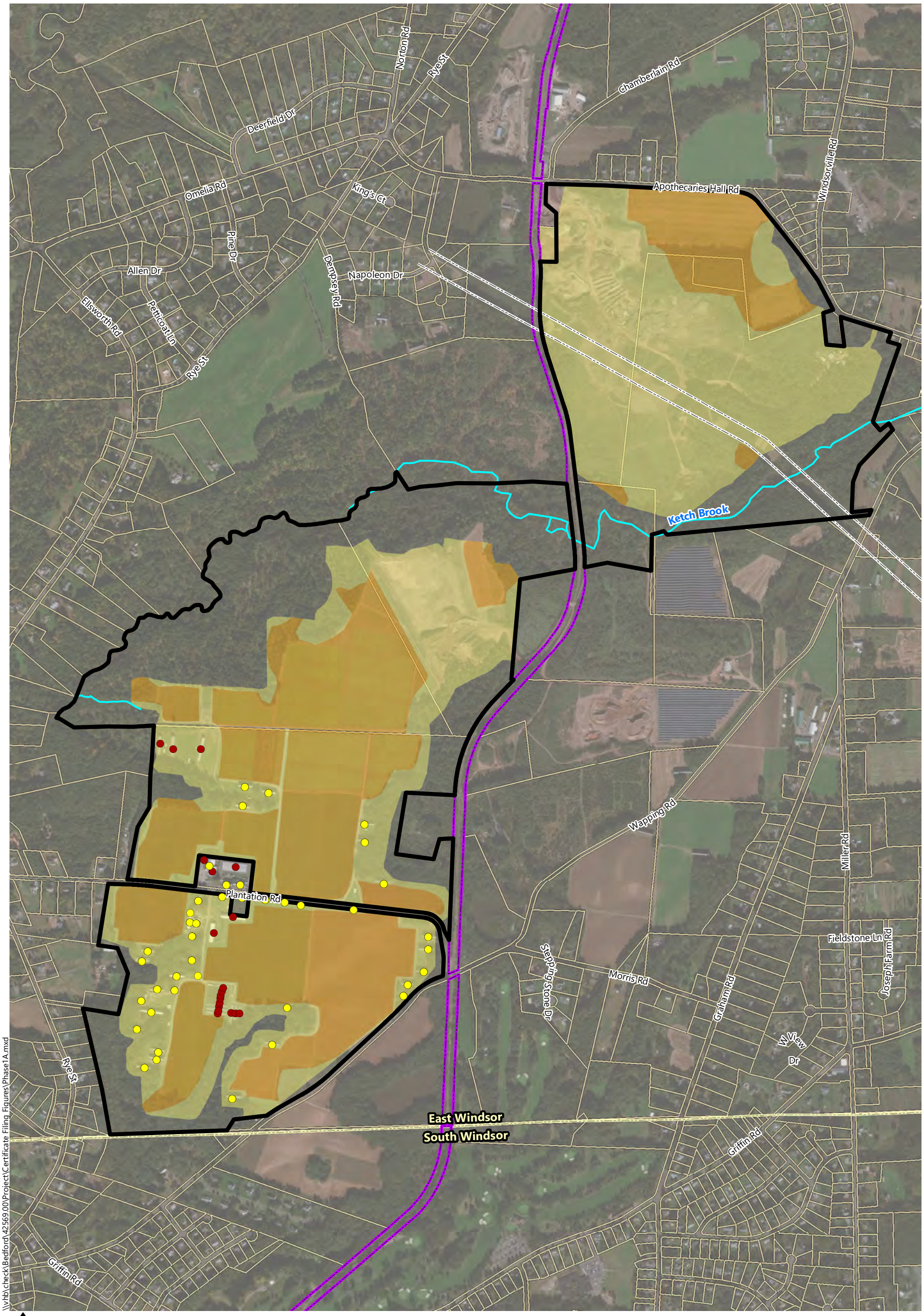
Gravel Pit Solar

East Windsor, Connecticut

Floodplain, Surface & Groundwater Resources Map

Source: VHB, CTDEEP, FEMA, ESRI

May 14, 2020



0 500 1000 2000 Feet

Gravel Pit Solar

East Windsor, Connecticut

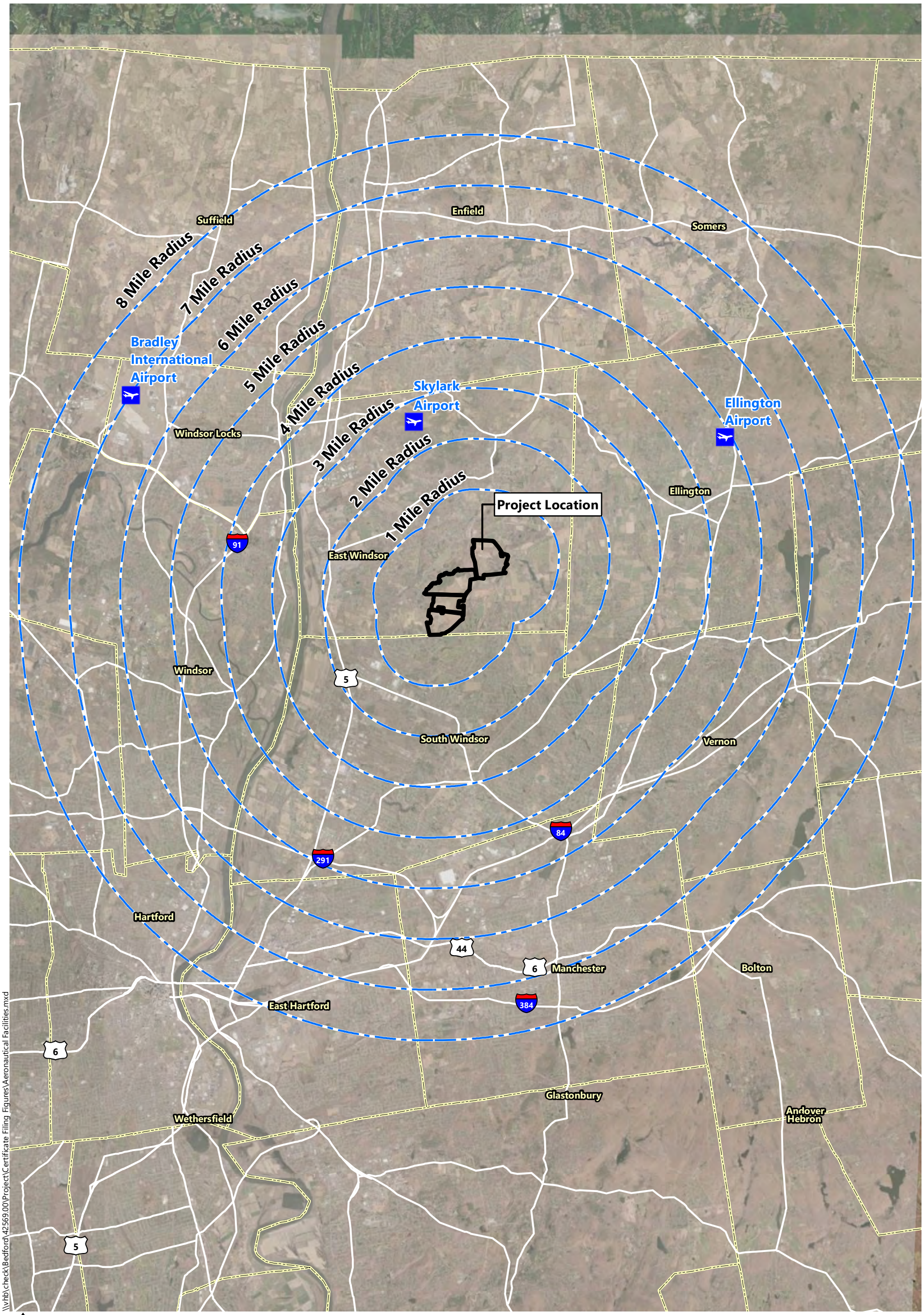
- Property Boundary
- Adjacent Parcels
- Town Boundary
- Approximate Railroad Boundary
- Approximate Eversource ROW
- Delineated Intermittent Watercourse
- Potentially Historic Structure
- Non-Historic Structure

Archaeological Sensitivity

- Moderate
- Low

Phase 1A Cultural Resource Survey

Source: VHB, CTDEEP, ESRI



0 5000 10000 20000 Feet

Property Boundary

Town Boundary

Property Boundary Radius (1 Mile Increments)

Aeronautical Facility

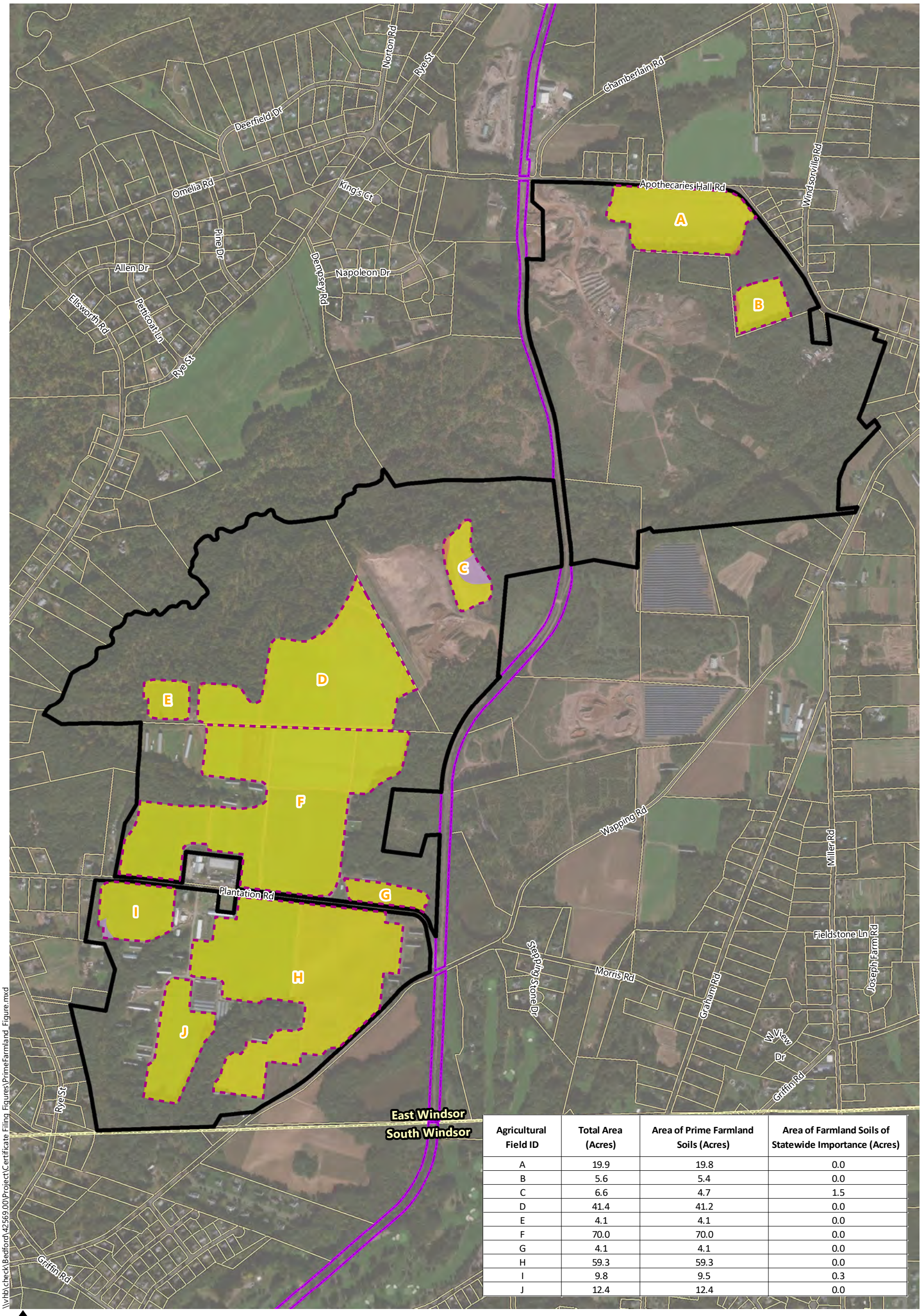
Gravel Pit Solar

East Windsor, Connecticut

Aeronautical Facilities

Source: VHB, CTDEEP, ESRI

May 15, 2020



Agricultural Field ID	Total Area (Acres)	Area of Prime Farmland Soils (Acres)	Area of Farmland Soils of Statewide Importance (Acres)
A	19.9	19.8	0.0
B	5.6	5.4	0.0
C	6.6	4.7	1.5
D	41.4	41.2	0.0
E	4.1	4.1	0.0
F	70.0	70.0	0.0
G	4.1	4.1	0.0
H	59.3	59.3	0.0
I	9.8	9.5	0.3
J	12.4	12.4	0.0

0 500 1000 2000 Feet

- Property Boundary
- Adjacent Parcels
- Town Boundary
- Approximate Railroad ROW
- Agricultural Field Boundary
- Prime Farmland Soils
- Statewide Important Farmland Soils
- Other Soils

Gravel Pit Solar

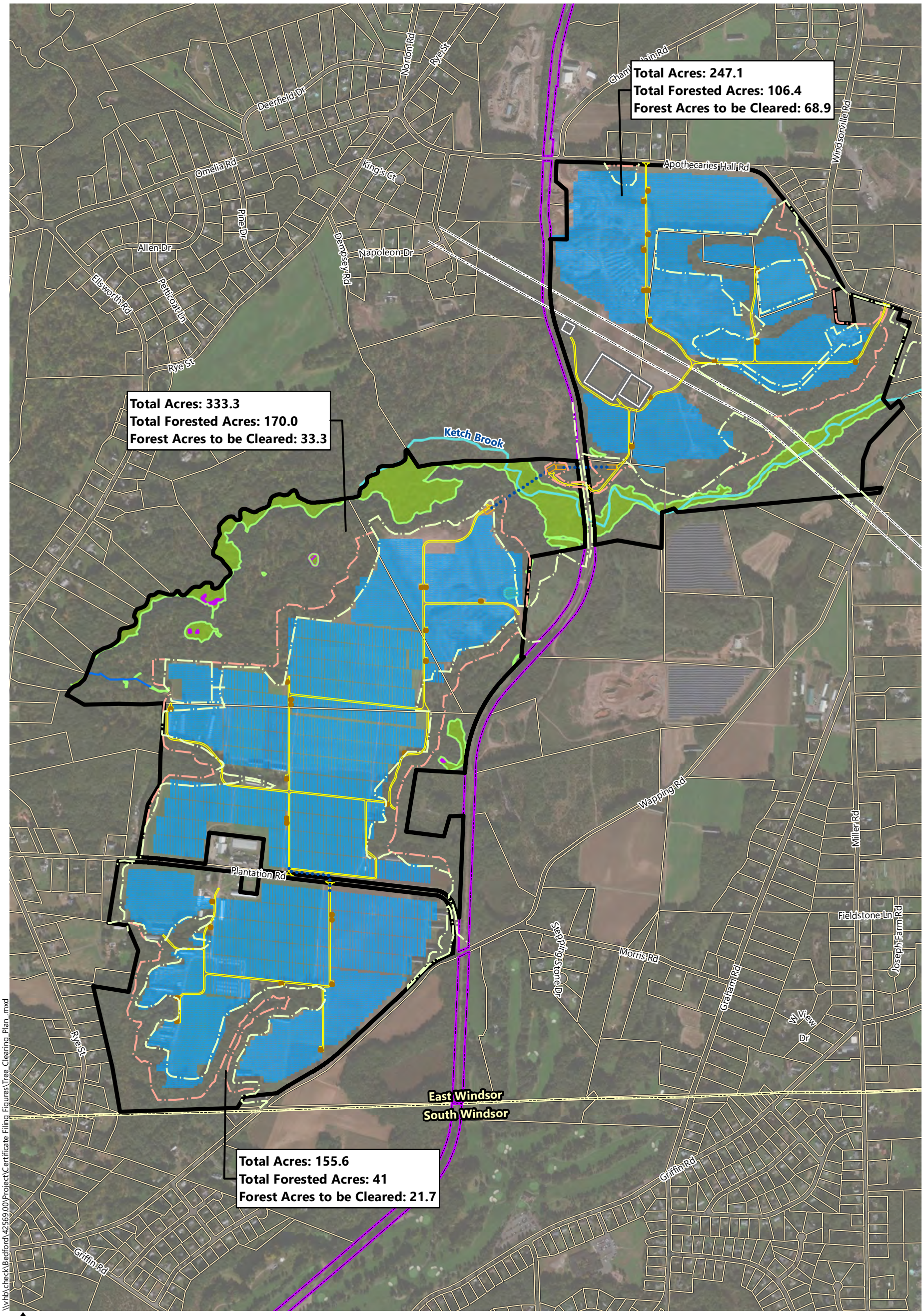
East Windsor, Connecticut

Prime Farmland Map

Source: VHB, CTDEEP, ESRI

\\vhb\check\Bedford\42569.00\Project\Certificate Filing Figures\PrimeFarmland_Figure.mxd

May 15, 2020



0 500 1000 2000 Feet

- Property Boundary
- Adjacent Parcels
- Town Boundary
- Approximate Railroad Boundary
- Approximate Eversource ROW
- Wetland Resource Areas
- Delineated Wetland Edge
- Vernal Pool
- Stream/River
- Delineated Intermittent Watercourse
- Solar Array
- Equipment Pad
- Substation
- Boring Pit
- Proposed Road
- Potential Cable Route
- Existing Treeline
- Proposed Treeline

Gravel Pit Solar

East Windsor, Connecticut

Tree Clearing Map

Source: VHB, CTDEEP, ESRI

Appendix B

DESRI Renewables, LLC

Company Resumes

The contents of this Exhibit were not completed at the time of this Filing.
[05/22/2020]

Appendix C
Site Plans

Exhibit C – Site Plans

Bound Separately

Appendix D
Public Information Session Information

The contents of this Exhibit were not completed at the time of this Filing.
[05/22/2020]

Appendix E
Abutting Property Owner List and Notice

The contents of this Exhibit were not completed at the time of this Filing.
[05/22/2020]

Appendix F

List of Municipal Officials and Government Agencies and Notice

The contents of this Exhibit were not completed at the time of this Filing.
[05/22/2020]

Appendix G
Visibility Assessment

Visibility Assessment

Gravel Pit Solar Project

Town of East Windsor
Hartford County, Connecticut

Prepared for:

1 Cedar Street, Suite 400
Providence, Rhode Island 02903
P: 401.272.8100

Prepared by:

Environmental Design & Research,
Landscape Architecture, Engineering & Environmental Services, D.P.C.
217 Montgomery Street, Suite 1000
Syracuse, New York 13202
P: 315.471.0688
www.edrdpc.com

May 2020

TABLE OF CONTENTS

1.0 INTRODUCTION 3
1.1 Purpose of the Investigation 3
1.2 Project Location and Description 3
1.2.1 Project Location 3
1.2.2 Project Description 5
2.0 BACKGROUND 8
2.1 Existing Visual Character 8
2.1.1 Visual Study Area 8
3.0 VISIBILITY ANALYSIS 9
3.1 Viewshed Methodology 10
3.1.1 Viewshed Results 11
3.2 Field Verification Methodology 13
3.2.1 Field Verification Results 15
3.3 Visual Simulations 16
3.3.1 Visual Simulation Methodology 17
3.3.2 Visual Simulation Results 18
4.0 CONCLUSION 18
4.1 Visual Assessment Summary 27
4.2 Mitigation 28

LIST OF TABLES

Table 3.3-1. Viewpoints Selected for Simulation 17

LIST OF FIGURES

Figure 1.2-1 – Project Location 4
Figure 1.2-2 – Fixed Tilt Panel 5
Figure 1.2-3 – Single Axis Tracker Panel 5
Figure 1.2-4 – Project Layout 6
Figure 2.1-1 – Visual Study Area 9
Figure 3.1-1 – Viewshed Analysis Results 12
Figure 3.1-2 – Viewshed Analysis Results Detail 13
Figure 3.2-1 – Viewpoint Location Map 15
Figure 3.3-1– Existing view from Apothecaries Hall Road – Viewpoint 9 19
Figure 3.3-2 – Proposed view from Apothecaries Hall Road – Viewpoint 9 19
Figure 3.3-3– Existing view from Plantation Road – Viewpoint 14 20
Figure 3.3-4 – Proposed view from Plantation Road – Viewpoint 14 21
Figure 3.3-5– Existing view from Wapping Road – Viewpoint 19 22
Figure 3.3-6 – Proposed view from Wapping Road – Viewpoint 19 23
Figure 3.3-7– Existing view from Plantation Road – Viewpoint 23 24
Figure 3.3-8 – Proposed view from Plantation Road – Viewpoint 23 25

LIST OF APPENDICES

Appendix A. Viewpoint Photo Log
Appendix B. Potential Vegetative Mitigation Measures

1.0 INTRODUCTION

1.1 Purpose of the Investigation

This Visual Assessment was developed in support of 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 Project (collectively Gravel Pit Solar) in the Town of East Windsor, Connecticut. The Project includes the development of a 120-megawatt (MW) alternating current (AC) ground-mounted solar photovoltaic system. The Project will encompass 517-acres (the Project Area) and will be sited on eight parcels of land totaling approximately 726 acres (the Project Site) located near Apothecaries Hall Road, Plantation Road, Wapping Road, and Windsorville Road. This assessment was prepared by Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C. (EDR) in support of an application for a Certificate of Environmental Compatibility and Public Need being submitted to the Connecticut Siting Council. The information and recommendations included in this report are intended to assist state agencies, interested stakeholders, and the general public in their review of the proposed Project. The purpose of this visibility assessment is to:

- Describe the visible components of the proposed Project.
- Evaluate the potential visibility of the Project within a defined visual study area (VSA).
- Identify key views for visual assessment.
- Assess the extent of potential Project visibility.
- Illustrate the appearance of the proposed Project.
- Identify potential mitigation measures.

1.2 Project Location and Description

1.2.1 Project Location

The proposed Project is located in the Town of East Windsor, Hartford County, Connecticut (see Figure 1.2-1).

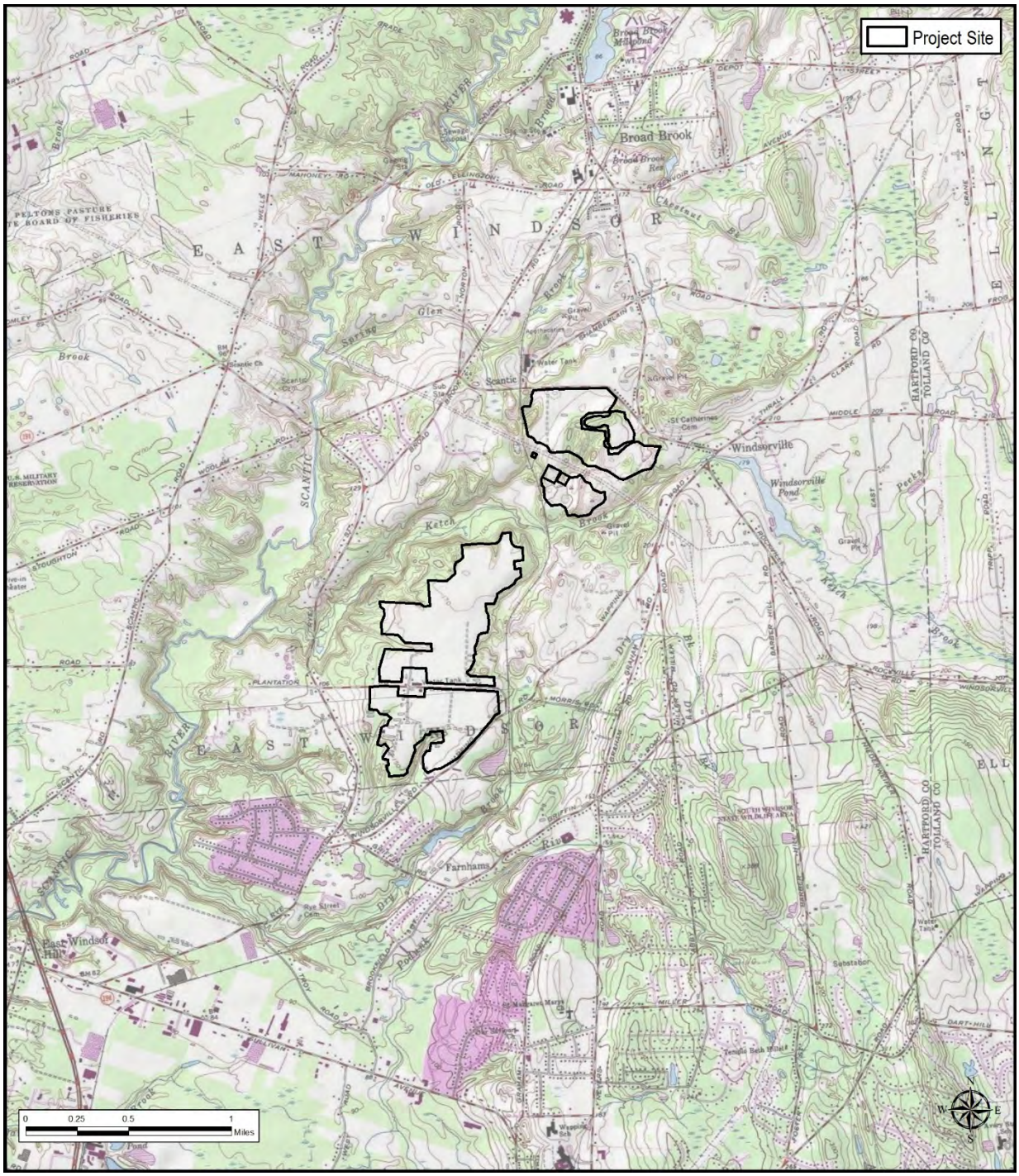


Figure 1.2-1 – Project Location

The Project Site (see Figure 1.2-4) includes forest land, actively cultivated agricultural fields, fallow fields, and an active gravel pit. Generally, the Project Site is bordered by dense forest vegetation and rural residential development. Additionally, a 115-kV transmission line runs south of Apothecaries Hall Road and traverses the Project Site in an east-

west direction. This development includes small residential subdivisions adjacent to agricultural fields, often separated by small remnant woodlots or landscape vegetation.

1.2.2 Project Description

The proposed Project evaluated in this visibility assessment is a solar-powered electric generation plant with a generating capacity of 120 MW. It will include ground-mounted solar photovoltaic photovoltaic (PV) modules, commonly known as solar panels (panels), to generate renewable electricity. The panels will consist of two types; fixed-tilt and single axis trackers. As the name implies, fixed-tilt panels are mounted at a fixed angle on a metal racking system connected to driven steel piles. Fixed-tilt panel arrays are installed on an east-west axis and the panels are permanently tilted in a south-facing position (Figure 1.2-2). The single axis tracker panel arrays are oriented on a north-south axis and have a racking system that allows the panels to rotate about a central pivot from east to west in order to "track" the movement of the sun throughout the day and optimize energy collection (Figure 1.2-3). The panel arrays will be grouped in separate, contiguous clusters, each of which will be fenced with locked gates, for equipment security and public safety, in accordance with National Electric Safety Code (NESC) standards. Within the fence line, where steep slopes are present, grading will be required to achieve maximum slopes of 15 percent. Substantial grading will be required to accommodate the Project in the existing rock quarry south of Apothecaries Hall Road. Vegetation clearing will be necessary throughout the Project Site in order to expand the area available for development and to minimize shading of the panels.

Figure 1.2-2 – Fixed Tilt Panel

Figure 1.2-3 – Single Axis Tracker Panel

Along with the PV modules, the Project includes associated support facilities, consisting of access roads, buried electrical collection lines, inverters, a Project Collector Substation (Collector Substation), a Transmission Owner (Eversource) Switchyard (Switchyard), and a short 115 kilovolt (kV) interconnection transmission line which will connect to the existing 115kV transmission line traversing the Project Site. The configuration/layout of the Project is illustrated in Figure 1.2-4. The major components of the proposed Project are described below.

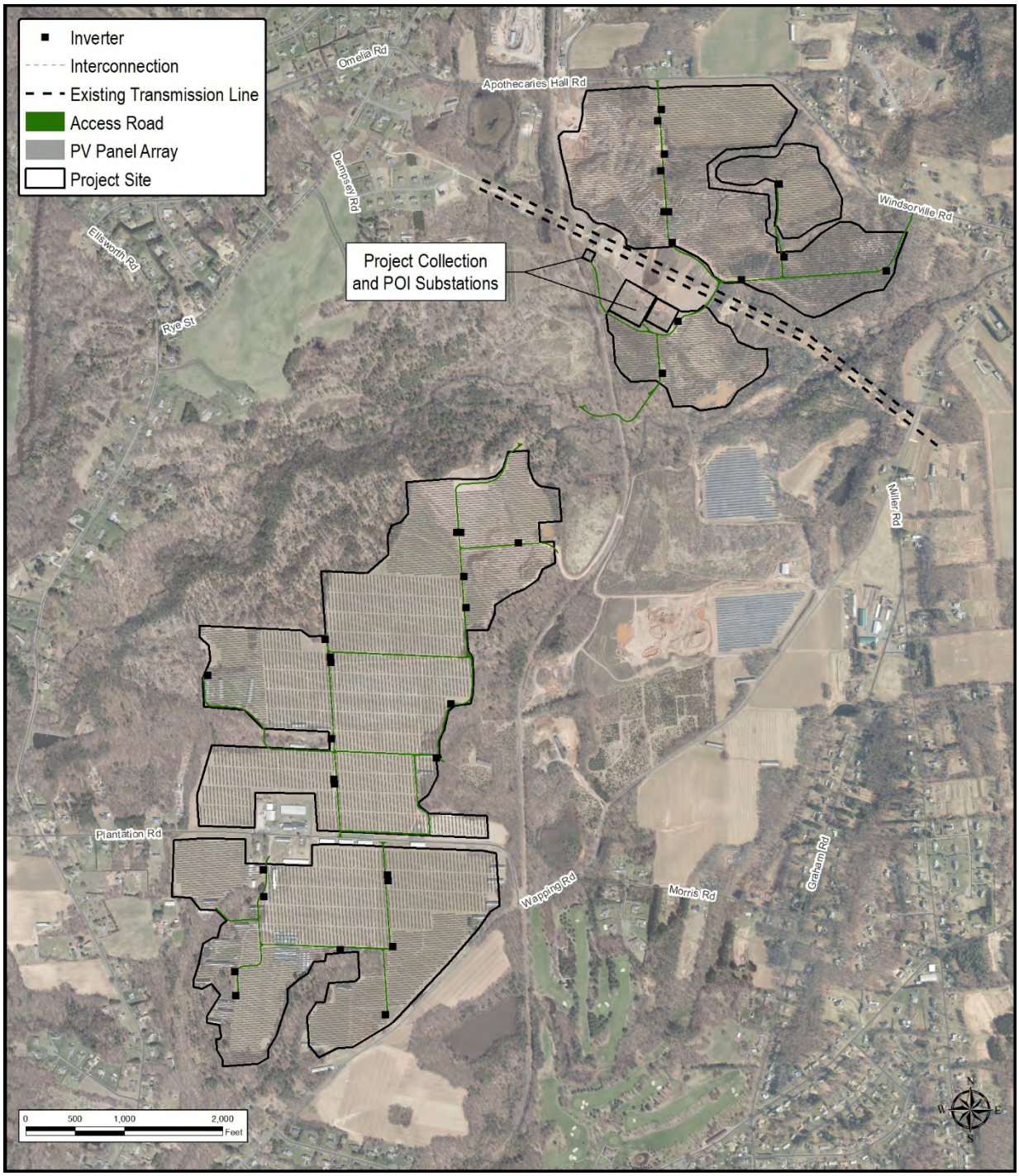


Figure 1.2-4 – Project Layout

1.2.2.1 Fencing

The above-ground components of the Project need to be fenced for safety and security purposes. As presently envisioned, the panel arrays will be surrounded by a 7-foot-tall chain link fence, with posts placed approximately every 8 feet. Both the posts and the chain link mesh will be made of galvanized steel.

1.2.2.2 Electrical System

The Project's solar panels will generate electricity when sunlight strikes the panels and excites electrons in their semiconducting material to generate direct electric current (DC). The DC current will be converted to alternating current (AC) and the voltage increased to 34.5 kV through a series of inverters and transformers located among the solar panels. The inverters and transformers will be installed on 15-foot square concrete foundations. The 34.5 kV AC energy will be transmitted via underground cables to the Collector Substation, which is located adjacent to the 115 kV transmission line at the northern end of the Project Site. The Collector Substation will be approximately 250 feet square and will be enclosed by a chain link fence similar to the fence enclosing the panel arrays. The Collector Substation will step up the 34.5 kV energy to 115 kV to allow a connection to the regional power grid. From the Collector Substation, the energy will enter the Switchyard (to be owned and operated by Eversource) which is directly adjacent to (and west of) the Collector Substation. The Switchyard is approximately 350 feet square and consists of a series of bus supports, circuit breakers, and two large A-frame structures which elevate the conductors to the grid interconnection. Both the Collector Substation and Switchyard include a series of self-supporting lightning masts which, at 50 feet tall, are the tallest substation components.

1.2.2.3 Access Roads

The Project will include a series of gravel roads to access the equipment for maintenance, repair, and replacement, and for emergency response (internal access roads). The internal access roads will be only as long and as wide as is necessary to accommodate these operational activities. Entrance roads to the Project will connect with public roads at two locations on Apothecaries Hall Road and two locations on Plantation Road.

2.0 BACKGROUND

2.1 Existing Visual Character

The existing visual character of the Project Site is defined by gently rolling topography and deciduous mature forest, interspersed with rural residential lots and winding local roads, which stem from the main feeder streets, such as Rye Street and Wapping Road. In the immediate vicinity of the Project Site, large isolated agricultural fields are enclosed by surrounding mature woodlots and forests. Residential development is generally most concentrated along Rye Street, Apothecaries Hall Road, and Windsorville Road. These homes tend to be clustered around small spur streets just off the main roads and consist of single-family modern homes with relatively large landscaped lots. To the northwest and south of the Project Site, development intensity is considerably higher, with suburban residential homes clustered around a network of spur streets. Within these developments, remnant mature vegetation stands weave between the clustered homes, creating a sense of separation and enclosure from within the individual lots. Generally, residential and agricultural uses dominate the area surrounding the Project Site. However, the Plantation Industrial Park on Plantation Road, along with a few other small commercial operations, also occur in the area. These commercial and industrial operations are relatively small and do not contribute substantially to the overall visual character of the area. The gravel pit which occurs within the Project Site is an extraction mining operation which covers an area of approximately 50 acres. The existence of the gravel pit from public vantage points is generally evidenced only by derelict, vegetated spoil piles surrounding the pit, and by a rail depot on Chamberlain Road which appears to be used for rail car loading of extracted materials from the gravel pit.

2.1.1 Visual Study Area

The visual study area (VSA) has been defined as the area contained within a 2-mile buffer around the Project property line (Figure 2.1-1). The resulting VSA encompasses approximately 25 square miles. However, based on a preliminary visibility analysis (described in Section 3.1), actual visibility within the VSA is likely to be limited to within 0.25 mile of the Project. Due to this limited visibility, the description of the VSA will generally be focused to this area of potential visibility, which primarily occurs on or adjacent to the Project Site (described in Section 2.1).

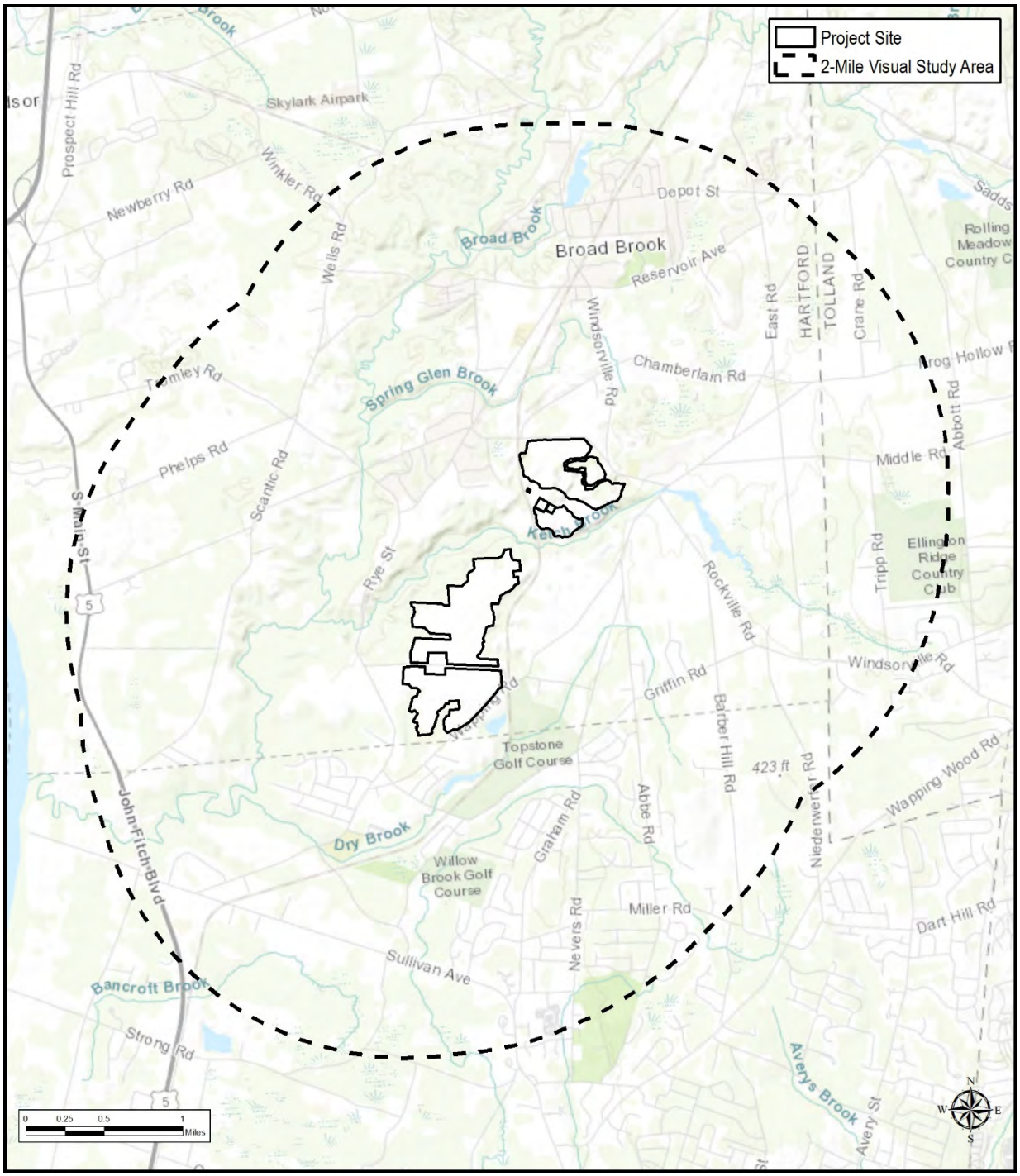


Figure 2.1-1 – Visual Study Area

3.0 VISIBILITY ANALYSIS

This Visibility Analysis utilizes three methods for determining potential Project visibility throughout the VSA: viewshed analysis, field verification, and visual simulations. The methodology employed for each of these assessment techniques, and the results of these analyses, are described below.

3.1 Viewshed Analysis Methodology

A viewshed map for the proposed Project was prepared using the following:

1. A bare earth digital elevation model (DEM) and a digital surface model (DSM) derived from the 2016 Capitol Region Council of Governments (CRCOG) Connecticut Statewide dataset via NOAA's Data Access Viewer lidar resource;
2. Sample points representing solar panel locations spaced 200 feet apart over the entire area proposed for panel installation;
3. An assumed maximum panel heights of 15.5 feet for the single axis trackers and 9 feet for the fixed-tilt panels;
4. An assumed viewer height of 6 feet; and
5. ESRI ArcGIS® software with the Spatial Analyst extension.

The previously mentioned publicly available lidar data did not accurately reflect the current conditions of the gravel pit due to an additional four years of extraction occurring since the time the lidar was collected. Therefore, EDR supplemented the lidar surface using survey data collected by the Project engineers (VHB). Additionally, due to the need for significant site grading, the proposed conditions surface was provided in site plans and was included in the DEM and DSM model surface to accurately reflect anticipated finished grades. These models were created by performing a comparison of a bare earth DEM, which includes a lidar-derived bare earth model (void of vegetation and structures) and a lidar derived DSM which includes structures and vegetation. Areas requiring clearing as a result of the Project were included in the analysis. The ArcGIS program defines the viewshed by reading every cell of the lidar data within the VSA on the modified DSM model to determine where ground-level views of the proposed Project could potentially be available. Once the viewshed analysis was completed, a conditional statement was used to set solar panel visibility to null in locations where the DSM elevation exceeded the DEM elevation by six feet or more (indicating the presence of vegetation or structures that exceed viewer height). This was done for two reasons; 1) because in locations where trees or structures are present in the DSM, the viewshed would reflect visibility from the vantage point of standing on the tree tops or building rooftops, which is not the intent of this analysis, and 2) to reflect the fact that ground-level vantage points within buildings or areas of vegetation exceeding six feet in height will generally be screened from views of the Project.

Because the lidar viewshed analysis accounts for the screening provided by structures and trees, the analysis is an accurate representation of potential Project visibility. However, it is worth noting that because certain characteristics of the solar panels that may influence visibility (color, distance from viewer, lower height of single axis trackers at certain times of the day, etc.) are not taken into consideration in the viewshed analyses, visibility indicated by this analysis does not necessarily equate to actual Project visibility. Conversely, possible views from beneath the tree canopy in forested areas are not considered in the viewshed analysis. Therefore, it is possible that residences and roads directly adjacent to the Project Site may have some Project visibility through the understory of existing forested areas where the viewshed analysis indicates a lack of Project visibility.

3.1.1 Viewshed Results

Results of the viewshed analysis (Figure 3.1-1 and 3.1-2) suggest that approximately 3.9 percent of the 2.0-mile radius VSA could have some level of Project visibility. The visible areas are largely contained within the Project Site itself, due to the relatively low-profile of the proposed panels and the presence of mature vegetation surrounding the Project Site. Local roads with potential visibility include Apothecaries Hall Road, Windsorville Road, Plantation Road, and Wapping Road. All of these roads occur directly adjacent to the Project Site. A small area of potential visibility extends beyond these roads and the Project Site into a small open field and a residential area north of Apothecaries Hall Road. As mentioned previously, possible views through the forest understory are not considered in this viewshed analysis and may be available in some locations where the understory is lacking in density or during winter months when the trees lack foliage. Similarly, in the southern portion of the Project Site, visibility extends to an open field south of Wapping Road. A narrow hedgerow separating this field from a residential development provides a vegetative buffer which could be effective in partially screening views of the Project. A very small area of visibility (approximately 57 feet wide) extends from the Project Site onto the Topstone Golf Course, located south of Wapping Road. To the west of the Project Site, views from Abraham George Lane and Rye Street would be substantially, if not entirely, screened from views toward the Project due to the presence of a thick vegetative buffer.

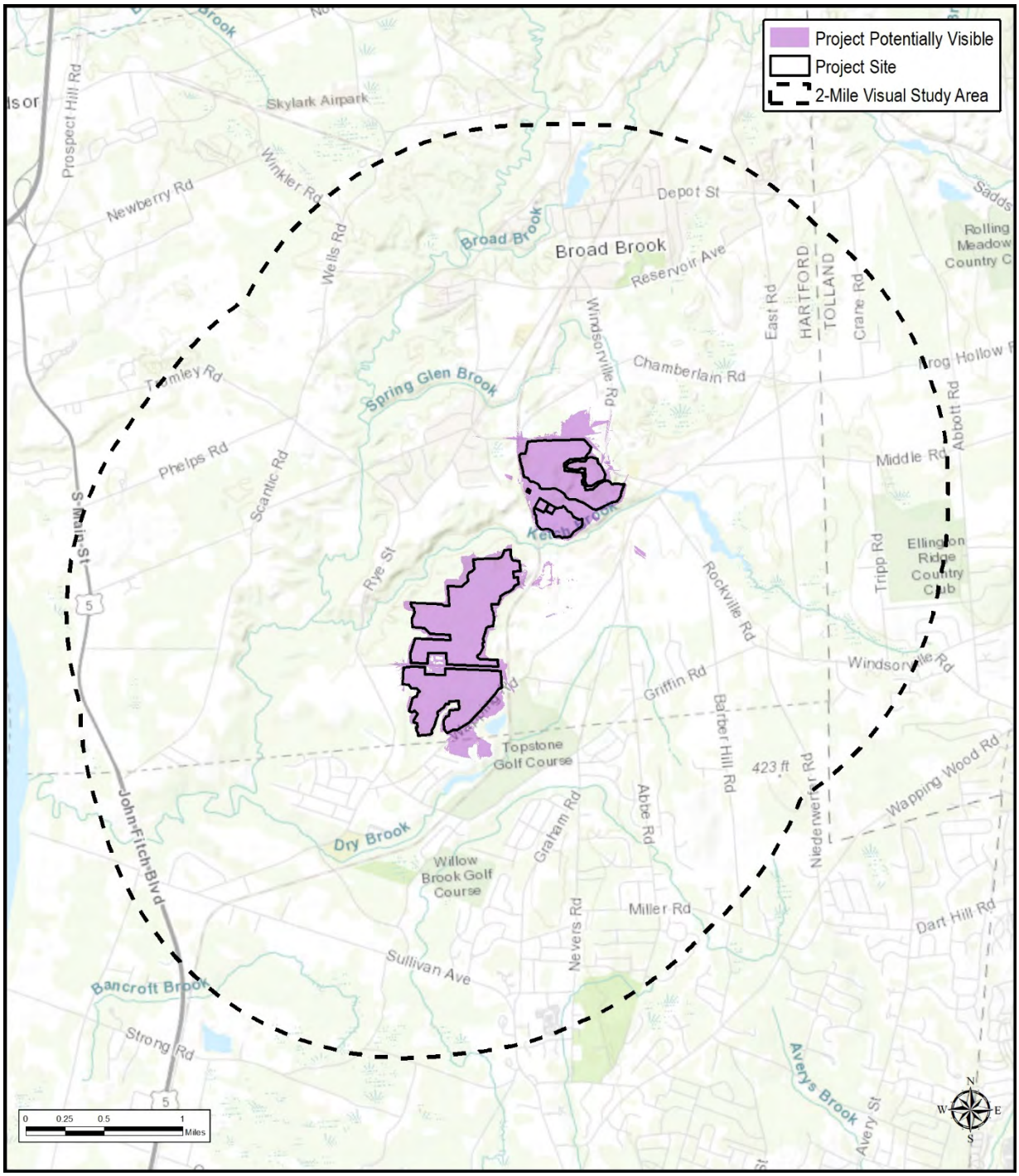


Figure 3.1-1 – Viewshed Analysis Results

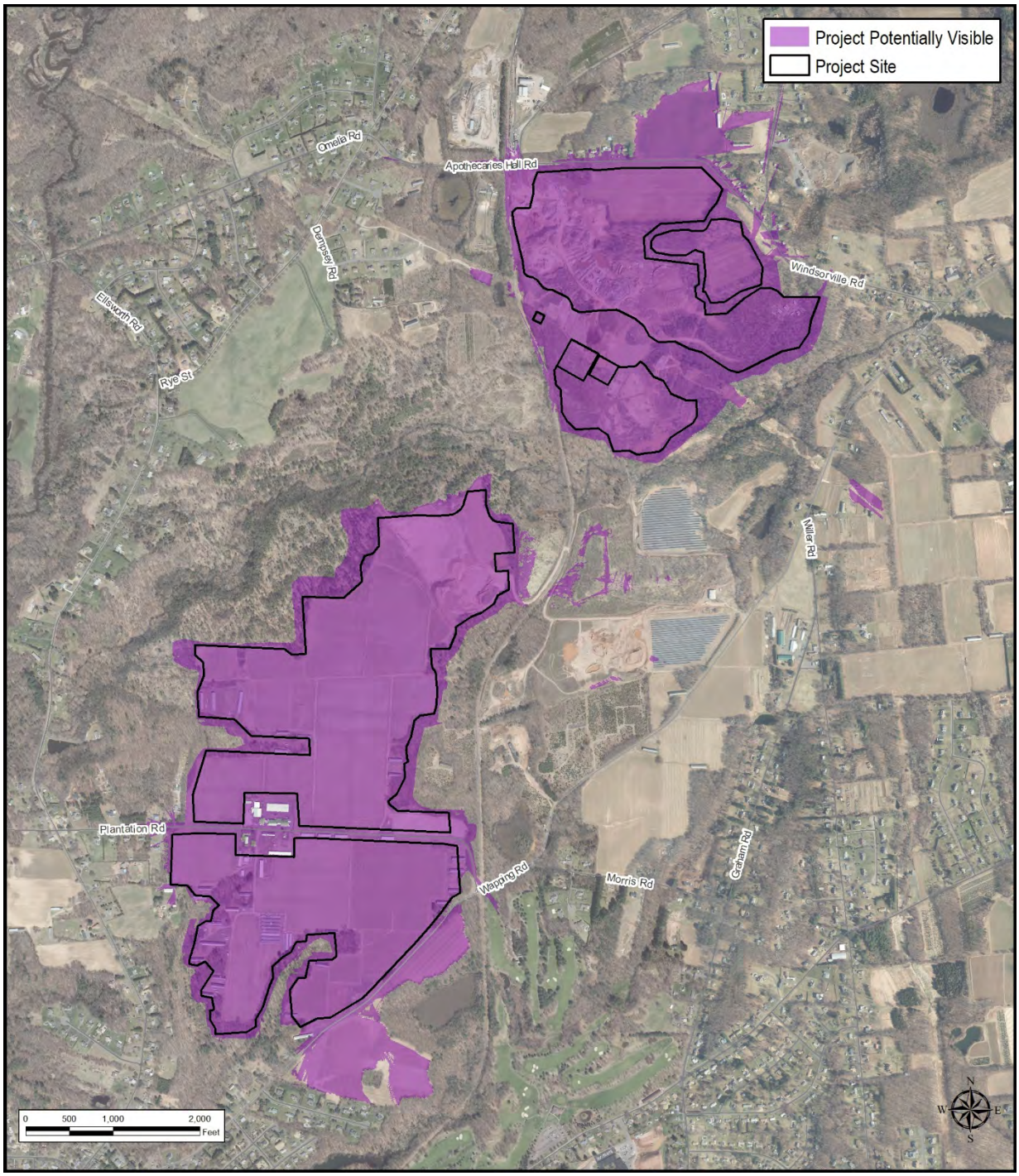


Figure 3.1-2 – Viewshed Analysis Results Detail

3.2 Field Verification Methodology

Potential visibility of the Project was evaluated in the field on February 14, 2020. The purpose of this field review was to identify available open views of the Project Site within the VSA, to obtain photographs for subsequent use in the development of visual simulations, and to document the visual character of the VSA. Consideration was also given to

viewer orientation and time of day by strategically capturing a variety of lighting conditions (front lit, side lit and backlit) as well as the angle of the solar array relative to the viewer.

During the field survey, an EDR staff member drove public roads and visited public vantage points within the VSA to document points from which the Project likely would be visible, partially screened, or fully screened. These vantage points were determined by looking for open views of the specific fields in which the Project is proposed. Photographs were taken from 23 representative viewpoints within the VSA. Photographs were taken with a Nikon D7100 camera with a focal length between 24 and 35 mm (equivalent to between 45 and 55 mm on a full frame 35mm camera). Viewpoint locations were determined using hand-held global positioning system (GPS) units, high resolution aerial photographs, and high-resolution lidar data (to determine elevation). The time and location of each photograph were documented on all electronic equipment (camera, GPS unit, etc.) and noted on electronic field data sheets. Where views toward the Project Site existed, viewpoints photographed during the field review generally represented the most open, unobstructed views available . The locations of viewpoints visited during field review are illustrated in Figure 3.2-1 and representative photographs are provided in Appendix A.

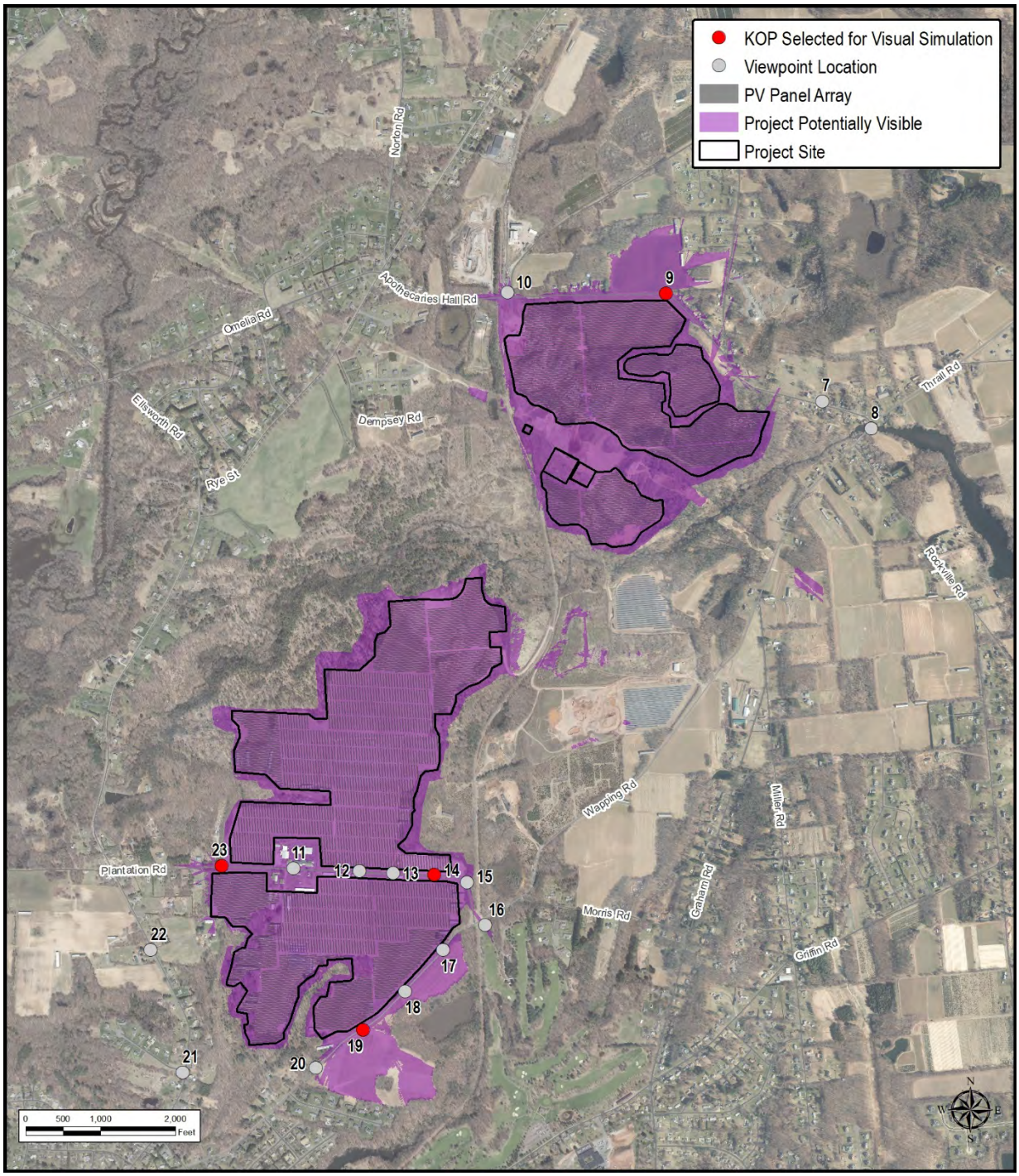


Figure 3.2-1 – Viewpoint Location Map

3.2.1 Field Verification Results

Confirming the results of the viewshed analysis, field review indicated that Project visibly would generally be restricted to locations void of vegetation and directly adjacent to the Project Site. Given the general lack of visibility beyond the

Project Site, viewpoint documentation was focused to areas along public roads adjacent to the Project Site. Views of the Project Site were available from Plantation Road, Apothecaries Hall Road, and Wapping Road. No potential views from Rye Street were available, and once beyond 500 feet from the Project, no public vantage points offered opportunities for open views toward the Project Site.

Field review also confirmed the viewshed analysis predictions that views of some portion of the Project would be available from the residences along Apothecaries Hall Road. In some instances, this visibility may be somewhat mitigated by the presence of landscape vegetation, but some portion of each of the adjacent residential properties or homes would likely see some of the proposed solar panels. On Plantation Road, a few adjacent residences to the west of the Project may have some level of Project visibility through an existing vegetated hedgerow during leaf-off conditions. These views would likely only include small portions of the Project through a relatively dense vegetated buffer. To the south of the Project, on Green Lane, several residences in a subdivision, may also have glimpses of the Project through an existing hedgerow. However, the Project is between 800 and 1,000 feet from these homes, so Project visibility would be significantly reduced as a result of distance and partial screening from the existing vegetation buffer.

Open views toward the Project Site were not available from the homes along Rye Street, to the west of the Project. However, some homes along the east side of Rye Street were set back from the road by up to 700 feet. For these residences, since they are situated much closer to the Project Site, views toward portions of the Project may be available through narrow hedgerows. Additionally, due to the location of the Project Collector Substation and the Switchyard within the Project Area, visibility of these facilities is expected to be very limited from public rights of way (ROWs).

It should be noted that fieldwork was completed during leaf-off conditions, thus representing the maximum potential visibility toward the Project Site in areas where existing vegetative buffers exist.

3.3 Visual Simulations

Beyond evaluating the potential visibility of the Project, this Visibility Assessment also examined the appearance of the solar arrays from various locations within the VSA. This assessment involved creating computer models of the solar panel arrays and above-ground Project components, selecting representative viewpoints within the study area, and preparing computer-assisted visual simulations of the proposed Project. These simulations then were used to characterize the type and extent of visibility and visual impact resulting from the construction of the Project. Details of the viewpoint selection and simulation procedures are described below.

From the photographic documentation conducted during the field survey, EDR selected four viewpoints for development of visual simulations. These viewpoints were selected based upon the following criteria:

1. They will provide views of the proposed Project (as determined through field verification).
2. They illustrate typical views from a variety of viewing distances and orientations.
3. They illustrate visibility/contrast of the solar arrays under different lighting conditions, to illustrate the range of visual change that will occur once the Project is in place.

Location of the selected viewpoints is indicated in Figure 3.2-1. Locational details and the criteria for selection of each simulation viewpoint are summarized in Table 3.3-1, below:

Table 1. Viewpoints Selected for Simulation

VP	Location	Town	Representative Land Use	Distance to Nearest Project Component	Direction of View	Time Taken
9	Apothecaries Hall Road	East Windsor	Rural Residential	129 Feet	Southwest	10:53 am
14	Plantation Road	East Windsor	Agricultural /Rural Residential	124 Feet	West-Southwest	11:56 am
19	Wapping Road	East Windsor	Agricultural /Rural Residential	114 Feet	North-Northeast	12:17 pm
23	Plantation Road	East Windsor	Agricultural /Rural Residential	233 Feet	Northeast	12:55 pm

3.3.1 Visual Simulation Methodology

To show visual changes that are expected to occur following construction of the Project, high-resolution computer-enhanced image processing was used to create realistic photographic simulations of the Project from each of the four selected viewpoints. These simulations were developed by constructing a three-dimensional (3D) computer model of the proposed solar panel arrays based on specifications and survey coordinates provided by VHB. .

Simulations were created by aligning each photographic viewpoint with the computer model of the Project and then superimposing the model on the photograph. This step involves the creation of a 3D virtual camera that exactly replicates the position, direction of view, and camera specifications used for field documentation. To verify the accuracy of the virtual camera alignment, aerial photographs, lidar data, and GPS data collected in the field were used to create an AutoCAD Civil 3D® drawing. The two-dimensional AutoCAD data were then imported into Autodesk 3ds MAX® and three-dimensional components (cameras, modeled array, etc.) added. These data were superimposed over photographs from each of the viewpoints, and minor changes in camera height, roll, and precise lens setting were

made to align all known reference points within the view. This process ensures that the elements of the Project are shown in proportion, perspective, and proper relation to the existing landscape elements in the view. Consequently, the alignment, elevations, dimensions, and locations of the proposed structures will be accurate and true in their relationship to other landscape features in the photograph.

At this point, a "wire frame" model of the Project and known reference points are shown on each of the photographs. The proposed exterior color/finish of the associated equipment were then added to the model and the appropriate sun angle simulated, based on the specific date, time, and location (latitude and longitude) at which each photograph was taken. This information allows the program to realistically illustrate highlights, shading and shadows for each individual array shown in the view.

3.3.2 Visual Simulation Results

The visual simulations illustrate the appearance of the proposed Project from four representative locations. The following results provide a summary of the visual character of the existing view (Figures 3.3.1, 3.3-3, 3.3-5, and 3.3-7), followed by a summary of the visual character of the view with the operational Project in place (Figures 3.3-2, 3.3-4, 3.3-6, and 3.3-8).

Figure 3.3-1– Existing view from Apothecaries Hall Road – Viewpoint 9

This existing view from Apothecaries Hall Road is adjacent to a small cluster of residential properties and therefore representative of the most open and unobstructed view available from these properties. The foreground of this view is dominated by the asphalt road and the roadside utility poles which enter the center of the frame and continue out of the frame on the right side. The small agricultural field adjacent to the road extends away from the viewer where it abruptly ends at a large horizontal berm in the middle ground. Beyond the berm, dense forest vegetation extends up to the blue sky forming a staggered horizon line across the entire view. The vertical forms presented by the utility poles juxtaposed with the horizonal form presented by the berm tend to distract the viewer and the sense of natural landform is interrupted. The overall scenic quality of this view is relatively low.

Figure 3.3-2 – Proposed view from Apothecaries Hall Road – Viewpoint 9

At its closest point, the proposed Project is approximately 129 feet from the viewer at this vantage point. With the Project in place, the solar panels and perimeter fence present another strong linear interruption of the landscape. However, the Project generally follows the road and the utility poles creating a visual reinforcement of the sinuous lines created by these existing landscape features. The backs of the panels are in full shade making the racking system and piles difficult to discern which strengthens the strong horizontal line created by the Project. The chain link fence does not appear out of character with what already appeared to be a heavily modified view. However, given the

presence of residences adjacent to this view, the solar panels and fencing represent a conflicting land use that changes the character of a once open view to the nearby woodlots. As a result, the Project is expected to result in appreciable visual impact to the residents living adjacent to this portion of the Project.

Figure 3.3-3 – Existing view from Plantation Road – Viewpoint 14

This existing view from Plantation Road illustrates an agricultural field with overhead netting and support structures for bird control. Several large tobacco barns line Plantation Road and a water tower is visible in the background. The foreground of this view is dominated by the asphalt road and the vertical posts associated with the netting system which extend down Plantation Road and away from the viewer. These posts add an element of visual clutter due to their irregular placement and lack of verticality. The middle ground is dominated on the right of the view by the large tobacco barns which are directly adjacent to the road. The barns are tall stately structures which, in combination with the water tower, add visual interest to the view. The background of the view consists of dense deciduous vegetation, occasionally interspersed with large evergreen trees. In the center of the view, there is a glimpse of distant hills through the tree line. The blue sky is wide open and interrupted only by the staggered tree line, the water tower, and roadside utility poles on the far right side of the view. This view exhibits a medium level of scenic quality.

Figure 3.3-4 – Proposed view from Plantation Road – Viewpoint 14

With the proposed Project in place, the solar panels are visible in the foreground (124 feet away) of the view and replaces the netting system with a regular and repeated pattern of horizontal and vertical forms across the view. This arrangement interrupts views of the background hedgerows in the center of the view and eliminates any view of the background hills. However, in the middle ground, the tobacco barns still represent a prominent focal point that draws the viewer's eye down the road. Although the berms help divert attention away from the Project, and serve to reduce its perceived scale, the panels substantially alter the agricultural character of the view, codominant with he barns and water tower as focal points in the view. Given the lack of residents or other visually sensitive resources in this location, it is anticipated that that Project will have limited visual impacts to the view.

Figure 3.3-5 – Existing view from Wapping Road – Viewpoint 19

This existing view from Wapping Road illustrates agricultural fields surrounded by several woodlots and hedgerows. The surface of Wapping Road is visible in the immediate foreground followed by what appears to be a successional field with tall grasses and a few shrubs scattered throughout. A system of overhead netting in the middle ground adds some visual clutter, but generally lacks color contrast and tends to blend in with the color of the dormant plant material in the field. A hedgerow in the foreground interrupts the blue sky on the left side of the view. Several tobacco barns are scattered throughout the middle ground of the view and appear somewhat discordant due to their seemingly random placement and variation in materials. The two barns in the center of the view tend to draw the viewer's eye due to the bright white color of their roofs resulting from reflection of direct sunlight. The background consists of a deciduous woodlot which runs across two thirds of the view. Generally, this view lacks visual interest and contains some visual clutter/discordant features which results in relatively low scenic quality.

Figure 3.3-6 – Proposed view from Wapping Road – Viewpoint 19

With the proposed Project in place, the solar panels appear to descend a small slope in the foreground, thus reducing the perceived height of the foreground panels (114 feet from the viewer). Additional rows of panels rise behind the initial row, but views of the background remains largely intact. Several barns are no longer visible due to their removal from the Project Site, and removal of a large hedgerow on the left reveals a broader expanse of open blue sky. The panels and chain link fence introduce an industrial element into the landscape, but this impact is limited by their relatively low profile and uniform character. The proposed Project alters the rural/agricultural character of the view, but lack of sensitive receptors and low baseline scenic quality limit adverse visual impact at this location.

Figure 3.3-7– Existing view from Plantation Road – Viewpoint 23

This existing view from Plantation Road is located approximately 0.5 mile west of Viewpoint 14 (previously described). This agricultural setting includes the previously mentioned netting and support system posts in the foreground as well as several large buildings (associated with the Plantation Industrial Park) partially visible beyond an evergreen screen in the middle ground. The road on the right side of the view extends away from the viewer, eventually disappearing from view. A short section of the road has patches vegetation on both sides and a small portion of a water tower can be seen beyond this vegetation. The built and natural elements in the foreground and middle ground of this view generally eliminate any long-distance views and the only evidence of the background is visible along the road and beyond the netting posts on the left side of the view. Due to the lack of topographic and vegetative variability, and the relative containment created by the built and natural features present in this view, the existing scenic quality is relatively low.

Figure 3.3-8 – Proposed view from Plantation Road – Viewpoint 23

At its closest point, the proposed Project is approximately 233 feet from the viewer at this location. The chain link fence enclosing the panels is clearly visible in the foreground, with the single axis tracker panels directly behind. Due to the time of the photograph, the solar panels are near their lowest profile position and they do not substantially block most of the background features in the view. From this location, the Project (particularly the fence) appear to be an extension of the Plantation Industrial Park. The solar panels eliminate the open character of the existing field, however, placement of the panels approximately 50 feet away from the road minimizes the feeling of enclosure commonly present with solar projects. While the fence and panels introduce an industrial feel, they do not appear out of place or contradictory to the existing land use. Based on this, along with the relatively low baseline scenic quality, minimal visual impacts are anticipated to result from the Project at this location.

3.3.3 Vegetative Screening

Gravel Pit Solar selected a single location on Apothecaries Hall Road to demonstrate potential vegetative screening measures which could be effective in minimizing the potential visual impacts to specific resources or discrete locations. The intent of this mitigation is to soften views toward the Project while providing a level of natural screening and additional ecological benefit to the Project. Figure 3.3-9 provides a plan view illustration of the potential mitigation concept along a short section of Apothecaries Hall Road adjacent to the residences with potential views of the Project.

Figure 3.3-9 – Plan View illustrating the potential conceptual mitigation on Apothecaries Hall Road

If vegetative mitigation is required, Gravel Pit Solar will give preference to the use of plants native to the region. The concept illustrated in Figure 3.3-9 uses a mix of evergreen (Eastern Red Cedar and White Spruce) for year-round screening and deciduous species (Red Maple, Red Oak, and Shadblow Serviceberry) for additional seasonal screening and ecological benefits such as wildlife food sources or natural foraging habitat. Additionally, the conceptual plant palette provides a mix of textures and colors for year-round visual interest. Figure 3.3-10 illustrates the simulation from Viewpoint 9 with the conceptual mitigation in place with a projected size representing five years of growth.

The simulation demonstrates that while the Project is still visible through the vegetative buffer, the strong linear form presented by the panels has been substantially softened, thus reducing the potential visual contrast previously presented by the Project. Additionally, the background vegetation is still somewhat visible through the vegetative buffer creating a sense of openness and continuation of the view. During the growing season, this mitigation is anticipated to provide additional screening of the Project, thus further reducing the potential visual contrast to the adjacent residences.

Figure 3.3-10 – Proposed view from Apothecaries Hall Road considering potential mitigation in place – Viewpoint 9

4.0 CONCLUSION

4.1 Visual Assessment Summary

The results of the Visibility Assessment can be summarized as follows:

- The viewshed analysis suggests that potential views of the Project will be contained within the Project Site, with the exception of some public roads and properties directly abutting the Project property. Approximately 3.9 percent of the VSA could have potential views of some portion of the Project (i.e., 96.1% of the VSA is fully screened from view). Most of the visible areas are actually contained within the boundaries of Project Site.
- Field review indicated that the viewshed results are generally accurate, and existing structures and vegetation will be effective in screening views of the Project in most locations. However, where forest vegetation is thin and/or understory vegetation is lacking, some visibility may be experienced from public roads and homes abutting the Project Site.
- Homes along Apothecaries Hall Road directly adjacent to the Project Site will experience some level of visual impact due to the introduction of the solar panels and boundary fencing. Vegetative mitigation (perimeter screen plantings) could be effective in reducing impacts to these residential areas.

- Homes located along Plantation Road may have some limited views into the Project Site through an existing hedgerow and may also benefit from some supplemental screening to minimize Project visibility.
- A few homes along Rye Street are situated relatively close to the Project Site and may experience some level of visual impact resulting from visibility of portions of the Project. Selective plantings may be effective in reducing or eliminating visibility from these locations.

4.2 Mitigation

Section 3.3.3 illustrates potential vegetative screening mitigation treatment for one of the aforementioned locations that may experience minor visual impacts associated with the Project. However, the following additional mitigation measures to minimize visual impacts may be considered for inclusion in the Project.

- Burial of interconnection cables amongst the solar arrays and substations will help minimize visual clutter.
- The use of non-specular materials can be effective in reducing potential visual impacts from adjacent areas. This is particularly true for the perimeter fencing which is typically constructed with galvanized steel. Black vinyl coating can minimize light reflection and thus visibility of the fence.
- Increased setbacks from residences can help minimize visibility of solar facilities and helps to minimize the sense of enclosure which can occur when solar panels are situated too close to public rights of way.
- Positioning inverters and transformers within the solar arrays and away from public vantage points can minimize their potential visibility and reduce visual clutter.

Some of these mitigation measures have already been included in the Project design; however, the feasibility and practicability of all measures has not been determined at this time. The need for specific mitigation measures will be evaluated in consultation with Project stakeholders during the permitting process.

Appendix H
Soil Scientists Report

WETLANDS DELINEATION REPORT

Date: May 7, 2020

Project No.: 42569.00

Prepared For: Gravel Pit Solar, II, III, IV

Project Name: Gravel Pit Solar Project consisting of the following eight properties as identified by the East Windsor' Assessor's Office:

Parcel ID	Area (Acres)
057-65-001	98.0
057-65-002	3.0
048-65-007	124.8
037-65-005A	14.6
025-49-017C	86.5
025-49-017A	124.4
016-49-007	118.7
016-50-001	156.2
Total Area	726.2

Site Location: Apothecaries Hall Road, Windsorville Road, Plantation Road, and Wapping Road, East Windsor, CT

Site Map: Wetland Delineation GIS Figure, dated May 7, 2020

Survey Plan: Existing Conditions Plan

Inspection Dates: 10/16/2019, 11/5/2019, 11/13/2019, 12/13/2019, 1/6/2020, 3/3/2020, 3/26/2020

Field Conditions: Weather: sunny to cloudy 20's to 50's
Snow Depth: 0-1 inches
General Soil Moisture: moist
Frost Depth: 0-1 inches

Type of Wetlands Identified and Delineated:

Connecticut Inland Wetlands and Watercourses ☒
Tidal Wetlands ☐
U.S. Army Corps of Engineers ☐

Wetland determinations are based on the presence of poorly drained, very poorly drained, alluvial, or floodplain soils and submerged land. Watercourses are defined 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

Engineers | Scientists | Planners | Designers
1 Cedar Street
Suite 400
Providence, RI 02903
P 401.272.8100
F 401.277.8400

portion thereof." Intermittent watercourse determinations are made based on the presence of a defined permanent channel and bank, and at least two of the following characteristics: (1) evidence of scour or deposits of recent alluvium or detritus, (2) the presence of standing or flowing water for a duration longer than a particular storm incident, and (3) the presence of hydrophytic vegetation. (See Inland Wetlands and Watercourses Act §22a-38 CGS.)

Local Regulated Upland Review Areas:

In general, the Inland Wetland and Watercourses Regulations of the Town of East Windsor (IWW Regulations) call for a **150 foot** regulated Upland Review Area from inland wetlands and watercourses.

Section 6.1 of the IWW Regulations describe regulated activities: *The Agency shall regulate any operation or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetlands or watercourses, and any earth-moving, grubbing land, filling, construction, or clear-cutting within one-hundred fifty (150) feet of an upland review area that borders a wetland and/or watercourse, and on terrace escarpment soils1 adjacent to a wetland, watercourse or upland review area*.

This means the regulated area around all delineated wetlands and watercourses consists of the 150-foot dimensional off-set from the flagged wetland edge and, where present, those portions of terrace escarpment soils[1] that are adjacent to the wetland, watercourse, or upland review area. Adjacent would seemingly indicate draining to the wetland.

Also, IWW Regulations Section 7.5.n. instructs: *The site plan shall show any potential vernal pools on the affected portion of the proposed property along with a written evaluation as to the quality of the vernal pool and probable effect of the development on the vernal pool(s) conducted by a certified wildlife scientist, professional wetland scientist or similar qualified individual (as determined by the Commission).*

1. A buffer of 100 feet of non-disturbance shall be incorporated into the site plans when a vernal pool is identified. This non-disturbance area can be adjusted at the approval of the Commission based upon evidence of vernal pool quality by an expert.

2. No piped stormwater system shall discharge into a vernal pool.

1 The IWW Regulations provide this definition for "Terrace Escarpment" *means steeply sloping lands denoted under the general soil classifications units Te, Tc, Tg in the Hartford County Soil of the Soil Conservation Service, U.S.D.A. in the Soil Survey of Hartford County, Connecticut (SCS, 1962). The latest revision to the Soil Survey (Web Soil Survey) now correlates the 1962 Tg map unit as 37E.*

Field Numbering Sequence of Wetlands Boundary: The field numbering sequences for wetlands delineated within the Project Area are provided in Table 1.

Table 1 Wetland Delineation Flag Series

Wetland No.	Flag Series
1	1-100 to 1-198, 1-200 to 1-228; 5-100 to 141; 5-157 to 180; 5A-100 to 107; 5B-100 to 108; 5-181 to 210; 5-214 to 5-220; CT5-100 to 104, 5-246 to 254; 5-267; CT5-110 to 145; 5-314 to 347; 5-348B to 355B; 5-354 to 385; 5-400 to 411; 5-450 to 500, 1-173 to 198; 198A to 198B; 1-199A to 199B, 1-195 to 1-283
2	2-100 to 2-107
3	3-100 to 3-126
4	4-100 to 4-110
5	5-100 to 5-107
6	6-100 to 6-142
7	7-100 to 7-104
8	8-100 to 8-113
9	5-600 to 5-623
10	3-100 to 3-109
11	2-100 to 2-112
12	2-100 to 2-124
13	1-100 to 1-109
14	14-100 to 14-105
15	15-91 to 15-105
16	5-100 to 5-145

[the wetlands are depicted on the attached **Wetland Delineation Figure** *dated May 7, 2020. Flags are not depicted on this figure due to issues of scale. The Existing Conditions Survey depicts all flags within the properties included in the Project Area.]*

Limitations of this Wetland Delineation: The wetland delineation specifically excludes an investigation inside of the active mining operation identified as Apothecaries Hall Enterprises, LLC (A.K.A. Charbonneau Gravel Pit) as shown on The Charbonneau Gravel Pit Plan for lots 057-49-003, 057-65-001 & 048-65-007 prepared by J.R. Russo & Associates dated 5-7-15. It is the understanding of the investigator the on-going mining operation is authorized to proceed through a series of phases by a Special Use Permit renewed periodically by the East Windsor Planning and Zoning Commission. Condition 814.3q in the Special Permit issued February 14, 2019 requires a minimum of 8 feet of separation between final grade in the reclaimed gravel pit and the water table. Since conditions within the gravel pit are transient, with closure and mining operation ongoing, no attempt was made to delineate wetlands or watercourses within the open pit, including the process water ponds.

Notwithstanding these statements, observations were made in portions of the pit that have been reclaimed and forested and areas excluded from the mining operation regarding regulated wetlands. The Charbonneau Gravel Pit Plan for lots 057-49-003, 057-65-001 & 048-65-007 prepared by J.R. Russo & Associates dated 5-7-15 depicts a wetland to be protected in Phase 9 near the N/F Penn Central Railroad. This area was closely investigated by soil scientists, but no wetland or watercourse was found in the area. Soils consisted of loamy sands and coarser material without hydromorphic features and were evaluated as moderately well drained and well drained.

However, in the southwest corner of gravel mine, in an area designated as Phase 3, a well-established wetland, Wetland 11 was delineated within an area reclaimed for an estimated 10 years or more. Similarly, wooded reclaimed areas along the mine access road from Windsorville Road were inspected and determined that no wetland exist in this long reclaimed part of the gravel mine.

The classification systems of the National Cooperative Soil Survey, the U.S. Department of Agriculture, Natural Resources Conservation Service, County Soil Survey Identification Legend (as revised and provided on-line by Web Soil Survey https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm, and the Connecticut Department of Energy and Environmental Protection were used in this investigation.

All established wetlands boundary lines are subject to change until officially adopted by local, state, or federal regulatory agencies.

The wetlands delineation was conducted and/or reviewed by:

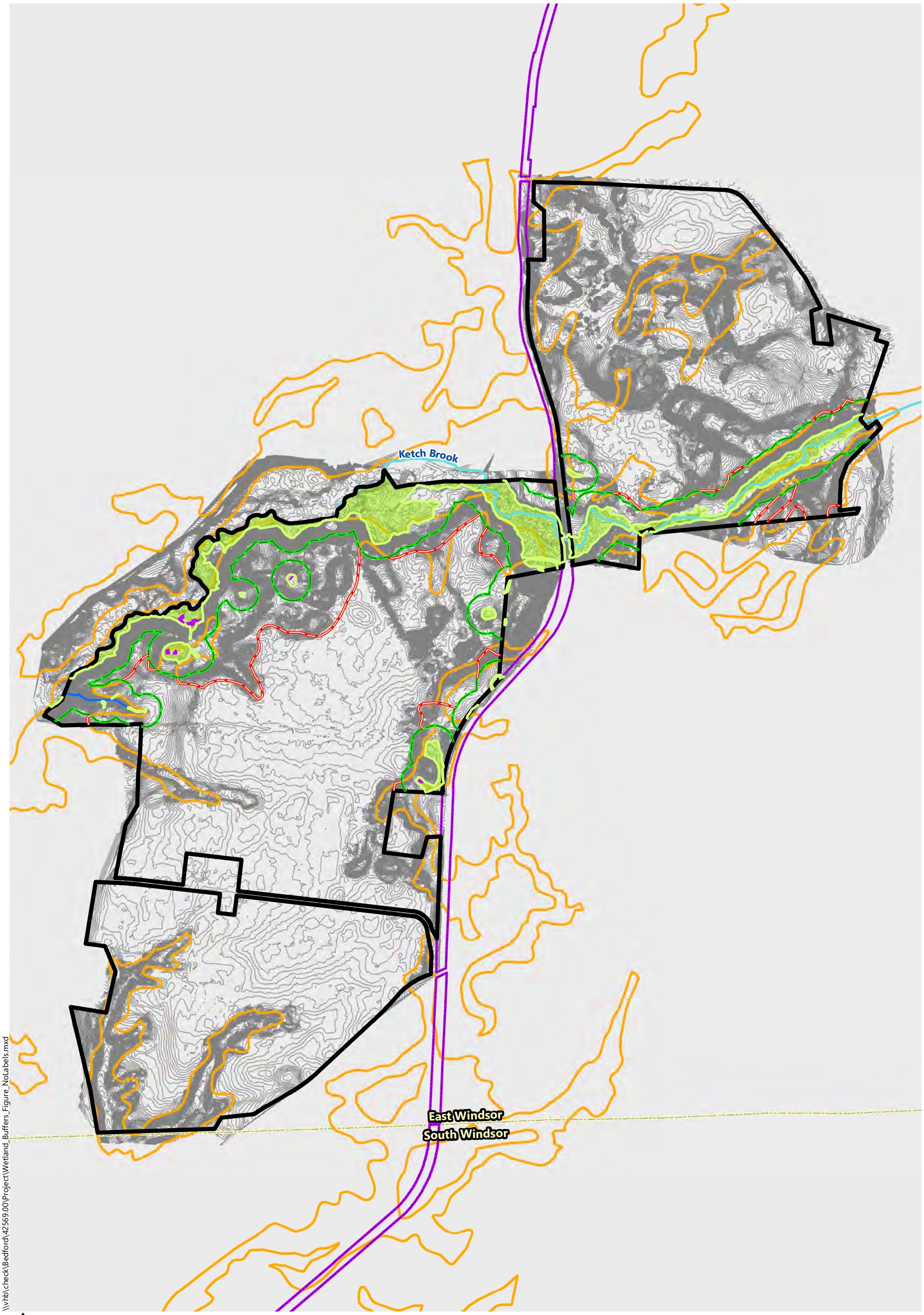
_____

Jeffrey Peterson
Certified Professional Soil Scientist

Enclosures

Attachments

- Wetland Delineation Map
- Wetland Delineation Field Forms
- NRCS Soil Reports and Soil Maps



0 500 1000 2000 Feet

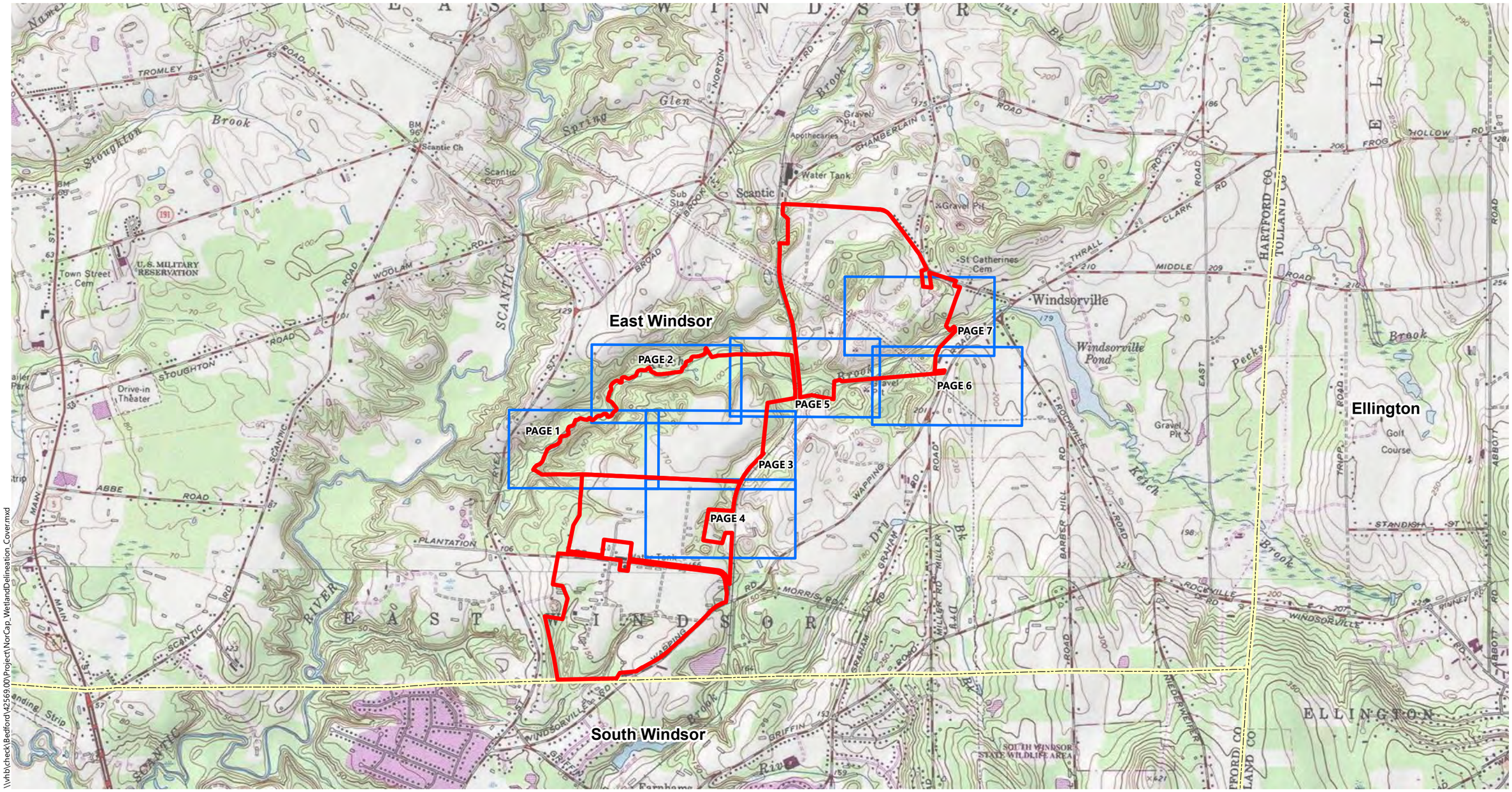
- Property Boundary
- Adjacent Parcels
- Town Boundary
- Approximate Railroad ROW
- 2-ft Contour
- Connecticut Inland Wetlands
- 150-ft Upland Review Area
- Adjacent Terrace Escarpment Soils
- Delineated Wetland Edge
- Vernal Pool
- Stream/River
- Delineated Intermittent
- Terrace Escarpment Soils (37E)

Gravel Pit Solar

East Windsor, Connecticut

Wetland Delineation w/ 150-ft Upland Review Area & Adjacent Mapped Terrace Escarpment Soils

Source: VHB, CTDEEP, ESRI



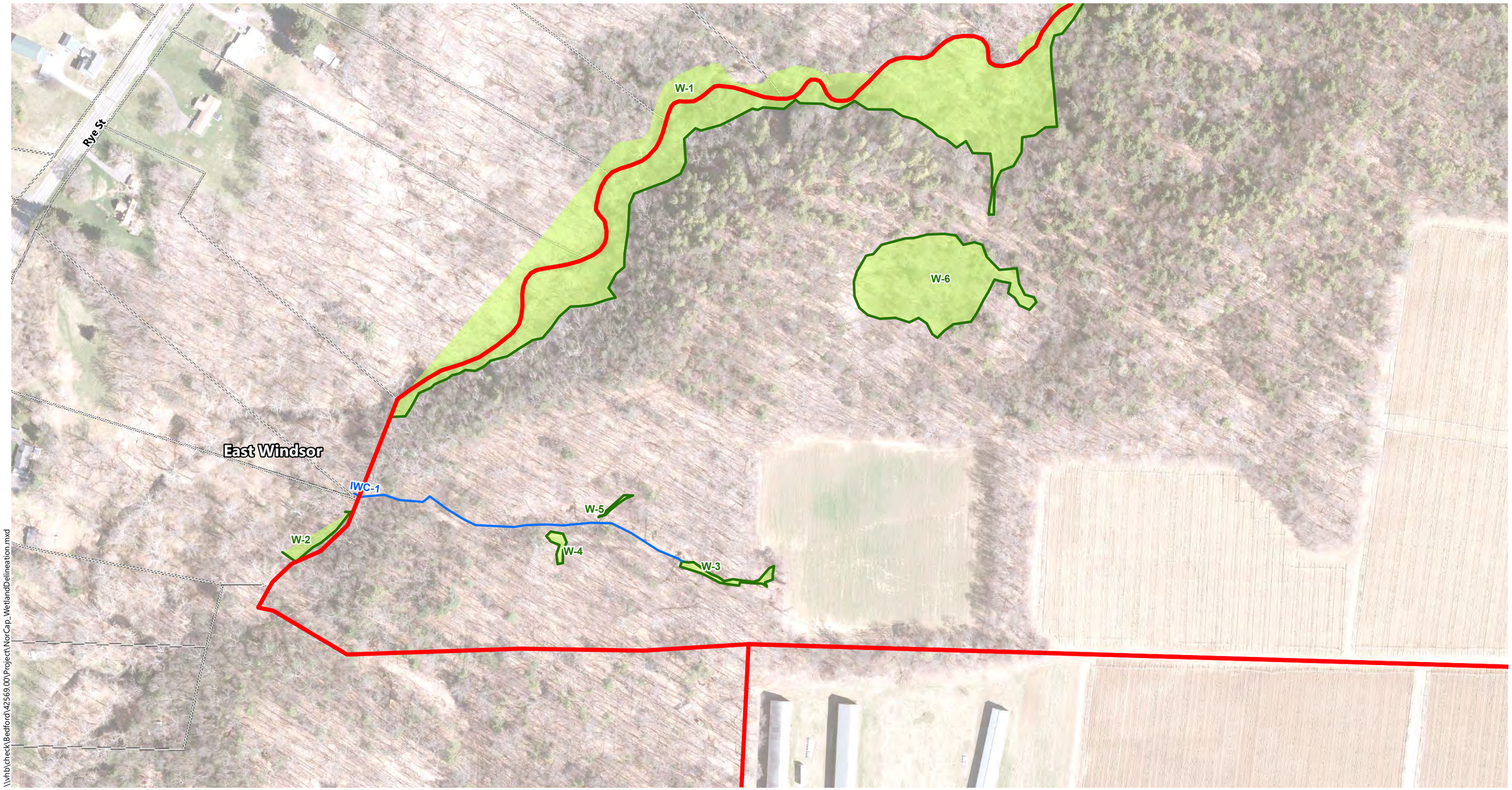
\\vhb\check\Bedford\42569.00\Project\NorCap_WetlandDelineation_Cover.mxd

Gravel Pit Solar | East Windsor, Connecticut

Wetland Delineation

Page Index Map

Source: CTDEEP, VHB, Eversource



0 100 200 400 Feet

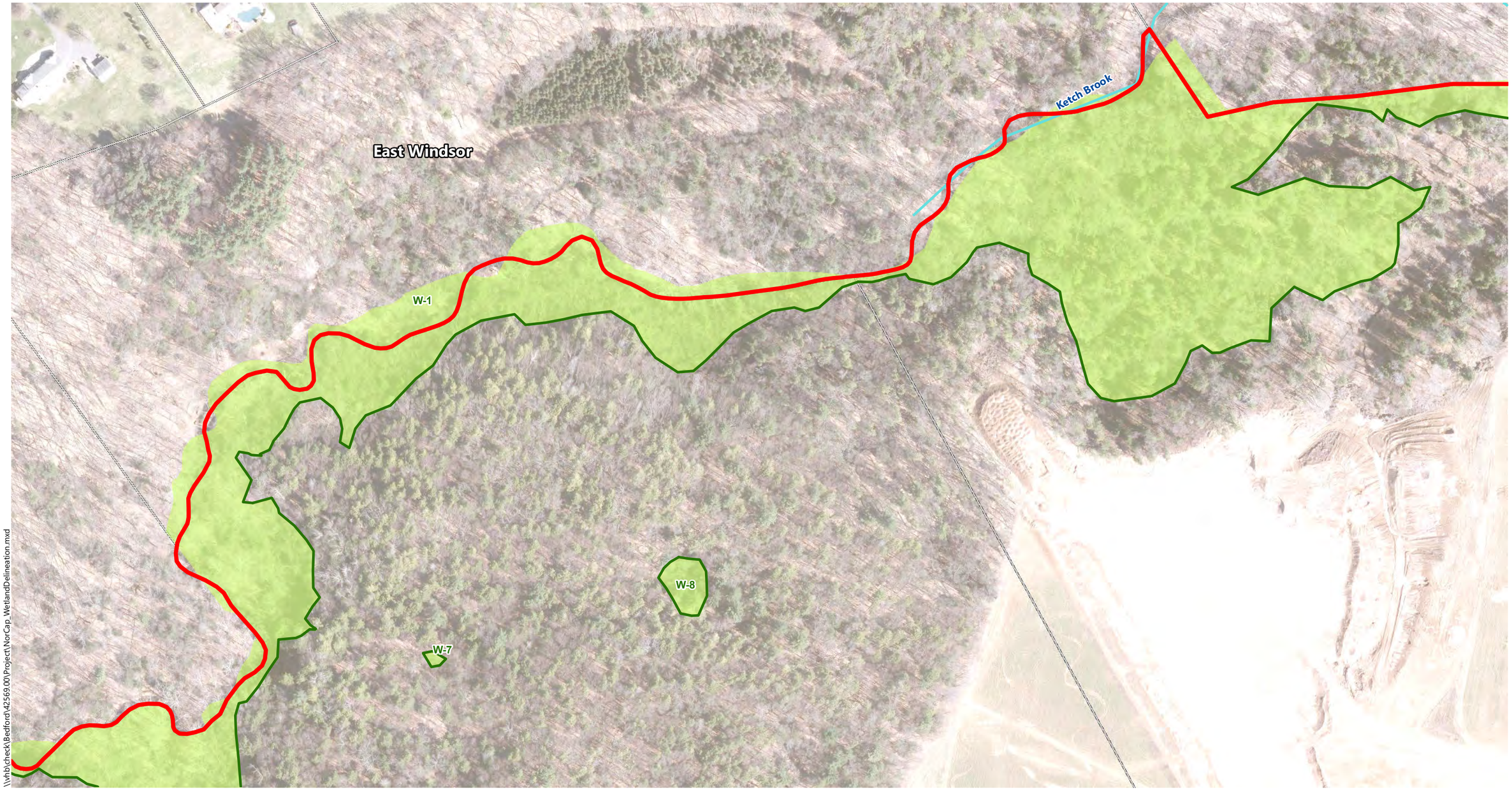
Legend

- Project Site
- Approximate Railroad ROW
- Parcel Boundary
- Town Boundary
- Delineated Intermittent Watercourse
- Stream/River
- Delineated Wetland Edge
- Wetland Resource Area

Gravel Pit Solar | East Windsor, Connecticut

Wetland Delineation

Source: VHB, CTDEEP, FEMA, ArcGIS Online



\\vhb\check\Bedford\42569.00\Project\NorCap_WetlandDelineation.mxd

0 100 200 400 Feet

Legend

- Project Site
- Approximate Railroad ROW
- Parcel Boundary
- Town Boundary
- Delineated Intermittent Watercourse
- Stream/River
- Delineated Wetland Edge
- Wetland Resource Area

Gravel Pit Solar | East Windsor, Connecticut

Wetland Delineation

Source: VHB, CTDEEP, FEMA, ArcGIS Online

0 100 200 400 Feet

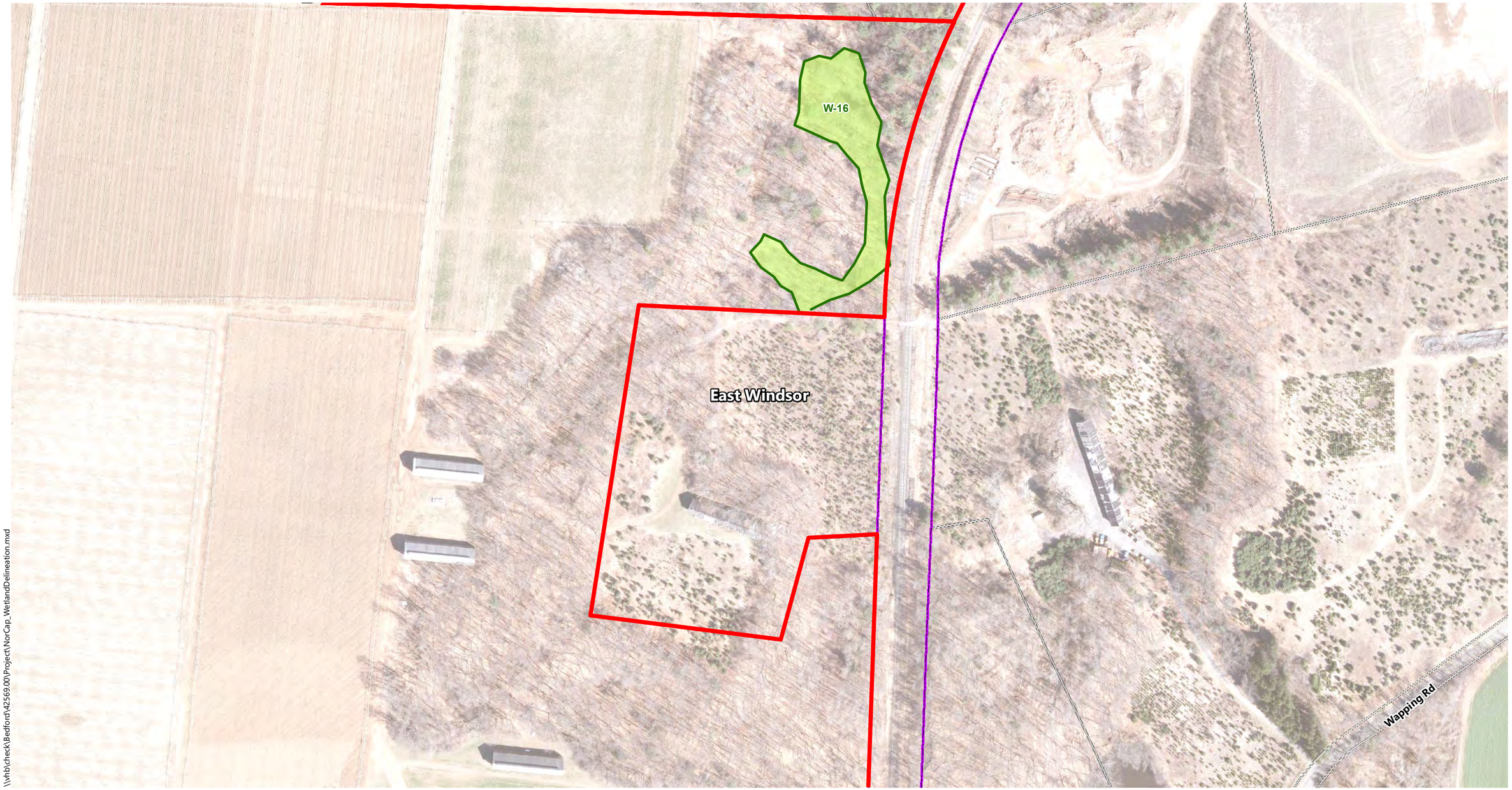
Legend

- Project Site
- Approximate Railroad ROW
- Parcel Boundary
- Town Boundary
- Delineated Intermittent Watercourse
- Stream/River
- Delineated Wetland Edge
- Wetland Resource Area

Gravel Pit Solar | East Windsor, Connecticut

Wetland Delineation

Source: VHB, CTDEEP, FEMA, ArcGIS Online



\\vhb\check\Bedford\42569.00\Project\NorCap_WetlandDelineation.mxd

0 100 200 400 Feet

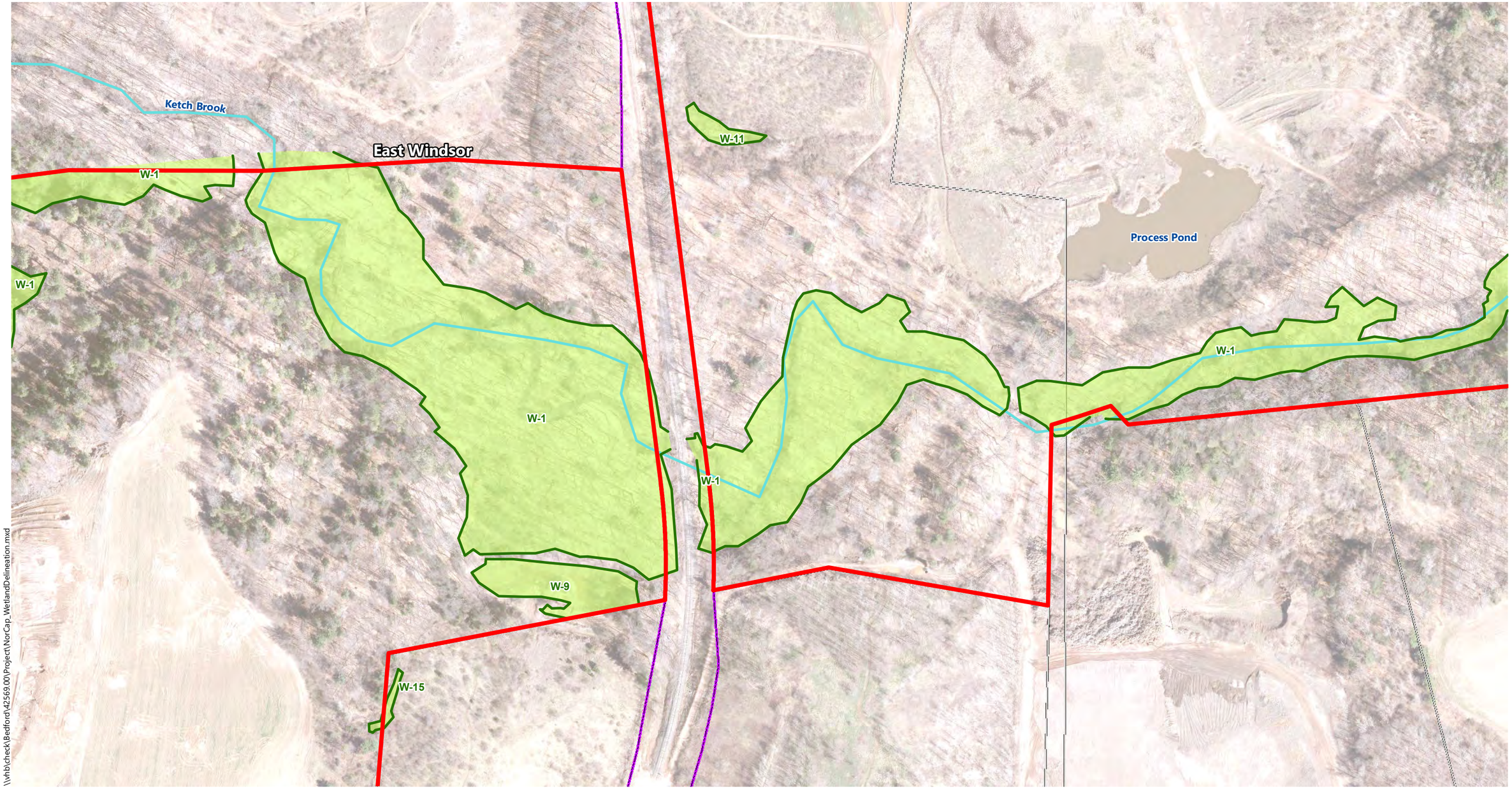
Legend

- Project Site
- Approximate Railroad ROW
- Parcel Boundary
- Town Boundary
- Delineated Intermittent Watercourse
- Stream/River
- Delineated Wetland Edge
- Wetland Resource Area

Gravel Pit Solar | East Windsor, Connecticut

Wetland Delineation

Source: VHB, CTDEEP, FEMA, ArcGIS Online



0 100 200 400 Feet

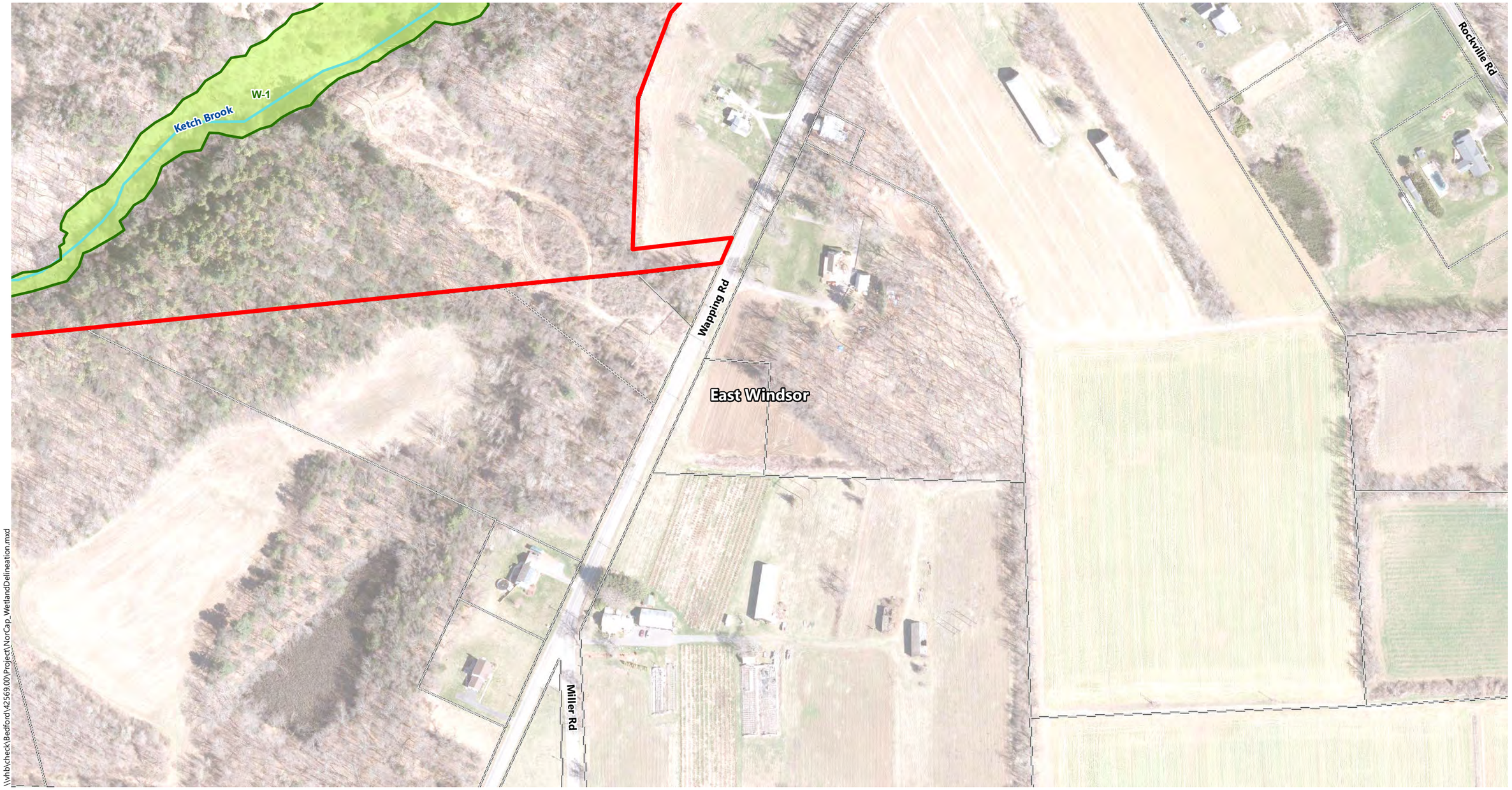
Legend

- Project Site
- Approximate Railroad ROW
- Parcel Boundary
- Town Boundary
- Delineated Intermittent Watercourse
- Stream/River
- Delineated Wetland Edge
- Wetland Resource Area

Gravel Pit Solar | East Windsor, Connecticut

Wetland Delineation

Source: VHB, CTDEEP, FEMA, ArcGIS Online



0 100 200 400 Feet

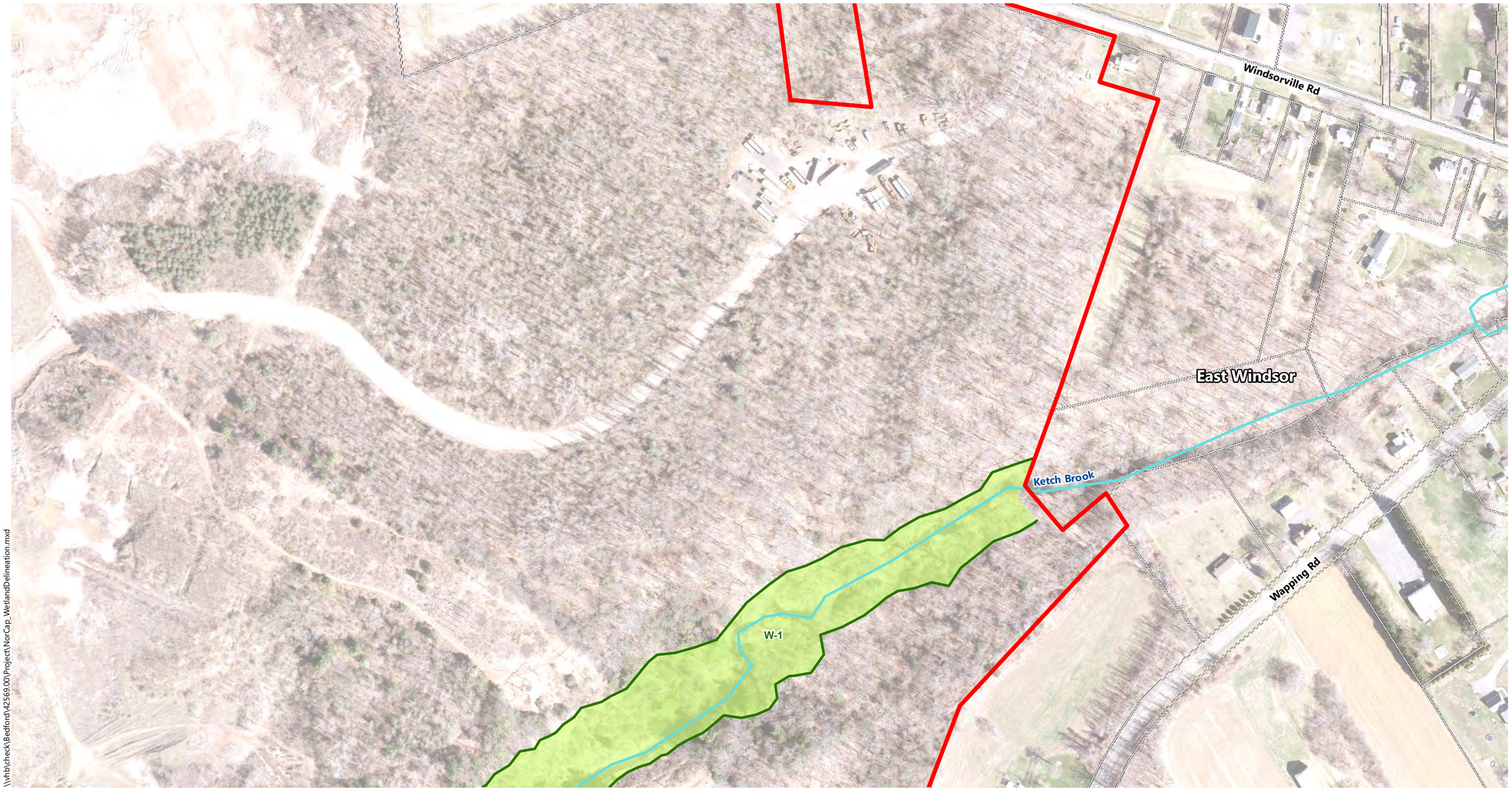
Legend

- Project Site
- Approximate Railroad ROW
- Parcel Boundary
- Town Boundary
- Delineated Intermittent Watercourse
- Stream/River
- Delineated Wetland Edge
- Wetland Resource Area

Gravel Pit Solar | East Windsor, Connecticut

Wetland Delineation

Source: VHB, CTDEEP, FEMA, ArcGIS Online



\\vhb\check\Bedford\42569.00\Project\NorCap_WetlandDelineation.mxd

0 100 200 400 Feet

Legend

- Project Site
- Approximate Railroad ROW
- Parcel Boundary
- Town Boundary
- Delineated Intermittent Watercourse
- Stream/River
- Delineated Wetland Edge
- Wetland Resource Area

Gravel Pit Solar | East Windsor, Connecticut

Wetland Delineation

Source: VHB, CTDEEP, FEMA, ArcGIS Online

Wetland Delineation Field Form

Project Address:	Plantation Rd, Wapping Rd, & Windsorville Rd East Windsor, CT	Project Number:	42569
Inspection Date:	10/16/2019, 11/5/2019, 11/13/19	Inspector:	Jeffrey Peterson, CPSS
Wetland I.D.:	Wetland 1		

Field Conditions:	Weather: Clear 30s	Snow Depth: 0 – 2 inches
	General Soil Moisture: moist	Frost Depth: 0 inches

Type of Wetland Delineation:	Connecticut ☒
	ACOE ☐
	Tidal ☐

Field Numbering Sequence: WF 1-100 to 1-198, 1-200 to 1-228; 5-100 to 141; 5-157 to 180; 5A-100 to 107; 5B-100 to 108; 5-181 to 210; 5-214 to 5-220; CT5-100 to 104, 5-246 to 254; 5-267; CT5-110 to 145; 5-314 to 347; 5-348B to 355B; 5-354 to 385; 5-400 to 411; 5-450 to 500, 1-173 to 198; 198A to 198B; 1-199A to 199B, 1-195 to 1-283

WETLAND HYDROLOGY:

NONTIDAL

Intermittently Flooded ☒	Artificially Flooded ☐	Permanently Flooded ☐
Semipermanently Flooded ☐	Seasonally Flooded ☐	Temporarily Flooded ☒
Permanently Saturated ☒	Seasonally Saturated – seepage ☒	Seasonally Saturated - perched ☐
Comments: Wetland 1 is the riparian corridor associated with the Ketch Brook floodplain and poorly and very poorly drained soils on terrace deposits adjacent to the alluvial soils along the brook.		

TIDAL

Subtidal ☐	Regularly Flooded ☐	Irregularly Flooded ☐
Irregularly Flooded ☐		
Comments: N/A		

WETLAND TYPE:

SYSTEM:

Estuarine ☐	Riverine ☒	Palustrine ☒
Lacustrine ☐	Marine ☐	
Comments:		

CLASS:

Emergent ☐	Scrub-shrub ☒	Forested ☒
Open Water ☐	Disturbed ☐	Wet Meadow ☐
Comments:.		

WATERCOURSE TYPE:

Perennial ☒	Intermittent ☐	Tidal ☐
Comments: Ketch Brook a perennial tributary to the Scantic River.		

Wetland Delineation Field Form (Cont.)

SPECIAL AQUATIC HABITAT:

Vernal Pool ☒	Other ☒	
Comments: A vernal pool is present in a backwater channel abandoned by Ketch Brook. Cold water fishery		

MAPPED SOILS:

SOIL SERIES (Map Unit Symbol)	WET	UP	NRCS MAPPED	FIELD IDD/ CONFIRMED
Fluaquents-Udifluvent complex, frequently flooded (109)	☒	☐	☒	☒
Occum fine sandy loam (101)	☒	☐	☒	☒
Manchester gravelly sandy loam, 15 to 45 percent slope (37E)	☐	☒	☒	☒
Raypol silt loam (12)	☒	☐	☒	☒

DOMINANT WETLAND PLANTS:

Red maple (*Acer rubrum*)	Jewelweed (*Impatiens capensis*)
Sycamore (*Platanus occidentalis*)	Skunk cabbage (*Symplocarpus foetidus*)
Eastern hemlock (*Tsuga canadensis*)	False hellebore (*Veratrum viride*)
	Evergreen woodfern (*Dryopteris intermedia*)
Spicebush (*Lindera benzoin)*)	
Winged euonymus (*Euonymus alata*)	

WETLAND NARRATIVE:

The active floodplain of Ketch Brook ranges in drainage class from very poorly drained to well drained. It enters the northeast corner of the Project Area near the intersection of Windsorville Road and Wapping Road to flow south then west to pass under a State of Connecticut Railroad Bridge. The stream continues to flow west then southwest along the Project Area property limits before leaving the Project Area to cross under Rye Street and enter the Scantic River. Well drained and moderately well drained soils within the delineation are formed in recent (Holocene) alluvium and are subject to regulation under the Connecticut Inland Wetlands and Watercourse Act. These alluvial soils also contact low terraces formed during deglaciation and more recent colluvium where near vertical terrace escarpments collapsed and splayed material into the floodplain. Past development in floodplain soils include unimproved dirt logging roads that are now abandoned.

The delineation between Flags 5-348B to 5-355B includes buried wetland soils covered by a mantle of recent sediment washed out from a gravel mining operation. The extent of buried wetland soil was delineated by hand digging test holes and probing with a soil auger. This area may require mitigation and the source of the sediment should be addressed.

The northern most segment of Ketch Brook is characterized by the presence of several small beaver impoundments generally two to four feet in height. High-water flows around these beaver dams have scoured new channels in the floodplain. The middle and lower segments of the floodplain have suffered severe damage from the illicit operation of all-terrain vehicles that have torn ups stream banks and ripped up alluvial soils and faces of terrace escarpments that confine the floodplain. Recent Spring 2020 observations during storm events revealed high turbidity levels in Ketch Brook due to the presence of these exposed soils.

The cold water habitat in Ketch Brook includes stretches of gravel bottom stream suitable for trout spawning. Undercut banks, pools and riffles, and woody debris provide potentially high quality finfish habitat.

The southernmost segment of the Ketch Brook floodplain includes an abandoned backwater channel (or

Wetland Delineation Field Form (Cont.)

"oxbow" which functions as a vernal pool. This feature is fed by a hillside spring down gradient of Wetland 6.

Nearly the entire run of Ketch Brook through the Project Site is bounded by steep sand and gravel terraces. According to The Inland Wetland and Watercourses Regulations of the Town of East Windsor (IWW Regulations) "*Terrace Escarpment*" *means steeply sloping lands denoted under the general soil classifications units Te, Tc, Tg in the Hartford County Soil of the Soil Conservation Service, U.S.D.A*. In the Soil Survey of Hartford County, Connecticut (SCS, 1962) the 37E map unit was mapped as Tg, a gravelly terrace escarpment.

Section 6.1 of the IWW Regulations define regulated activity as: *The Agency shall regulate any operation or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetlands or watercourses, and any earth-moving, grubbing land, filling, construction, or clear-cutting within one-hundred fifty (150) feet of an upland review area that borders a wetland and/or watercourse, and on terrace escarpment soils adjacent to a wetland, watercourse or upland review area.*

This means the regulated area around Wetland 1 consists of the 150 foot dimensional off-set from the flagged wetland edge plus the portion of the 37E unit that is adjacent to this wetland or upland review area. Adjacent would seemingly indicate that part of the escarpment draining to the wetland.

Verified vernal pool 3 (see separately bound Vernal Pool Report) within Wetland 1 receives additional protection from the IWW Regulations Section 7.5.n. which instructs: *The site plan shall show any potential vernal pools on the affected portion of the proposed property along with a written evaluation as to the quality of the vernal pool and probable effect of the development on the vernal pool(s) conducted by a certified wildlife scientist, professional wetland scientist or similar qualified individual (as determined by the Commission).*

1. A buffer of 100 feet of non-disturbance shall be incorporated into the site plans when a vernal pool is identified. This non-disturbance area can be adjusted at the approval of the Commission based upon evidence of vernal pool quality by an expert.
2. No piped stormwater system shall discharge into a vernal pool.

Wetland Delineation Field Form

Project Address:	Plantation Road, East Windsor, CT	Project Number:	42569
Inspection Date:	11/5/2019	Inspector:	Jeffrey Peterson, CPSS
Wetland I.D.:	Wetland 2		

Field Conditions:	Weather: Clear 30s	Snow Depth: 0 inch
	General Soil Moisture: moist	Frost Depth: 0 inch

Type of Wetland Delineation:	Connecticut ☒
	ACOE ☐
	Tidal ☐
Field Numbering Sequence: WF	

WETLAND HYDROLOGY:

NONTIDAL

Intermittently Flooded ☐	Artificially Flooded ☐	Permanently Flooded ☐
Semipermanently Flooded ☐	Seasonally Flooded ☐	Temporarily Flooded ☐
Permanently Saturated ☐	Seasonally Saturated – seepage ☒	Seasonally Saturated - perched ☐
Comments: Wetland 2 is a discharge wetland located at the bottom of a terrace escarpment. It is separated from the floodplain of Ketch Brook by a large sediment plume deposited below Intermittent Watercourse-1.		

TIDAL

Subtidal ☐	Regularly Flooded ☐	Irregularly Flooded ☐
Irregularly Flooded ☐		
Comments: N/A		

WETLAND TYPE:

SYSTEM:

Estuarine ☐	Riverine ☐	Palustrine ☒
Lacustrine ☐	Marine ☐	
Comments:		

CLASS:

Emergent ☐	Scrub-shrub ☒	Forested ☒
Open Water ☐	Disturbed ☐	Wet Meadow ☐
Comments:.		

WATERCOURSE TYPE:

Perennial ☐	Intermittent ☒	Tidal ☐
Comments:		

SPECIAL AQUATIC HABITAT:

Vernal Pool ☐	Other ☐	
Comments: NA		

Wetland Delineation Field Form (Cont.)

MAPPED SOILS:

SOIL SERIES (Map Unit Symbol)	WET	UP	NRCS MAPPED	FIELD IDD/ CONFIRMED
Raypol silt loam (12)	☒	☐	☒	☒
Manchester gravelly sandy loam, 15 to 45 percent slope (37E)	☐	☒	☒	☒

DOMINANT WETLAND PLANTS:

Red maple (*Acer rubrum*)	Spicebush (*Lindera benzoin)*)
Sycamore (*Platanus occidentalis*)	Multiflora rose (*Rosa multiflora*)
Green ash (*Fraxinus pennsylvanica*)	
	Skunk cabbage (*Symplocarpus foetidus*)
	Jewelweed (*Impatiens capensis*)

WETLAND NARRATIVE:

Wetland 2 is part of a low terrace above the floodplain of Ketch Brook. It is bounded to the west by the steep terrace escarpment which separates the farmed terraces perched above the valley bottom. Only a small part of this unit is within the property limits of the Project.

According to The Inland Wetland and Watercourses Regulations of the Town of East Windsor (IWW Regulations) "*Terrace Escarpment*" *means steeply sloping lands denoted under the general soil classifications units Te, Tc, Tg in the Hartford County Soil of the Soil Conservation Service, U.S.D.A*. In the Soil Survey of Hartford County, Connecticut (SCS, 1962) the 37E map unit was mapped as Tg, a gravelly terrace escarpment.

Section 6.1 of the IWW Regulations define regulated activity as: *The Agency shall regulate any operation or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetlands or watercourses, and any earth-moving, grubbing land, filling, construction, or clear-cutting within one-hundred fifty (150) feet of an upland review area that borders a wetland and/or watercourse, and on terrace escarpment soils adjacent to a wetland, watercourse or upland review area.*

This means the regulated area around Wetlands 2 consists of the 150 foot dimensional off-set from the flagged wetland edge plus the portion of the 37E unit that is adjacent to this wetland. Adjacent would seemingly indicate that part of the escarpment draining to the wetland.

Wetland Delineation Field Form

Project Address:	Plantation Road, East Windsor, CT	Project Number:	42569
Inspection Date:	11/5/2019	Inspector:	Jeffrey Peterson, CPSS
Wetland I.D.:	Wetlands 3, 4, and 5		

Field Conditions:	Weather: Clear 30s	Snow Depth: 0 inch
	General Soil Moisture: moist	Frost Depth: 0 inch

Type of Wetland Delineation:	Connecticut ☒
	ACOE ☐
	Tidal ☐

Field Numbering Sequence: WF 3-100 to 3-126, 4-100 to 4-110, 5-100 to 5-107

WETLAND HYDROLOGY:

NONTIDAL

Intermittently Flooded ☐	Artificially Flooded ☐	Permanently Flooded ☐
Semipermanently Flooded ☐	Seasonally Flooded ☐	Temporarily Flooded ☐
Permanently Saturated ☐	Seasonally Saturated – seepage ☒	Seasonally Saturated - perched ☒
Comments: Wetlands 3, 4, and 5 are formed on slopes below a terrace where perched groundwater is intercepted. They feed into a large drainage valley first cut during deglaciation and continuing cut into the terrace. Each wetland drains into Intermittent Watercourse-1		

TIDAL

Subtidal ☐	Regularly Flooded ☐	Irregularly Flooded ☐
Irregularly Flooded ☐		
Comments: N/A		

WETLAND TYPE:

SYSTEM:

Estuarine ☐	Riverine ☐	Palustrine ☒
Lacustrine ☐	Marine ☐	
Comments:		

CLASS:

Emergent ☐	Scrub-shrub ☒	Forested ☒
Open Water ☐	Disturbed ☐	Wet Meadow ☐
Comments: Watercourse rarely flows through segments eroded into sand deposits.		

WATERCOURSE TYPE:

Perennial ☐	Intermittent ☒	Tidal ☐
Comments:		

SPECIAL AQUATIC HABITAT:

Vernal Pool ☐	Other ☐	
Comments: NA		

Wetland Delineation Field Form (Cont.)

MAPPED SOILS:

SOIL SERIES (Map Unit Symbol)	WET	UP	NRCS MAPPED	FIELD IDD/ CONFIRMED
Enfield silt loam, 3 to 8 percent slopes (704B)	☐	☒	☒	☒
Manchester gravelly sandy loam, 15 to 45 percent slope (37E)	☐	☒	☒	☒
Raypol silt loam (12)	☒	☐	☐	☒

DOMINANT WETLAND PLANTS:

Red maple (*Acer rubrum*)	Jewelweed (*Impatiens capensis*)
Umbrella tree (*Magnolia tripetala*) (Wetland 3 only)	
Spicebush (*Lindera benzoin)*)	
Multiflora rose (*Rosa multiflora*)	

WETLAND NARRATIVE:

These small discharge wetlands form where water held above clay-rich glacio-lacustral deposits breaks out near the top of a terrace escarpment. Each of these three wetlands drains to the same large swale carved into the outwash terrace and underlying glacial lakebed deposits. Each of these wetlands act as discharge sites and the intermittent watercourse as a recharge site as it travels over rapidly permeable sands and gravel. Flows from these wetlands rarely make it all the way down to the Ketch Brook floodplain.

According to The Inland Wetland and Watercourses Regulations of the Town of East Windsor (IWW Regulations) "*Terrace Escarpment*" *means steeply sloping lands denoted under the general soil classifications units Te, Tc, Tg in the Hartford County Soil of the Soil Conservation Service, U.S.D.A*. In the Soil Survey of Hartford County, Connecticut (SCS, 1962) the 37E map unit was mapped as Tg, a gravelly terrace escarpment.

Section 6.1 of the IWW Regulations define regulated activity as: *The Agency shall regulate any operation or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetlands or watercourses, and any earth-moving, grubbing land, filling, construction, or clear-cutting within one-hundred fifty (150) feet of an upland review area that borders a wetland and/or watercourse, and on terrace escarpment soils adjacent to a wetland, watercourse or upland review area.*

This means the regulated area around Wetlands 3, 4, and 5 consists of the 150 foot dimensional off-set from the flagged wetland edge plus the portion of the 37E unit that is adjacent to this wetland. Adjacent would seemingly indicate that part of the escarpment draining to the wetland.

Wetland Delineation Field Form

Project Address:	Plantation Road, East Windsor, CT	Project Number:	42569
Inspection Date:	11/5/2019	Inspector:	Jeffrey Peterson, CPSS
Wetland I.D.:	Wetland 6		

Field Conditions:	Weather: Clear 30s	Snow Depth: 0 inch
	General Soil Moisture: moist	Frost Depth: 0 inch
Type of Wetland Delineation:	Connecticut ☒	
	ACOE ☐	
	Tidal ☐	
Field Numbering Sequence: WF 6-100 to 6-142		

WETLAND HYDROLOGY:

NONTIDAL

Intermittently Flooded ☐	Artificially Flooded ☐	Permanently Flooded ☐
Semipermanently Flooded ☐	Seasonally Inundated ☒	Temporarily Flooded ☐
Permanently Saturated ☐	Seasonally Saturated – seepage ☐	Seasonally Saturated - perched ☒
Comments: Wetland 6 is a broad depression formed in a terrace of ice-contact stratified drift.		

TIDAL

Subtidal ☐	Regularly Flooded ☐	Irregularly Flooded ☐
Irregularly Flooded ☐		
Comments: N/A		

WETLAND TYPE:

SYSTEM:

Estuarine ☐	Riverine ☐	Palustrine ☒
Lacustrine ☐	Marine ☐	
Comments:		

CLASS:

Emergent ☐	Scrub-shrub ☐	Forested ☒
Open Water ☐	Disturbed ☐	Wet Meadow ☐
Comments: Several recent tree throws.		

WATERCOURSE TYPE:

Perennial ☐	Intermittent ☐	Tidal ☐
Comments: NA		

SPECIAL AQUATIC HABITAT:

Vernal Pool ☒	Other ☐	
Comments: Two small vernal pools were identified within this wetland.		

Wetland Delineation Field Form (Cont.)

MAPPED SOILS:

SOIL SERIES (Map Unit Symbol)	WET	UP	NRCS MAPPED	FIELD IDD/ CONFIRMED
Manchester gravelly sandy loam, 15 to 45 percent slope (37E)	☐	☒	☒	☒
Raypol silt loam (12)	☒	☐	☐	☒
Scarboro muck, 0 to 3 percent slope (15)	☒	☐	☐	☒

DOMINANT WETLAND PLANTS:

Red maple (*Acer rubrum*)	Spicebush (*Lindera benzoin*)
White pine (*Pinus strobus*)	
	Cinnamon fern (*Osmundastrum cinnamomeum*)
Highbush blueberry (*Vaccinium corymbosum*)	
Winterberry (*Ilex verticillata*)	

WETLAND NARRATIVE:

Wetland 6 occupies a depression in a pitted, ice-contact outwash plain. Vernal pool indicators were observed in two depressions within the wetland that held water in the spring. The wetland is a dissimilar inclusion in the Manchester gravelly sandy loam map unit (37E).

According to The Inland Wetland and Watercourses Regulations of the Town of East Windsor (IWW Regulations) "*Terrace Escarpment*" *means steeply sloping lands denoted under the general soil classifications units Te, Tc, Tg in the Hartford County Soil of the Soil Conservation Service, U.S.D.A*. In the Soil Survey of Hartford County, Connecticut (SCS, 1962) the 37E map unit was mapped as Tg, a gravelly terrace escarpment.

Section 6.1 of the IWW Regulations define regulated activity as: *The Agency shall regulate any operation or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetlands or watercourses, and any earth-moving, grubbing land, filling, construction, or clear-cutting within one-hundred fifty (150) feet of an upland review area that borders a wetland and/or watercourse, and on terrace escarpment soils adjacent to a wetland, watercourse or upland review area.*

This means the regulated area around Wetland 6 consists of the 150 foot dimensional off-set from the flagged wetland edge plus the portion of the 37E unit that is adjacent to this wetland. Adjacent would seemingly indicate draining to the wetland.

Verified vernal pools 4 and 5 (see separately bound Vernal Pool Report) within Wetland 6 receive additional protection from IWW Regulations Section 7.5.n. which instructs: *The site plan shall show any potential vernal pools on the affected portion of the proposed property along with a written evaluation as to the quality of the vernal pool and probable effect of the development on the vernal pool(s) conducted by a certified wildlife scientist, professional wetland scientist or similar qualified individual (as determined by the Commission).*
1. A buffer of 100 feet of non-disturbance shall be incorporated into the site plans when a vernal pool is identified. This non-disturbance area can be adjusted at the approval of the Commission based upon evidence of vernal pool quality by an expert.
2. No piped stormwater system shall discharge into a vernal pool.

Wetland Delineation Field Form

Project Address:	Plantation Road, East Windsor, CT	Project Number:	42569
Inspection Date:	11/5/2019	Inspector:	Jeffrey Peterson, CPSS
Wetland I.D.:	Wetland 7		

Field Conditions:	Weather: Clear 30s	Snow Depth: 0 inch
	General Soil Moisture: moist	Frost Depth: 0 inch
Type of Wetland Delineation:	Connecticut ☒	
	ACOE ☐	
	Tidal ☐	
Field Numbering Sequence: WF 7-100 to 7-104		

WETLAND HYDROLOGY:

NONTIDAL

Intermittently Flooded ☐	Artificially Flooded ☐	Permanently Flooded ☐
Semipermanently Flooded ☐	Seasonally Flooded ☐	Temporarily Flooded ☐
Permanently Saturated ☐	Seasonally Saturated – seepage ☐	Seasonally Saturated - perched ☒
Comments: Wetland 7 is a kettle hole depression in ice-contact stratified drift.		

TIDAL

Subtidal ☐	Regularly Flooded ☐	Irregularly Flooded ☐
Irregularly Flooded ☐		
Comments: N/A		

WETLAND TYPE:

SYSTEM:

Estuarine ☐	Riverine ☐	Palustrine ☒
Lacustrine ☐	Marine ☐	
Comments:		

CLASS:

Emergent ☐	Scrub-shrub ☐	Forested ☒
Open Water ☐	Disturbed ☐	Wet Meadow ☐
Comments: Several recent tree throws.		

WATERCOURSE TYPE:

Perennial ☐	Intermittent ☐	Tidal ☐
Comments: NA		

SPECIAL AQUATIC HABITAT:

Vernal Pool ☐	Other ☐	
Comments: NA		

Wetland Delineation Field Form (Cont.)

MAPPED SOILS:

SOIL SERIES (Map Unit Symbol)	WET	UP	NRCS MAPPED	FIELD IDD/ CONFIRMED
Manchester gravelly sandy loam, 15 to 45 percent slope (37E)	☐	☒	☒	☒
Raypol silt loam (12)	☒	☐	☐	☒

DOMINANT WETLAND PLANTS:

Red maple (*Acer rubrum*)	
White pine (*Pinus strobus*)	
Highbush blueberry (*Vaccinium corymbosum*)	

WETLAND NARRATIVE:

This very small wetland is seasonally wet but does not hold sufficient water to a depth suitable and long enough period to function as a vernal pool. An ATV trail runs through the middle of the feature.

According to The Inland Wetland and Watercourses Regulations of the Town of East Windsor (IWW Regulations) "*Terrace Escarpment*" *means steeply sloping lands denoted under the general soil classifications units Te, Tc, Tg in the Hartford County Soil of the Soil Conservation Service, U.S.D.A*. In the Soil Survey of Hartford County, Connecticut (SCS, 1962) the 37E map unit was mapped as Tg, a gravelly terrace escarpment.

Section 6.1 of the IWW Regulations define regulated activity as: *The Agency shall regulate any operation or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetlands or watercourses, and any earth-moving, grubbing land, filling, construction, or clear-cutting within one-hundred fifty (150) feet of an upland review area that borders a wetland and/or watercourse, and on terrace escarpment soils adjacent to a wetland, watercourse or upland review area.*

This means the regulated area around Wetland 7 consists of the 150 foot dimensional off-set from the flagged wetland edge plus the portion of the 37E unit that is adjacent to this wetland. Adjacent would seemingly indicate draining to the wetland.

Wetland Delineation Field Form

Project Address:	Plantation Road, East Windsor, CT	Project Number:	42569
Inspection Date:	11/5/2019	Inspector:	Jeffrey Peterson, CPSS
Wetland I.D.:	Wetland 8		

Field Conditions:	Weather: Clear 30s	Snow Depth: 0
	General Soil Moisture: moist	Frost Depth: 0 inch
Type of Wetland Delineation:	Connecticut ☒	
	ACOE ☐	
	Tidal ☐	
Field Numbering Sequence: WF 8-100 to 8-113		

WETLAND HYDROLOGY:

NONTIDAL

Intermittently Flooded ☐	Artificially Flooded ☐	Permanently Flooded ☐
Semipermanently Flooded ☐	Seasonally Inundated ☒	Temporarily Flooded ☐
Permanently Saturated ☒	Seasonally Saturated – seepage ☒	Seasonally Saturated - perched ☐
Comments: Wetland 8 is a classic kettle hole wetland formed in ice-contact stratified drift.		

TIDAL

Subtidal ☐	Regularly Flooded ☐	Irregularly Flooded ☐
Irregularly Flooded ☐		
Comments: N/A		

WETLAND TYPE:

SYSTEM:

Estuarine ☐	Riverine ☐	Palustrine ☒
Lacustrine ☐	Marine ☐	
Comments: Wetland has no inlet or outlet		

CLASS:

Emergent ☐	Scrub-shrub ☐	Forested ☒
Open Water ☒	Disturbed ☐	Wet Meadow ☐
Comments: Most of the wetland is forested.		

WATERCOURSE TYPE:

Perennial ☐	Intermittent ☐	Tidal ☐
Comments: NA		

SPECIAL AQUATIC HABITAT:

Vernal Pool ☒	Other ☐	
Comments: Classic vernal pool with amphibian and invertebrate obligate species present.		

Wetland Delineation Field Form (Cont.)

MAPPED SOILS:

SOIL SERIES (Map Unit Symbol)	WET	UP	NRCS MAPPED	FIELD IDD/ CONFIRMED
Manchester gravelly sandy loam, 15 to 45 percent slope (37E)	☐	☒	☒	☒
Raypol silt loam (12)	☒	☐	☐	☒
Scarboro muck, 0 to 3 percent slopes (15)	☒	☐	☐	☒

DOMINANT WETLAND PLANTS:

Red maple (*Acer rubrum*)	
White pine (*Pinus strobus*)	
Pin oak (*Quercus palustris*)	Cinnamon fern (*Osmundastrum cinnamomeum*)
Eastern Hemlock (*Tsuga canadensis*)	Sensitive fern (*Onoclea sensibilis*)
Winterberry (*Ilex verticillata*)	

WETLAND NARRATIVE:

Wetland 8 is formed in a kettle hole depression underlain by an impervious layer, perhaps glaciolacustral silts and clays deposited in Glacial Lake Hitchcock. Several similar kettle holes in the same ice-contact stratified drift field on the terrace above Ketch Brook did not support wetlands. Slopes above the pool elevation act to discharge groundwater and are similar to the Raypol or Walpole series.

Wetland 8 occupies the bottom of a kettle hole. This wetland is a dissimilar inclusion in a Manchester gravelly sandy loam, 15 to 45 percent slopes map unit (37E). The wetland does not have an inlet or outlet. The wetland is disturbed by an illicit all-terrain vehicle trail south of the pool.

According to The Inland Wetland and Watercourses Regulations of the Town of East Windsor (IWW Regulations) "*Terrace Escarpment*" *means steeply sloping lands denoted under the general soil classifications units Te, Tc, Tg in the Hartford County Soil of the Soil Conservation Service, U.S.D.A*. In the Soil Survey of Hartford County, Connecticut (SCS, 1962) the 37E map unit was mapped as Tg, a gravelly terrace escarpment.

Section 6.1 of the IW Regulations define regulated activity as: *The Agency shall regulate any operation or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetlands or watercourses, and any earth-moving, grubbing land, filling, construction, or clear-cutting within one-hundred fifty (150) feet of an upland review area that borders a wetland and/or watercourse, and on terrace escarpment soils adjacent to a wetland, watercourse or upland review area.*

This means the regulated area around Wetland 8 consists of the 150 foot dimensional off-set from the flagged wetland edge plus the portion of the 37E unit that is adjacent to this wetland or the 150 foot upland review area. Adjacent would seemingly indicate draining to the wetland.

Wetland 8 is a verified vernal pool (see separately bound Vernal Pool Report) and receives additional protection from IWW Regulations Section 7.5.n. which instructs: *The site plan shall show any potential vernal pools on the affected portion of the proposed property along with a written evaluation as to the quality of the vernal pool and probable effect of the development on the vernal pool(s) conducted by a certified wildlife scientist, professional wetland scientist or similar qualified individual (as determined by the Commission).*
1. A buffer of 100 feet of non-disturbance shall be incorporated into the site plans when a vernal pool is identified. This non-disturbance area can be adjusted at the approval of the Commission based upon evidence of vernal pool quality by an expert.
2. No piped stormwater system shall discharge into a vernal pool.

Wetland Delineation Field Form

Project Address:	Plantation Road, East Windsor, CT	Project Number:	42569
Inspection Date:	11/13/2019	Inspector:	Jeffrey Peterson, CPSS
Wetland I.D.:	Wetland 9		

Field Conditions:	Weather: Clear 30s	Snow Depth: 0 inches
	General Soil Moisture: moist	Frost Depth: 0 inch
Type of Wetland Delineation:	Connecticut ☒	
	ACOE ☐	
	Tidal ☐	
Field Numbering Sequence: WF 5-600 to 5-623		

WETLAND HYDROLOGY:

NONTIDAL

Intermittently Flooded ☐	Artificially Flooded ☐	Permanently Flooded ☐
Semipermanently Inundated ☒	Seasonally Flooded ☐	Temporarily Flooded ☐
Permanently Saturated ☐	Seasonally Saturated – seepage ☒	Seasonally Saturated - perched ☐
Comments: Wetland 9 is a sediment control basin constructed for a closed landfill on an adjacent property.		

TIDAL

Subtidal ☐	Regularly Flooded ☐	Irregularly Flooded ☐
Irregularly Flooded ☐		
Comments: N/A		

WETLAND TYPE:

SYSTEM:

Estuarine ☐	Riverine ☐	Palustrine ☒
Lacustrine ☐	Marine ☐	
Comments: Artificial impoundment within the floodplain of Ketch Brook		

CLASS:

Emergent ☒	Scrub-shrub ☐	Forested ☐
Open Water ☐	Disturbed ☒	Wet Meadow ☒
Comments:		

WATERCOURSE TYPE:

Perennial ☐	Intermittent ☒	Tidal ☐
Comments: This wetland is fed by an off-site intermittent watercourse that conveys runoff from an adjacent gravel pit haul roads and State of Connecticut railroad line. Outfall is within Ketch Brook floodplain.		

SPECIAL AQUATIC HABITAT:

Vernal Pool ☐	Other ☐	
Comments: An investigation of the waters in the basin did not find any obligate vernal pool species present.		

Wetland Delineation Field Form (Cont.)

MAPPED SOILS:

SOIL SERIES (Map Unit Symbol)	WET	UP	NRCS MAPPED	FIELD IDD/ CONFIRMED
Walpole sandy loam, 0 to 3 percent slopes (13)	☒	☐	☐	☒
Udorthents-Pits complex gravelly (305)	☐	☒	☒	☒
Fluvaquents-Udifluvents complex, frequently flooded (109)	☒	☐	☒	☒
Manchester gravelly sandy loam, 15 to 45 percent slope	☐	☒	☒	☒

DOMINANT WETLAND PLANTS:

Multiflora rose (*Rosa multiflora*)	Cattail (*Typha latifolia*)
Willow species (*Salix* sp.)	Climbing false buckwheat (*Polygonum scandens*)

WETLAND NARRATIVE:

This wetland was constructed as a sediment basin for the adjacent closed landfill. It is isolated from the adjacent Ketch Brook floodplain by an earthen berm. The basin continues to detain water and discharges out onto the floodplain by a hard pipe structure.

Wetland Delineation Field Form

Project Address:	Plantation Road, East Windsor, CT	Project Number:	42569
Inspection Date:	11/13/2019	Inspector:	Jeffrey Peterson, CPSS
Wetland I.D.:	Wetland 10		

Field Conditions:	Weather: Clear 30s	Snow Depth: 0 inch
	General Soil Moisture: moist	Frost Depth: 0 inch
Type of Wetland Delineation:	Connecticut ☒	
	ACOE ☐	
	Tidal ☐	
Field Numbering Sequence: 3-100 to 3-109		

WETLAND HYDROLOGY:

NONTIDAL

Intermittently Flooded ☐	Artificially Flooded ☐	Permanently Flooded ☐
Semipermanently Flooded ☐	Seasonally Flooded ☐	Temporarily Inundated ☒
Permanently Saturated ☐	Seasonally Saturated – seepage ☐	Seasonally Saturated - perched ☒
Comments: Wetland 10 is a depressional wetland at the edge of a farm field. It is visible in aerial photos dating back to 2006. In may have been created by compaction of the silt loam solum by farm equipment.		

TIDAL

Subtidal ☐	Regularly Flooded ☐	Irregularly Flooded ☐
Irregularly Flooded ☐		
Comments: N/A		

WETLAND TYPE:

SYSTEM:

Estuarine ☐	Riverine ☐	Palustrine ☒
Lacustrine ☐	Marine ☐	
Comments: Perched wetland in a depression underlain by a thick layer outwash sand without a water table.		

CLASS:

Emergent ☒	Scrub-shrub ☐	Forested ☐
Open Water ☐	Disturbed ☐	Wet Meadow ☐
Comments: Heavily rutted by illicit ATV operation, possibly plowed in drier years.		

WATERCOURSE TYPE:

Perennial ☐	Intermittent ☐	Tidal ☐
Comments: NA		

SPECIAL AQUATIC HABITAT:

Vernal Pool ☐	Other ☐	
Comments: Over wintering green frog larvae observed in early March 2020 most dead by mid-April.		

Wetland Delineation Field Form (Cont.)

MAPPED SOILS:

SOIL SERIES (Map Unit Symbol)	WET	UP	NRCS MAPPED	FIELD IDD/ CONFIRMED
Hartford sandy loam, 3 to 8 percent slopes (33B)	☐	☒	☒	☒
Raypol silt loam (12)	☒	☐	☐	☒
Enfield silt loam, 0 to 3 percent slopes (704A)	☐	☒	☒	☒

DOMINANT WETLAND PLANTS:

Woolgrass (*Scirpus cyperinus*)	
Soft rush (*Juncus effusus*)	
Cattail (*Typha latifolia*)	

WETLAND NARRATIVE:

Wetland 10 is a depression within an agricultural field. As evidenced by the absence of a water table in the adjacent gravel pit, the wetland retains water in the compacted silt loam solum. Soils within this wetland had strong hydromorphic development including prominent redox concentrations on a low chroma (depleted) matrix. The soil is similar to the Raypol series. The hydrologic support of this wetland may come from the slopes of an adjacent closed landfill. A review of publicly available aerial imagery shows the landfill active in April 1990 and closed and vegetated in August 2003.

Wetland Delineation Field Form

Project Address:	Windsorville Road & Apothecaries Hall Road, East Windsor, CT	Project Number:	42569
Inspection Date:	11/13/2020	Inspector:	Jeffrey Peterson, CPSS
Wetland I.D.:	Wetland 11		

Field Conditions:	Weather: Clear 40s	Snow Depth: 0 inches
	General Soil Moisture: moist	Frost Depth: 0 inches

Type of Wetland Delineation:	Connecticut ☒
	ACOE ☐
	Tidal ☐
Field Numbering Sequence: 2-100 to 2-112	

WETLAND HYDROLOGY:

NONTIDAL

Intermittently Flooded ☐	Artificially Flooded ☐	Permanently Flooded ☐
Semipermanently Flooded ☐	Seasonally Inundated ☒	Temporarily Flooded ☐
Permanently Saturated ☐	Seasonally Saturated – seepage ☒	Seasonally Saturated - perched ☐
Comments: Depression created between cut slope and fill slope		

TIDAL

Subtidal ☐	Regularly Flooded ☐	Irregularly Flooded ☐
Irregularly Flooded ☐		
Comments: N/A		

WETLAND TYPE:
SYSTEM:

Estuarine ☐	Riverine ☐	Palustrine ☒
Lacustrine ☐	Marine ☐	
Comments:		

CLASS:

Emergent ☐	Scrub-shrub ☒	Forested ☐
Open Water ☐	Disturbed ☐	Wet Meadow ☐
Comments: Willow.		

WATERCOURSE TYPE:

Perennial	Intermittent ☐	Tidal ☐
Comments: NA		

SPECIAL AQUATIC HABITAT:

Vernal Pool ☐	Other ☐	
Comments: Only midge, mosquito and caddisfly larvae observed in central pool. A hatch of midges observed in April 2020 attracted a pair of eastern phoebe.		

Wetland Delineation Field Form (Cont.)

MAPPED SOILS:

SOIL SERIES (Map Unit Symbol)	WET	UP	NRCS MAPPED	FIELD IDD/ CONFIRMED
Raypol silt loam (12)	☒	☐	☐	☒
Enfield silt loam, 0 to 3 percent slopes (704A)	☐	☒	☒	☒
Manchester gravelly sandy loam, 15 to 45 percent slopes (37E)	☐	☒	☒	☒
Udorthents-pits complex (305)	☐	☒	☐	☒

DOMINANT WETLAND PLANTS:

Willow (*Salix* sp.)	Sensitive fern (*Onoclea sensibilis*)
Multiflora rose (*Rosa multiflora*)	Common reed (*Phragmites australis*)
Silky dogwood (*Cornus amomum*)	

WETLAND NARRATIVE:

Wetland 11 was created as part of the Charbonneau Gravel Pit reclamation. The wetland is situated in a depression created when fill installed the close the gravel operation was pushed up against the face of the original excavation. Based on a review of aerial photographs, Wetland 11 was first visible in 2008 and has been undisturbed since. This wetland provides groundwater recharge and limited production export.

According to The Inland Wetland and Watercourses Regulations of the Town of East Windsor (IWW Regulations) "Terrace Escarpment" means steeply sloping lands denoted under the general soil classifications units Te, Tc, Tg in the Hartford County Soil of the Soil Conservation Service, U.S.D.A. In the Soil Survey of Hartford County, Connecticut (SCS, 1962) the 37E map unit was mapped as Tg, a gravelly terrace escarpment.

Section 6.1 of the IWW Regulations define regulated activity as: *The Agency shall regulate any operation or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetlands or watercourses, and any earth-moving, grubbing land, filling, construction, or clear-cutting within one-hundred fifty (150) feet of an upland review area that borders a wetland and/or watercourse, and on terrace escarpment soils adjacent to a wetland, watercourse or upland review area.*

This means the regulated area around Wetland 11 consists of the 150 foot dimensional off-set from the flagged wetland edge plus the portion of the 37E unit that is adjacent to this wetland. Adjacent would seemingly indicate draining to the wetland.

Wetland Delineation Field Form

Project Address:	Plantation Road, East Windsor, CT	Project Number:	42569
Inspection Date:	11/13/2020	Inspector:	Jeffrey Peterson, CPSS
Wetland I.D.:	Wetland 12		

Field Conditions:	Weather: Clear 30s	Snow Depth: 0 inches
	General Soil Moisture: moist	Frost Depth: 0 inches
Type of Wetland Delineation:	Connecticut ☒	
	ACOE ☐	
	Tidal ☐	
Field Numbering Sequence: 2-100 to 2-124		

WETLAND HYDROLOGY:

NONTIDAL

Intermittently Flooded ☐	Artificially Flooded ☐	Permanently Flooded ☐
Semipermanently Flooded ☐	Seasonally Inundated ☒	Temporarily Flooded ☐
Permanently Saturated ☐	Seasonally Saturated – seepage ☒	Seasonally Saturated - perched ☐
Comments: Depression next to railroad fill section		

TIDAL

Subtidal ☐	Regularly Flooded ☐	Irregularly Flooded ☐
Irregularly Flooded ☐		
Comments: N/A		

WETLAND TYPE:

SYSTEM:

Estuarine ☐	Riverine ☐	Palustrine ☒
Lacustrine ☐	Marine ☐	
Comments: Low point near railroad fill section		

CLASS:

Emergent ☐	Scrub-shrub ☒	Forested ☒
Open Water ☐	Disturbed ☐	Wet Meadow ☐
Comments: Shrub dominated area near railroad track		

WATERCOURSE TYPE:

Perennial	Intermittent ☐	Tidal ☐
Comments: NA		

SPECIAL AQUATIC HABITAT:

Vernal Pool ☒	Other ☐	
Comments: Water ponds in the northern part of the wetland.		

Wetland Delineation Field Form (Cont.)

MAPPED SOILS:

SOIL SERIES (Map Unit Symbol)	WET	UP	NRCS MAPPED	FIELD IDD/ CONFIRMED
Raypol silt loam, 0 to 3 percent slopes (12)	☒	☐	☐	☒
Scarboro muck, 0 to 3 percent slopes (15)	☒	☐	☐	☒
Ellington silt loam, 0 to 5 percent slopes (20A)	☐	☒	☐	☐
Hartford sandy loam, 3 to 8 percent slopes (33B)	☐	☒	☒	☒

DOMINANT WETLAND PLANTS:

Red maple (*Acer rubrum*)	Royal fern (*Osmunda regalis*)
	Poison ivy (*Toxicodendron radicans*)
Spicebush (*Lindera benzoin*)	Jewelweed (*Impatiens capensis*)
Buttonbush (*Cephalanthus occidentalis*)	
Multiflora rose (*Rosa multiflora*)	

WETLAND NARRATIVE:

Wetlands 12 occupies a depression adjacent to the fill section of the State of Connecticut railroad line. This wetland also functions as a vernal pool. These wetland depressions trap sediment generated in uplands including the railroad embankment and recharge the groundwater.

According to The Inland Wetland and Watercourses Regulations of the Town of East Windsor (IWW Regulations) "Terrace Escarpment" means steeply sloping lands denoted under the general soil classifications units Te, Tc, Tg in the Hartford County Soil of the Soil Conservation Service, U.S.D.A. In the Soil Survey of Hartford County, Connecticut (SCS, 1962) the 37E map unit was mapped as Tg, a gravelly terrace escarpment.

Section 6.1 of the IWW Regulations define regulated activity as: *The Agency shall regulate any operation or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetlands or watercourses, and any earth-moving, grubbing land, filling, construction, or clear-cutting within one-hundred fifty (150) feet of an upland review area that borders a wetland and/or watercourse, and on terrace escarpment soils adjacent to a wetland, watercourse or upland review area.*

This means the regulated area around Wetland 12 consists of the 150 foot dimensional off-set from the flagged wetland edge plus the portion of the 37E unit that is adjacent to this wetland. Adjacent would seemingly indicate draining to the wetland.

Wetland 12 is a verified vernal pool (see separately bound Vernal Pool Report) and receives additional protection from IWW Regulations Section 7.5.n. which instructs: *The site plan shall show any potential vernal pools on the affected portion of the proposed property along with a written evaluation as to the quality of the vernal pool and probable effect of the development on the vernal pool(s) conducted by a certified wildlife scientist, professional wetland scientist or similar qualified individual (as determined by the Commission).*

1. A buffer of 100 feet of non-disturbance shall be incorporated into the site plans when a vernal pool is identified. This non-disturbance area can be adjusted at the approval of the Commission based upon evidence of vernal pool quality by an expert.
2. No piped stormwater system shall discharge into a vernal pool.

Wetland Delineation Field Form

Project Address:	Plantation Road, East Windsor, CT	Project Number:	42569
Inspection Date:	11/13/2020	Inspector:	Jeffrey Peterson, CPSS
Wetland I.D.:	Wetland 13		

Field Conditions:	Weather: Clear 30s	Snow Depth: 0 inches
	General Soil Moisture: moist	Frost Depth: 0 inches
Type of Wetland Delineation:	Connecticut ☒	
	ACOE ☐	
	Tidal ☐	
Field Numbering Sequence: 1-100 to 1-109		

WETLAND HYDROLOGY:

NONTIDAL

Intermittently Flooded ☐	Artificially Flooded ☐	Permanently Flooded ☐
Semipermanently Flooded ☐	Seasonally Flooded ☐	Temporarily Flooded ☐
Permanently Saturated ☐	Seasonally Saturated – seepage ☒	Seasonally Saturated - perched ☐
Comments: Depression next to railroad fill section		

TIDAL

Subtidal ☐	Regularly Flooded ☐	Irregularly Flooded ☐
Irregularly Flooded ☐		
Comments: N/A		

WETLAND TYPE:

SYSTEM:

Estuarine ☐	Riverine ☐	Palustrine ☒
Lacustrine ☐	Marine ☐	
Comments: Low point near railroad fill section		

CLASS:

Emergent ☐	Scrub-shrub ☒	Forested ☒
Open Water ☐	Disturbed ☐	Wet Meadow ☐
Comments: Shrub dominated area near railroad track		

WATERCOURSE TYPE:

Perennial	Intermittent ☐	Tidal ☐
Comments: NA		

SPECIAL AQUATIC HABITAT:

Vernal Pool ☐	Other ☐	
Comments: No water ponds in this depression		

Wetland Delineation Field Form (Cont.)

MAPPED SOILS:

SOIL SERIES (Map Unit Symbol)	WET	UP	NRCS MAPPED	FIELD IDD/ CONFIRMED
Raypol silt loam, 0 to 3 percent slopes (12)	☒	☐	☐	☒
Scarboro muck, 0 to 3 percent slopes (15)	☒	☐	☐	☒
Ellington silt loam, 0 to 5 percent slopes (20A)	☐	☒	☐	☐
Hartford sandy loam, 3 to 8 percent slopes (33B)	☐	☒	☒	☒

DOMINANT WETLAND PLANTS:

Red maple (*Acer rubrum*)	Jewelweed (*Impatiens capensis*)
American elm (Ulmus americana)	Wood-reed grass (*Cinna latifolia*)
Red oak (*Quercus rubra*)	Skunk cabbage (*Symplocarpus foetidus*)
Spicebush (Lindera benzoin)	
Cottonwood *(Populus deltoides*)	
Silky dogwood (*Cornus amomum*)	

WETLAND NARRATIVE:

Wetlands 13 occupies a depression adjacent to the fill section of the State of Connecticut railroad line. The slopes above this depression have accumulated sediment from years of farmland erosion. This wetland depression traps sediment generated in uplands including from farm fields and the railroad embankment, transforms nutrients, and recharges the groundwater.

According to The Inland Wetland and Watercourses Regulations of the Town of East Windsor (IWW Regulations) "*Terrace Escarpment*" *means steeply sloping lands denoted under the general soil classifications units Te, Tc, Tg in the Hartford County Soil of the Soil Conservation Service, U.S.D.A*. In the Soil Survey of Hartford County, Connecticut (SCS, 1962) the 37E map unit was mapped as Tg, a gravelly terrace escarpment.

Section 6.1 of the IWW Regulations define regulated activity as: *The Agency shall regulate any operation or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetlands or watercourses, and any earth-moving, grubbing land, filling, construction, or clear-cutting within one-hundred fifty (150) feet of an upland review area that borders a wetland and/or watercourse, and on terrace escarpment soils adjacent to a wetland, watercourse or upland review area.*

This means the regulated area around Wetland 13 consists of the 150 foot dimensional off-set from the flagged wetland edge plus the portion of the 37E unit that is adjacent to this wetland. Adjacent would seemingly indicate that part of the escarpment draining to the wetland.

V

Wetland Delineation Field Form

Project Address:	Plantation Road, East Windsor, CT	Project Number:	42569
Inspection Date:	3/26/2020	Inspector:	Jeffrey Peterson, CPSS
Wetland I.D.:	Wetland 14		

Field Conditions:	Weather: Clear 40s	Snow Depth: 0 inches
	General Soil Moisture: moist	Frost Depth: 0 inches
Type of Wetland Delineation:	Connecticut ☒	
	ACOE ☐	
	Tidal ☐	
Field Numbering Sequence: WF 14-100 to 14-105		

WETLAND HYDROLOGY:

NONTIDAL

Intermittently Flooded ☐	Artificially Flooded ☐	Permanently Flooded ☐
Semipermanently Flooded ☐	Seasonally Flooded ☐	Temporarily Flooded ☐
Permanently Saturated ☐	Seasonally Saturated – seepage ☒	Seasonally Saturated - perched ☒
Comments: Depression at base of closed landfill that holds water.		

TIDAL

Subtidal ☐	Regularly Flooded ☐	Irregularly Flooded ☐
Irregularly Flooded ☐		
Comments: N/A		

WETLAND TYPE:

SYSTEM:

Estuarine ☐	Riverine ☐	Palustrine ☒
Lacustrine ☐	Marine ☐	
Comments: Wetland hydrology driven by surface runoff and discharge from landfill slope cover.		

CLASS:

Emergent ☐	Scrub-shrub ☒	Forested ☐
Open Water ☐	Disturbed ☐	Wet Meadow ☐
Comments: Red maple, willow (*Salix* sp.)		

WATERCOURSE TYPE:

Perennial	Intermittent ☐	Tidal ☐
Comments: NA		

SPECIAL AQUATIC HABITAT:

Vernal Pool ☐	Other ☐	
Comments: NA		

Wetland Delineation Field Form (Cont.)

MAPPED SOILS:

SOIL SERIES (Map Unit Symbol)	WET	UP	NRCS MAPPED	FIELD IDD/ CONFIRMED
Raypol silt loam, 0 to 3 percent slopes (12)	☒	☐	☐	☒
Hartford sandy loam, 3 to 8 percent slopes (33B)	☐	☒	☒	☒
Udorthents-pits complex, gravelly (305)	☐	☒	☒	☒

DOMINANT WETLAND PLANTS:

Red maple (*Acer rubrum*)	
Willow (*Salix* sp.)	

WETLAND NARRATIVE:

This small wetland depression may be off-site. It occupies an isolated depression at the toe of a closed landfill site. This feature was created by human alteration of the site which traps water above compacted soil layers. This wetland may trap sediment washing down from the landfill cover.

The Soil Survey Legend for Connecticut has not established series for closed landfills with caps that support plant growth. The classification of the closed landfill soil abutting Wetland 14 and 15 to family level (one level of classification above series) would likely be coarse loamy, methanogenic, mixed, mesic Anthropic Udorthents.

Wetland Delineation Field Form

Project Address:	Plantation Road, East Windsor	Project Number:	42569
Inspection Date:	3/26/2020	Inspector:	Jeffrey Peterson, CPSS
Wetland I.D.:	Wetland 15		

Field Conditions:	Weather: Clear 40s	Snow Depth: 0 inches
	General Soil Moisture: moist	Frost Depth: 0 inches
Type of Wetland Delineation:	Connecticut ☒	
	ACOE ☐	
	Tidal ☐	
Field Numbering Sequence: WF 15-91 to 15-105		

WETLAND HYDROLOGY:

NONTIDAL

Intermittently Flooded ☐	Artificially Flooded ☐	Permanently Flooded ☐
Semipermanently Flooded ☐	Seasonally Flooded ☐	Temporarily Flooded ☐
Permanently Saturated ☐	Seasonally Saturated – seepage ☒	Seasonally Saturated - perched ☐
Comments: Hydrology driven by seepage off landfill cap from Lot 027-49-006.		

TIDAL

Subtidal ☐	Regularly Flooded ☐	Irregularly Flooded ☐
Irregularly Flooded ☐		
Comments: N/A		

WETLAND TYPE:

SYSTEM:

Estuarine ☐	Riverine ☐	Palustrine ☒
Lacustrine ☐	Marine ☐	
Comments: Seepage from landfill cap flows into excavated depression before re-infiltrating into sands.		

CLASS:

Emergent ☐	Scrub-shrub ☐	Forested ☒
Open Water ☐	Disturbed ☐	Wet Meadow ☐
Comments:		

WATERCOURSE TYPE:

Perennial	Intermittent ☐	Tidal ☐
Comments: NA		

SPECIAL AQUATIC HABITAT:

Vernal Pool ☐	Other ☐	
Comments: NA		

Wetland Delineation Field Form (Cont.)

MAPPED SOILS:

SOIL SERIES (Map Unit Symbol)	WET	UP	NRCS MAPPED	FIELD IDD/ CONFIRMED
Scarboro muck, 0 to 3 percent slopes (15)	☒	☐	☐	☒
Manchester gravelly sandy loam, 3 to 15 percent slopes (37C)	☐	☒	☐	☒
Enfield silt loam, 0 to 3 percent slopes (704A)	☐	☒	☒	☒
Udorthents-Pits complex (305)	☐	☒	☒	☒

DOMINANT WETLAND PLANTS:

Red maple (*Acer rubrum*)	
White pine (*Pinus strobus*)	
Sensitive fern (*Onoclea sensibilis*)	
Poison ivy (*Toxicodendron radicans*)	

WETLAND NARRATIVE:

This wetland likely formed in uplands after the Northern Capitol Region Disposal Landfill was capped. Water infiltrates into the friable soils above the impervious landfill cap and flows above the liner (through-flow) to the toe of slope where it breaks out onto the ground surface (reflow). Wetland 15 is a depression where this reflow enters the ground again and recharges the groundwater. The soil in this feature is similar to the Scarboro series as it has a thin muck surface tier above sand and gravel. The wetland provides a groundwater recharge function.

Wetland Delineation Field Form

Project Address:	Plantation Road, East Windsor, CT	Project Number:	42569
Inspection Date:	March 3, 2020	Inspector:	Jeffrey Peterson, CPSS
Wetland I.D.:	Wetland 16		

Field Conditions:	Weather: Clear 40s	Snow Depth: 0 inches
	General Soil Moisture: moist	Frost Depth: 0 inches
Type of Wetland Delineation:	Connecticut ☒	
	ACOE ☐	
	Tidal ☐	
Field Numbering Sequence: WF 5-100 to 5-144, open at property line		

WETLAND HYDROLOGY:

NONTIDAL

Intermittently Flooded ☐	Artificially Flooded ☐	Permanently Flooded ☐
Semipermanently Flooded ☐	Seasonally Flooded ☐	Temporarily Inundated ☒
Permanently Saturated ☒	Seasonally Saturated – seepage ☒	Seasonally Saturated - perched ☐
Comments: Kettle hole depression in ice contact stratified drift adjacent to stagnant ice front.		

TIDAL

Subtidal ☐	Regularly Flooded ☐	Irregularly Flooded ☐
Irregularly Flooded ☐		
Comments: N/A		

WETLAND TYPE:

SYSTEM:

Estuarine ☐	Riverine ☐	Palustrine ☒
Lacustrine ☐	Marine ☐	
Comments:		

CLASS:

Emergent ☐	Scrub-shrub ☒	Forested ☒
Open Water ☐	Disturbed ☐	Wet Meadow ☐
Comments:		

WATERCOURSE TYPE:

Perennial ☐	Intermittent ☐	Tidal ☐
Comments: Isolated wetland in bottom of kettle hole depression		

SPECIAL AQUATIC HABITAT:

Vernal Pool ☒	Other ☐	
Comments: Vernal pool present in southwest corner of wetland below the 122 foot elevation contour		

Wetland Delineation Field Form (Cont.)

MAPPED SOILS:

SOIL SERIES (Map Unit Symbol)	WET	UP	NRCS MAPPED	FIELD IDD/ CONFIRMED
Manchester gravelly sandy loam, 15 to 45 percent slopes (37E) (Tg*)	☐	☒	☒	☒
Walpole sandy loam, 0 to 3 percent slopes (13)	☒	☐	☐	☒
Scarboro muck, 0 to 3 percent slopes (15)	☒	☐	☐	☒
Hartford sandy loam, 3 to 8 percent slopes- (33B)	☐	☒	☒	☒
Udorthents-Pits complex gravelly (305)	☐	☒	☒	☐

* Tg Terrace Escarpment from 1962 Soil Survey of Hartford County, CT

DOMINANT OR COMMON WETLAND PLANTS:

Red maple (*Acer rubrum*)	Cinnamon fern (*Osmundastrum cinnamomeum*)
	Sensitive fern (*Onoclea sensibilis*)
Eastern hemlock (*Tsuga canadensis*)	Jewelweed (*Impatiens capensis*)
Yellow birch (*Betula alleghaniensis*)	Evergreen wood fern (*Dryopteris intermedia*)
White pine (Pinus strobus)	
Winterberry (*Ilex verticillata*)	
Arrowwood (*Viburnum recognitum*)	
Highbush blueberry (*Vaccinium corymbosum*)	

WETLAND NARRATIVE:

Wetland 16 occupies the bottom of a steep-sided kettle hole one quarter mile north of Plantation Road proximate to the State of Connecticut Railroad Line. This wetland is a dissimilar inclusion in a Manchester gravelly sandy loam, 15 to 45 percent slopes map unit (37E). The wetland does not have an inlet or outlet. Runoff from farming operations to the west are directed to the depression occupied by this wetland. The wetland is disturbed by illicit all-terrain vehicle trails that enter the site from the adjacent State of Connecticut railroad grade. The wetland is believed to intercept the true groundwater table and serves an important recharge function. Sediments and nutrients washed in from farming and railroad operations are also trapped in this wetland depression.

The southern end of the wetland includes a depression below elevation 122 feet which has been determined to be a vernal pool.

According to The Inland Wetland and Watercourses Regulations of the Town of East Windsor (IWW Regulations) "*Terrace Escarpment*" *means steeply sloping lands denoted under the general soil classifications units Te, Tc, Tg in the Hartford County Soil of the Soil Conservation Service, U.S.D.A*. In the Soil Survey of Hartford County, Connecticut (SCS, 1962) the 37E map unit was mapped as Tg, a gravelly terrace escarpment.

Section 6.1 of the IWW Regulations define regulated activity as: *The Agency shall regulate any operation or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetlands or watercourses, and any earth-moving, grubbing land, filling, construction, or clear-cutting within one-hundred fifty (150) feet of an upland review area that borders a wetland and/or watercourse, and on terrace escarpment soils adjacent to a wetland, watercourse or upland review area.*

This means the regulated area around Wetland 16 consists of the 150-foot dimensional off-set from the

flagged wetland edge plus the portion of the 37E unit that is adjacent to this wetland. Adjacent would seemingly indicate draining to the wetland.

The verified vernal pool (see separately bound Vernal Pool Report) in the southern part of Wetland 16 receives additional protection from IWW Regulations Section 7.5.n. which instructs: *The site plan shall show any potential vernal pools on the affected portion of the proposed property along with a written evaluation as to the quality of the vernal pool and probable effect of the development on the vernal pool(s) conducted by a certified wildlife scientist, professional wetland scientist or similar qualified individual (as determined by the Commission).*
1. A buffer of 100 feet of non-disturbance shall be incorporated into the site plans when a vernal pool is identified. This non-disturbance area can be adjusted at the approval of the Commission based upon evidence of vernal pool quality by an expert.
2. No piped stormwater system shall discharge into a vernal pool.

United States Department of Agriculture

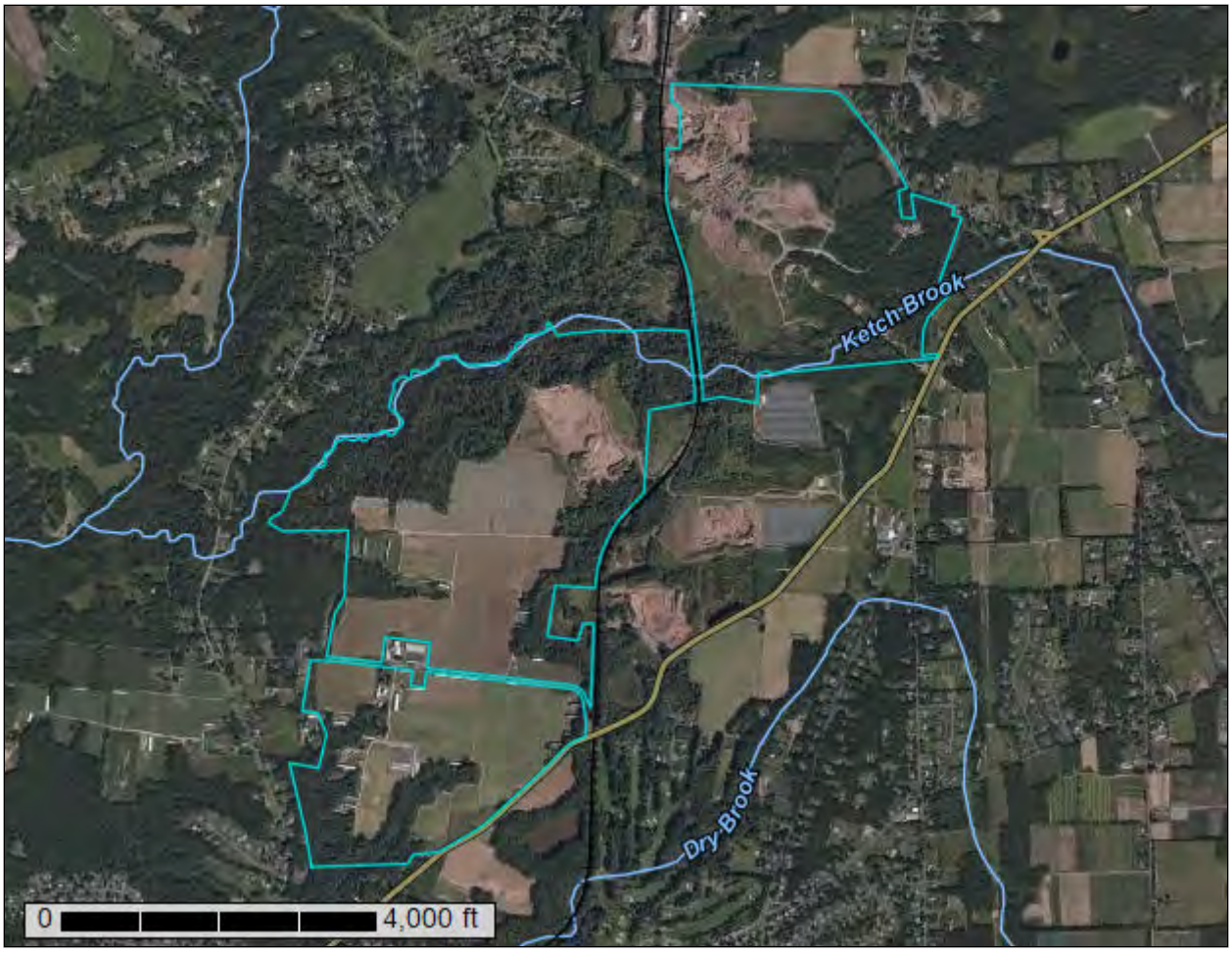
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for State of Connecticut

GPS Project Site, East Windsor, CT



April 30, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

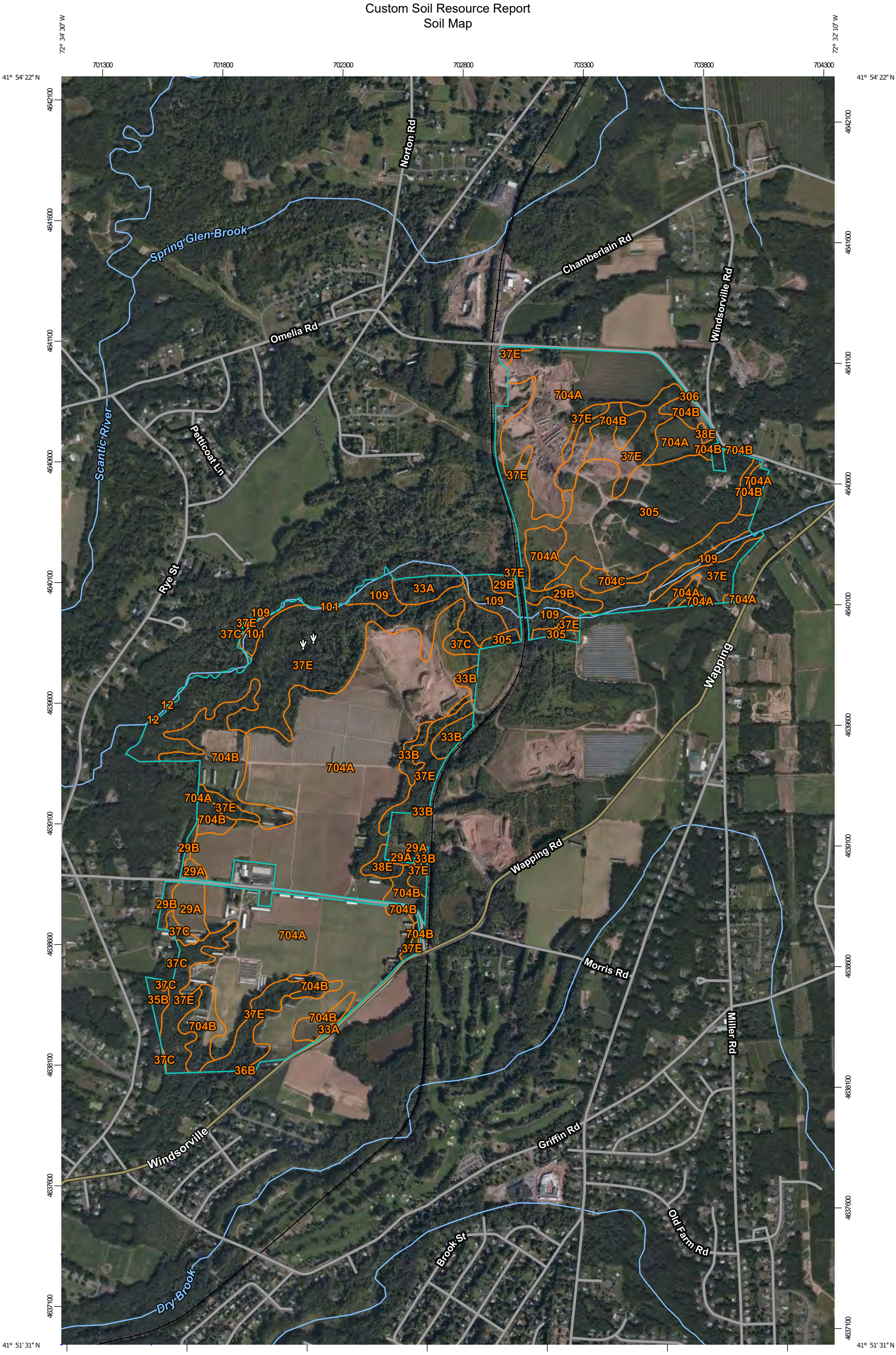
Contents

Preface..... 2
Soil Map..... 5
Soil Map.....6
Legend.....7
Map Unit Legend..... 8
Map Unit Descriptions..... 8
State of Connecticut.....11
12—Raypol silt loam.....11
29A—Agawam fine sandy loam, 0 to 3 percent slopes.....12
29B—Agawam fine sandy loam, 3 to 8 percent slopes.....14
33A—Hartford sandy loam, 0 to 3 percent slopes.....16
33B—Hartford sandy loam, 3 to 8 percent slopes.....17
35B—Penwood loamy sand, 3 to 8 percent slopes.....19
36B—Windsor loamy sand, 3 to 8 percent slopes..... 20
37C—Manchester gravelly sandy loam, 3 to 15 percent slopes..... 22
37E—Manchester gravelly sandy loam, 15 to 45 percent slopes..... 23
38E—Hinckley loamy sand, 15 to 45 percent slopes.....25
101—Occum fine sandy loam..... 27
109—Fluvaquents-Udifluvents complex, frequently flooded..... 28
305—Udorthents-Pits complex, gravelly..... 31
306—Udorthents-Urban land complex.....33
704A—Enfield silt loam, 0 to 3 percent slopes.....34
704B—Enfield silt loam, 3 to 8 percent slopes.....36
704C—Enfield silt loam, 8 to 15 percent slopes.....37
References.....40

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:14,700 if printed on B portrait (11" x 17") sheet.

N

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Connecticut
Survey Area Data: Version 19, Sep 13, 2019

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

Date(s) aerial images were photographed: Aug 24, 2019—Oct 24, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12	Raypol silt loam	0.0	0.0%
29A	Agawam fine sandy loam, 0 to 3 percent slopes	8.6	1.2%
29B	Agawam fine sandy loam, 3 to 8 percent slopes	9.4	1.3%
33A	Hartford sandy loam, 0 to 3 percent slopes	6.6	0.9%
33B	Hartford sandy loam, 3 to 8 percent slopes	10.6	1.4%
35B	Penwood loamy sand, 3 to 8 percent slopes	2.8	0.4%
36B	Windsor loamy sand, 3 to 8 percent slopes	0.0	0.0%
37C	Manchester gravelly sandy loam, 3 to 15 percent slopes	5.9	0.8%
37E	Manchester gravelly sandy loam, 15 to 45 percent slopes	185.9	25.3%
38E	Hinckley loamy sand, 15 to 45 percent slopes	3.8	0.5%
101	Occum fine sandy loam	3.2	0.4%
109	Fluvaquents-Udifluvents complex, frequently flooded	23.8	3.2%
305	Udorthents-Pits complex, gravelly	72.4	9.8%
306	Udorthents-Urban land complex	0.0	0.0%
704A	Enfield silt loam, 0 to 3 percent slopes	332.5	45.2%
704B	Enfield silt loam, 3 to 8 percent slopes	67.1	9.1%
704C	Enfield silt loam, 8 to 15 percent slopes	3.4	0.5%
Totals for Area of Interest		**736.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic

class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

State of Connecticut

12—Raypol silt loam

Map Unit Setting

National map unit symbol: 9ljx
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Raypol and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Raypol

Setting

Landform: Depressions, drainageways
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Ap - 0 to 8 inches: silt loam
Bg1 - 8 to 12 inches: very fine sandy loam
Bg2 - 12 to 20 inches: silt loam
Bw1 - 20 to 26 inches: silt loam
Bw2 - 26 to 29 inches: very fine sandy loam
2C1 - 29 to 52 inches: stratified very gravelly coarse sand to loamy fine sand
2C2 - 52 to 65 inches: stratified very gravelly coarse sand to loamy fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Haven
Percent of map unit: 5 percent
Landform: Terraces, outwash plains
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Enfield
Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Ninigret
Percent of map unit: 3 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Scarboro
Percent of map unit: 2 percent
Landform: Drainageways, depressions, terraces
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Tisbury
Percent of map unit: 2 percent
Landform: Outwash plains, terraces
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Walpole
Percent of map unit: 2 percent
Landform: Depressions on terraces, drainageways on terraces
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Unnamed, loamy substratum
Percent of map unit: 1 percent

29A—Agawam fine sandy loam, 0 to 3 percent slopes

Map Unit Setting
National map unit symbol: 2tyqw

Elevation: 0 to 1,040 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Agawam and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Agawam

Setting

Landform: Moraines, kames, outwash terraces, outwash plains, kame terraces
Landform position (two-dimensional): Backslope, shoulder, footslope, summit
Landform position (three-dimensional): Side slope, crest, tread, riser, rise, dip
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from gneiss, granite, schist, and/or phyllite

Typical profile

Ap - 0 to 11 inches: fine sandy loam
Bw1 - 11 to 16 inches: fine sandy loam
Bw2 - 16 to 26 inches: fine sandy loam
2C1 - 26 to 39 inches: loamy fine sand
2C2 - 39 to 55 inches: loamy fine sand
2C3 - 55 to 65 inches: loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 15 to 35 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Ninigret

Percent of map unit: 5 percent
Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Concave

Hydric soil rating: No

Windsor

Percent of map unit: 4 percent
Landform: Outwash plains, dunes, deltas, outwash terraces
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Walpole

Percent of map unit: 3 percent
Landform: Depressions, deltas, outwash terraces, outwash plains, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Hinckley

Percent of map unit: 3 percent
Landform: Eskers, outwash plains, kames, deltas
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

29B—Agawam fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyqx
Elevation: 0 to 820 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Agawam and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Agawam

Setting

Landform: Outwash terraces, moraines, kame terraces, outwash plains, kames
Landform position (two-dimensional): Backslope, shoulder, footslope, summit
Landform position (three-dimensional): Side slope, crest, tread, riser, rise, dip
Down-slope shape: Convex

Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits derived from gneiss, granite, schist, and/or phyllite

Typical profile

Ap - 0 to 11 inches: fine sandy loam
Bw1 - 11 to 16 inches: fine sandy loam
Bw2 - 16 to 26 inches: fine sandy loam
2C1 - 26 to 45 inches: loamy fine sand
2C2 - 45 to 55 inches: loamy fine sand
2C3 - 55 to 65 inches: loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 15 to 35 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Terraces, deltas, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Outwash plains, kames, deltas, eskers
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest, head slope, nose slope, rise
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Merrimac

Percent of map unit: 3 percent
Landform: Eskers, outwash terraces, moraines, outwash plains, kames
Landform position (two-dimensional): Backslope, footslope, summit, shoulder

Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 2 percent
Landform: Dunes, deltas, outwash terraces, outwash plains
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

33A—Hartford sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9lmv
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Hartford and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hartford

Setting

Landform: Terraces, outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciofluvial deposits derived from sandstone and/or basalt

Typical profile

Ap - 0 to 8 inches: sandy loam
Bw1 - 8 to 20 inches: sandy loam
Bw2 - 20 to 26 inches: loamy sand
2C - 26 to 65 inches: stratified very gravelly coarse sand to loamy fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Penwood

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Branford

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Ellington

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Manchester

Percent of map unit: 5 percent
Landform: Terraces, kames, eskers, outwash plains
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

33B—Hartford sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9lmw
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Hartford and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hartford

Setting

Landform: Terraces, outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciofluvial deposits derived from sandstone and/or basalt

Typical profile

Ap - 0 to 8 inches: sandy loam
Bw1 - 8 to 20 inches: sandy loam
Bw2 - 20 to 26 inches: loamy sand
2C - 26 to 65 inches: stratified very gravelly coarse sand to loamy fine sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Branford

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Manchester

Percent of map unit: 5 percent
Landform: Outwash plains, terraces, kames, eskers
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Ellington

Percent of map unit: 5 percent
Landform: Terraces, outwash plains

Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Penwood

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

35B—Penwood loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9ln1
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Penwood and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Penwood

Setting

Landform: Terraces, outwash plains
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy glaciofluvial deposits derived from sandstone and shale

Typical profile

Ap - 0 to 8 inches: loamy sand
Bw1 - 8 to 18 inches: loamy sand
Bw2 - 18 to 30 inches: sand
C - 30 to 60 inches: sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 99.62 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Branford

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Manchester

Percent of map unit: 5 percent
Landform: Eskers, outwash plains, kames, terraces
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Hartford

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Ellington

Percent of map unit: 3 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Unnamed, gravelly substratum

Percent of map unit: 2 percent
Hydric soil rating: No

36B—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svkf
Elevation: 0 to 1,210 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor, loamy sand, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor, Loamy Sand

Setting

Landform: Outwash plains, deltas, outwash terraces, dunes
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Hinckley, loamy sand

Percent of map unit: 10 percent
Landform: Eskers, kames, outwash plains, deltas
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Deerfield, loamy sand

Percent of map unit: 5 percent
Landform: Outwash plains, terraces, deltas

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

37C—Manchester gravelly sandy loam, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9ln6
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Manchester and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manchester

Setting

Landform: Kames, outwash plains, terraces, eskers
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits derived from sandstone and shale and/or basalt

Typical profile

Ap - 0 to 9 inches: gravelly sandy loam
Bw - 9 to 18 inches: gravelly loamy sand
C - 18 to 65 inches: stratified extremely gravelly coarse sand to very gravelly loamy sand

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Penwood
Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Hartford
Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Branford
Percent of map unit: 3 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Ellington
Percent of map unit: 3 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Unnamed, gravelly loamy sand surface
Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed, nongravelly surface
Percent of map unit: 2 percent
Hydric soil rating: No

37E—Manchester gravelly sandy loam, 15 to 45 percent slopes

Map Unit Setting
National map unit symbol: 9ln7
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Manchester and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Manchester

Setting

Landform: Eskers, kames, outwash plains, terraces
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits derived from sandstone and shale and/or basalt

Typical profile

Ap - 0 to 9 inches: gravelly sandy loam
Bw - 9 to 18 inches: gravelly loamy sand
C - 18 to 65 inches: stratified extremely gravelly coarse sand to very gravelly loamy sand

Properties and qualities

Slope: 15 to 45 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Hartford

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Branford

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Penwood

Percent of map unit: 5 percent
Landform: Outwash plains, terraces

Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Walpole

Percent of map unit: 3 percent
Landform: Drainageways on terraces, depressions on terraces
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scitico

Percent of map unit: 2 percent
Landform: Terraces, drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

38E—Hinckley loamy sand, 15 to 45 percent slopes

Map Unit Setting

National map unit symbol: 2svmj
Elevation: 0 to 1,280 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Outwash deltas, outwash terraces, eskers, kames, kame terraces, outwash plains, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Linear, concave, convex
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand

BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 15 to 45 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent
Landform: Eskers, outwash terraces, kames, moraines, outwash plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope, nose slope, crest, riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Outwash deltas, moraines, outwash terraces, eskers, kames, kame terraces, outwash plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Convex, linear, concave
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Agawam

Percent of map unit: 3 percent
Landform: Kame terraces, outwash terraces, eskers, kames, outwash plains, moraines, outwash deltas
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent
Landform: Kame terraces, outwash plains, outwash deltas, outwash terraces, eskers, kames, moraines
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: No

101—Occum fine sandy loam

Map Unit Setting

National map unit symbol: 9ljm
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Occum and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Occum

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy alluvium

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 17 inches: fine sandy loam
Bw2 - 17 to 28 inches: sandy loam
C1 - 28 to 32 inches: stratified very gravelly coarse sand to loamy fine sand
C2 - 32 to 42 inches: stratified very gravelly coarse sand to loamy fine sand
C3 - 42 to 65 inches: stratified very gravelly coarse sand to loamy fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 60 to 72 inches
Frequency of flooding: Occasional

Frequency of ponding: None
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Pootatuck

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Rippowam

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Suncook

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Agawam

Percent of map unit: 5 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

109—Fluvaquents-Udifluvents complex, frequently flooded

Map Unit Setting

National map unit symbol: 9ljw
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Fluvaquents, frequently flooded, and similar soils: 50 percent

Udifluvents, frequently flooded, and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fluvaquents, Frequently Flooded

Setting
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium

Typical profile
A - 0 to 4 inches: silt loam
Cg1 - 4 to 14 inches: fine sand
Cg2 - 14 to 21 inches: very fine sand
Ab1 - 21 to 38 inches: silt loam
Ab2 - 38 to 45 inches: fine sandy loam
C'g3 - 45 to 55 inches: sand
A'b3 - 55 to 60 inches: fine sandy loam

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.2 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Description of Udifluvents, Frequently Flooded

Setting
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile
A - 0 to 2 inches: fine sandy loam
C - 2 to 4 inches: loamy fine sand
Ap - 4 to 12 inches: fine sandy loam
AC - 12 to 18 inches: fine sandy loam
C1 - 18 to 35 inches: loamy sand
C2 - 35 to 38 inches: very gravelly loamy sand
C3 - 38 to 60 inches: very gravelly coarse sand

Properties and qualities
Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (0.57 to 35.99 in/hr)
Depth to water table: About 72 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Riverwash

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

Rippowam

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: Yes

Saco

Percent of map unit: 3 percent
Landform: Flood plains
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Pootatuck

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Occum

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

305—Udorthents-Pits complex, gravelly

Map Unit Setting

National map unit symbol: 9lmf
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 65 percent
Pits: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Gravelly outwash

Typical profile

A - 0 to 5 inches: loam
C1 - 5 to 21 inches: gravelly loam
C2 - 21 to 80 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 35 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: About 24 to 54 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Pits

Typical profile

C - 0 to 65 inches: very gravelly sand

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Unranked

Minor Components

Merrimac

Percent of map unit: 2 percent
Landform: Terraces, kames, outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 2 percent
Landform: Outwash plains, terraces, kames, eskers
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Gloucester

Percent of map unit: 2 percent
Landform: Hills
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 2 percent
Landform: Outwash plains, terraces, kames
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Sudbury

Percent of map unit: 1 percent
Landform: Outwash plains, terraces
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ninigret

Percent of map unit: 1 percent
Landform: Outwash plains, terraces
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

306—Udorthents-Urban land complex

Map Unit Setting

National map unit symbol: 9lmg
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 50 percent
Urban land: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Drift

Typical profile

A - 0 to 5 inches: loam
C1 - 5 to 21 inches: gravelly loam
C2 - 21 to 80 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: About 54 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Urban Land

Typical profile

H - 0 to 6 inches: material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Unnamed, undisturbed soils

Percent of map unit: 8 percent
Hydric soil rating: No

Udorthents, wet substratum

Percent of map unit: 5 percent
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Rock outcrop

Percent of map unit: 2 percent
Hydric soil rating: No

704A—Enfield silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2y07p
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Enfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Enfield

Setting

Landform: Outwash terraces, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear

Parent material: Coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite, schist, and/or gneiss

Typical profile

Ap - 0 to 7 inches: silt loam
Bw1 - 7 to 15 inches: silt loam
Bw2 - 15 to 25 inches: silt loam
2C - 25 to 60 inches: stratified very gravelly coarse sand to loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 16 to 39 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Haven

Percent of map unit: 5 percent
Landform: Outwash terraces, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Tisbury

Percent of map unit: 5 percent
Landform: Outwash terraces, outwash plains, deltas, valley trains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Agawam

Percent of map unit: 3 percent
Landform: Kame terraces, outwash terraces, kames, moraines, outwash plains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Side slope, crest, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Raypol

Percent of map unit: 2 percent
Landform: Drainageways, depressions

Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

704B—Enfield silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2y07q
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Enfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Enfield

Setting

Landform: Outwash terraces, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite, schist, and/or gneiss

Typical profile

Ap - 0 to 7 inches: silt loam
Bw1 - 7 to 15 inches: silt loam
Bw2 - 15 to 25 inches: silt loam
2C - 25 to 60 inches: stratified very gravelly coarse sand to loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 16 to 39 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Haven
Percent of map unit: 5 percent
Landform: Outwash terraces, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Tisbury
Percent of map unit: 5 percent
Landform: Valley trains, outwash terraces, outwash plains, deltas
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Agawam
Percent of map unit: 3 percent
Landform: Outwash plains, kame terraces, outwash terraces, kames, moraines
Landform position (two-dimensional): Backslope, shoulder, footslope, summit, toeslope
Landform position (three-dimensional): Side slope, crest, head slope, nose slope, tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Raypol
Percent of map unit: 2 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

704C—Enfield silt loam, 8 to 15 percent slopes

Map Unit Setting
National map unit symbol: 2y07r
Elevation: 0 to 1,200 feet
Mean annual precipitation: 43 to 54 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 140 to 185 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Enfield and similar soils: 85 percent

Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Enfield

Setting

Landform: Outwash terraces, outwash plains
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Coarse-silty eolian deposits over sandy and gravelly glaciofluvial deposits derived from granite, schist, and/or gneiss

Typical profile

Ap - 0 to 7 inches: silt loam
Bw1 - 7 to 15 inches: silt loam
Bw2 - 15 to 25 inches: silt loam
2C - 25 to 60 inches: stratified very gravelly coarse sand to loamy sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 16 to 39 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Haven

Percent of map unit: 5 percent
Landform: Outwash terraces, outwash plains
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Tisbury

Percent of map unit: 5 percent
Landform: Valley trains, outwash terraces, outwash plains, deltas
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Agawam

Percent of map unit: 3 percent

Landform: Moraines, outwash plains, kame terraces, outwash terraces, kames
Landform position (two-dimensional): Backslope, shoulder, footslope
Landform position (three-dimensional): Side slope, crest, nose slope, head slope, riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Raypol

Percent of map unit: 2 percent
Landform: Drainageways, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Appendix I
Wildlife Evaluations
Technical Memorandum

Memorandum

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

Date: May 20, 2020

Project #: 42569.00

From: Jeffrey Peterson, PWS
Chelsea Glinka, ENV SP

Re: Wildlife Habitat and Vegetation Cover Type Evaluation
Gravel Pit Solar Site
East Windsor, Connecticut

Introduction

This Wildlife Habitat and Vegetation Cover Type Evaluation 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) in the Town of East Windsor, Connecticut. The Project includes the development of a 120 megawatt (MW) alternating current (AC) ground-mounted solar photovoltaic system. The Project will encompass 485 acres (the Project Area) and will be sited on eight parcels of land totaling approximately 726 acres (the Project Site) located near Apothecaries Hall Road, Plantation Road, Wapping Road, and Windsorville Road (see Project Location Map **A-1** provided in **Attachment A**).

The memo begins with an overview of the vegetation, habitat types and a general description of the wildlife present within the Project Site. These investigations were used to identify Key Habitat Types and wildlife species of Greatest Conservation Need (GCN) according to the Connecticut Wildlife Action Plan (CWAP) (CTDEEP, 2015), and any Connecticut Critical Habitats as defined by the 2005 Comprehensive Wildlife Conservation Strategy (CWCS), the predecessor to the CWAP. Connecticut Critical Habitats provide the classification of 25 rare and specialized wildlife habitats. Natural vegetation is described according to the system provided in The Vegetation of Connecticut, which is one of the standard classification systems used to develop the Key Habitat Types in the CWAP (Metzler and Barrett, 2006).

This memo then addresses potential state-listed plant and animal species that may occur within the Project Site that are subject to protection under the Connecticut Endangered Species Act (CGS Section 26-303) (CT ESA). A total of 15 state-listed plant and animal species (**Table 1**) was provided by two Preliminary Assessments (PAs) from the Connecticut Department of Energy and Environmental Protection (CTDEEP) Natural Diversity Data Base (NDDB), dated December 31, 2019 and March 4, 2020. **Figure A-2** shows the potential locations of state-listed species evaluated by the NDDB as well as Critical Habitat types mapped within or adjacent to the Project Site.

The goal of the CT ESA is to conserve, protect, restore and enhance endangered or threatened species and their essential habitats. Under the CT ESA, species are listed according to their level of risk for extirpation in one of three designations:

"Endangered Species" *means any native species documented by biological research and inventory to be in danger of extirpation throughout all or a significant portion of its range within the state and to have no more than five occurrences in the state, and any species determined to be an "endangered species" pursuant to the federal Endangered Species Act (ESA).*

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-23
P 860.807.4300

"Threatened Species" *means any native species documented by biological research and inventory to be likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range within the state and to have no more than nine occurrences in the state, and any species determined to be a "threatened species" pursuant to the ESA, except for such species determined to be endangered by the Commissioner of the CTDEEP in accordance with section 4 of the CT ESA*.

"Species of Special Concern" *means any native plant species or any native non-harvested wildlife species documented by scientific research and inventory to have a naturally restricted range or habitat in the state, to be at a low population level, to be in such high demand by man that its unregulated taking would be detrimental to the conservation of its population or has been extirpated from the state*.

Table 1. Species Provided in NDDB Preliminary Assessments

Status	Scientific Name	Common Name	Survey Planned/Timing
	Invertebrates		
SC	*Lycaena epixanthe*	Bog copper	No[1]
SC	*Margaritifera margaritifera*	Eastern pearlshell	No[1]
SC	*Sympistis perscripta*	Scribbled sallow moth	Yes/July (host plant)
SC	*Cicindela formosa generosa*	Big sand tiger beetle	Yes/May and June
	Vascular Plants		
T	*Alopecurus aequalis*	Short-awned meadow foxtail	Yes/June-July
SC	*Asclepias purpurascens*	Purple milkweed	Yes/June-July
T	*Gaylussacia bigeloviana*	Dwarf huckleberry	No[1]
SC	*Lygodium palmatum*	Climbing fern	Yes/completed
	Vertebrates		
E	*Accipiter striatus*	Sharp-shinned hawk	Yes/ May and June
T	*Asio flammeus*	Short-eared owl	Yes/May and June
SC	*Falco sparverius*	American kestrel	Yes/May and June
SC	*Glyptemys insculpta*	Wood turtle	Yes/May and June
E	*Lethenteron appendix*	American brook lamprey	No[1]
E	*Melanerpes erythrocephalus*	Red-headed woodpecker	Yes/May and June BBS
SC	*Passerculus sandwichensis*	Savannah sparrow	Yes/May-Mid June BBS

1: Explanations for why surveys are not planned for these species are provided in the Wildlife and Plant Surveys Section of this report.
Source: CTDEEP NDDB Preliminary Assessment Letters 201914275 and 202002957

VHB Scientists also used the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) tool to assess the potential presence of species subject to federal protection under the

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

Endangered Species Act of 1973 within the Project Site. According to the USFWS IPaC-generated Official Species List, the only federally listed species with the potential to occur within the Project Site is the federally threated northern long-eared bat (*Myotis septentrionalis*).

Finally, proposed and completed field survey methods used to identify rare plants and animals within the Project Site are described followed by the consideration of anticipated Project-related direct and indirect effects on listed species and recommended mitigative measures to avoid and minimize these effects.

VHB botanists and wildlife scientists initiated a series of field investigations, including wetland mapping, bird surveys, vernal pool surveys, wildlife observations, and description of the floristic composition and structure of the plant associations present within the Project Site These field efforts began in the late fall of 2019 and will continue until July 2020 to observe wildlife including breeding birds, reptiles, and certain plants during their flowering period to correctly identify taxa.

Project Site Vegetation Cover Type Descriptions

The existing and proposed cover type areas within the Project Site are provided in **Table 2**. Brief descriptions of each cover type are included below and a figure depicting the habitat cover types is included in **Figure A-3** in **Attachment A**. **Tables B-1 through B-3** in **Attachment B** list observed wildlife species and species with a potential to occur within the Project Site according to cover type.

Table 2 Project Site Cover Types: Existing and Proposed

Cover Type	Existing Area (Acres)	Area to be Altered[1] (Acres)	Area to Remain (Acres)
Agricultural Fields	233.1	208.3	24.8
Sand and Gravel Quarries	76.0	57.1	18.9
Early successional	61.6	23.9	37.7
Deciduous Forest	262.8	42.2	220.6
Coniferous Forest	26.7	15.2	11.5
Forested Wetland	27.5	27.5	27.5
Vernal Pools	0.3	0	0.3
Manmade Features	40.9	22.3	18.6

1: Solar fields will all be managed as warm or cool season grassland.

Agricultural Fields

In the CWAP, farmland corresponds to the Manmade designation portion of Key Habitat 10, Sub-habitat Agricultural Lands. A large portion of the farmlands occupy broad level terraces that consist of sandy outwash and or deltaic deposits capped by an aeolian mantle all resting on glacio-lacustral lakebed deposits. Farmland along Plantation Road in the southern part of the Project Site (see Site Photos in **Attachment C)** have traditionally been used to produce shade-grown wrapper tobacco which is cured in one of the twenty tobacco barns around the field perimeters. This labor-intensive crop is raised under partial shade inside "tents". Field margins and grounds associated with the tobacco barns and other

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

outbuildings provide some edge habitat. Cover crops including annual rye grass and oats are sown in the fall after tobacco harvest provide a limited habitat for wintering songbirds and small mammals.

Along Plantation Road, three fields were not in tobacco; one was planted in gourds, one in vegetables and one field adjoining Plantation Road was planted in seed corn that was not harvested. In the northern Project Site two fields along Apothecaries Hall Road were planted in seed corn and cut leaving only stubble in the fields.

The fields managed as a monoculture of tobacco provide little wildlife value. The two fields with corn stover and two with stubble provide forage for mourning dove (*Zenaida macroura*), European starling (*Sturnus vulgaris*), common grackle (*Quiscalus quiscula*), Canada goose (*Branta canadensis*) and small mammals such as southern red-backed vole (*Myodes gapperi*), white-footed mouse (*Peromyscus leucopus*) and larger mammals such as white-tailed deer (*Odocoileus virginianus*), racoon (*Procyon lotor*), and Virginia opossum (*Didelphis virginiana*).

Disturbance associated with tillage as well as weed and insect pest control precludes utilization of farm fields by grassland birds. Song sparrow (*Melospiza melodia*), chipping sparrow (*Spizella passerina*), tree swallow (*Tachycineta bicolor*) and barn swallow (*Hirundo rustica*) were observed foraging over fields or along field edges. Tree and barn swallows, house sparrows, and European starlings were observed following a tractor tilling the winter cover crop, presumably to forage on insects flushed or exposed by the tractor.

At least two pairs of American kestrels (*Falco sparverius*), a state species of special concern, were observed along field margins and early successional habitats around gravel mines and off-site capped landfills in the southern Project Site. A northern harrier (*Circus cyaneus*), likely a migrant and a GCS species according to the CWAP, pivoted and dipped across the southern agricultural fields as it scouted field margins north of Plantation Road on May 5, 2020.

Sand and Gravel Quarries

These earth material mines are grouped under the Manmade designation of Key Habitat 10, Sub-habitat Urban and Man-made Features in the CWAP. Approximately 76.0 acres of the Project Site are occupied by one of two sand and gravel quarries. Recently mined open areas within the quarries generally do not support vegetation or function as wildlife habitat. These quarries attract illicit recreational use by all-terrain-vehicle (ATV) users and dirt bikers. The southern pit is also used for firearm target practice.

Very little wildlife activity was noted in the floor and walls of the open pits. However, the early succession margins and partially restored areas attract species such as song sparrow, field sparrow (*Spizella pusilla*) (GCN species), and wild turkey (*Meleagris gallopavo*). Suitable substrate for big sand tiger beetle (*Cicindela formosa generosa*), a state species of special concern, may be present in inactive portions of the pits.

Early Successional Grassland and Shrubland

These cover types correspond to the Upland Shrub designation portion of Key Habitat 2, Sub-habitat Reverting Field and Early Successional Shrubland. Approximately 61.6 acres of the Project Site are occupied by early successional habitat consisting of grassland with patches of shrubs, shrubland, or open woodland with low tree cover. These areas occur in partially reclaimed quarry areas, along the margins of agricultural fields, within the Eversource overhead electric transmission right-of-way (ROW), along the adjacent to the

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

State of Connecticut Railroad line, off-site on adjacent closed landfills and gravel pits, and as patches in recently harvested forest areas.

The vegetation in these areas is variable and may be dominated by cool season grasses such as fescues (*Festuca* spp.), rye (*Lolium perenne*), and others. Alternatively, warm season grasses such as little bluestem (*Schizachyrium scoparium*), poverty grass (*Danthonia spicata*) colonize drier substrates often with goldenrod (*Solidago canadensis*, *S*. spp.), common mullein (*Verbascum thapsus*), and invasive species such as wormwood (*Artemisia vulgaris*).

Shrub and low tree species that are early colonizers include black cherry (*Prunus serotina*), alder (*Alnus* sp.), autumn olive (*Elaeagnus umbellata*), blackberry (*Rubus occidentalis*), multiflora rose (*Rosa multiflora*). Cleared woodland patches are often quickly colonized by black birch (*Betula lenta*).

Depending on habitat size and the proportion of grass versus shrub cover, these areas provides nesting and foraging grounds for field sparrow, song sparrow, prairie warbler (*Setophaga discolor*) (GCN species), eastern bluebird (*Sialia sialis*), American goldfinch (*Spinus tristis*), yellow warbler (*Setophaga petechia*), eastern towhee (*Poecile atricapillus*), and several other passerine species. A pair of American kestrel was observed foraging within these early successional habitat types. Other wildlife that may utilize this scrub-shrub cover include mammals such as mice, shrew, voles, striped skunk (*Mephitis mephitis nigra*), and red fox (*Vulpes vulpes*). These areas also provide wintering habitat for songbirds including dark-eyed junco (*Junco hyemalis*) and white-throated sparrow (*Zonotrichia albicollis*).

The early successional shrub and grass cover established around a process water pond in the northern gravel pit provided foraging habitat for a spotted sandpiper (*Actitis macularius*) in breeding plumage observed on April 28, 2020.

Mixed Deciduous and Coniferous Upland Forests

The cover types within the upland forested portion of the Project Site correspond to the Upland Forest Key Habitat and includes the Mixed Hardwood Forest and Coniferous Forest Sub-habitats listed in the CWAP.

Forest and woodland are present throughout the Project Site and mostly occupy irregularly sloping ice-contact stratified drift deposits and terrace escarpments that are too rugged to farm (see Photos in **Attachment C**). The forests can be generally classified as upland broad-leaved deciduous, approximately 26.7 acres and upland coniferous evergreen which comprises approximately 262.8 acres.

Upland deciduous forests mostly fall into the *Northern red oak / Maple-leaf viburnum* community[1] along terrace escarpments and low ice-contact stratified drift terraces. Kame summits support a community similar to the *Northern red oak-Black oak / Blue ridge blueberry* community proposed by the same authors. Pignut hickory (*Carya glabra*), red maple (*Acer rubrum*), sugar maple (*A. saccharum*), and American beech (*Fagus grandifolia*) are common tree. Most of these forests have been selectively cut, but still contain numerous standing snags and large trees with defects that provide nesting cavities and mast.

[1] Community types in italics are taken from The Vegetation of Connecticut (Metzler and Barrett, 2006)

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

The most common evergreen forest type is *Eastern hemlock* which occupies much of the steep terrace escarpment along Ketch Brook in the southern part of the site. Other components of this forest include white (*Pinus strobus*) and pitch pine (*Pinus rigida*), red oak (*Quercus rubra*), black oak (*Q. velutina*), sugar maple (*Acer saccharum*) and red maple (*A. rubrum*). This community is deeply shaded and supports little understory.

The forests provide habitat for several year-round resident and neo-tropical migrant songbirds as well as several other classes of fauna, including mammals such as white-tailed deer, reptiles and amphibians, and invertebrates. Species commonly encountered include white-breasted nuthatch (*Sitta carolinensis)*, black-capped chickadee (*Poecile atricapillus*), downy (*Dryobates pubescens*), hairy (Dryobates villosus), red-bellied (*Melanerpes carolinus*) and pileated woodpecker (*Dryocopus pileatus*), northern flicker (*Colaptes auratus*), American red squirrel (*Tamiasciurus hudsonicus*) and eastern gray squirrel (*Sciurus carolinensis*), and wild turkey. Potential summer breeding species, including yellow-rumped warbler (*Setophaga coronata*) and magnolia warbler (*S. magnolia*), and suspected migrant species, including blackpoll warbler (*S. striata*) were also observed.

Mixed Deciduous and Coniferous Wetland and Floodplain Forests

The forested wetland portion corresponds to the Forested Inland Wetland Habitat Key Habitat, Sub-habitats Floodplain Forest and Red Maple Forest Sub-habitats.

Wetland deciduous forests outside of the floodplain are typically dominated by red maple with pin oak (*Quercus palustris*) and American elm (*Ulmus americana*) often present. Winterberry and spicebush are common shrubs, with skunk cabbage, cinnamon fern and sensitive fern common herbaceous species. Sloping and discharge wetlands support associations similar to *Red Maple / Northern Spicebush* community and wetlands in kettle hole bottoms forests similar to the *Red Maple / Pin Oak* community. Both of these wetland forests may include eastern hemlock (*Tsuga canadensis*), white pine and pitch pine. Some of the kettle holes contain vernal pools which are special habitats described later in this section.

While Ketch Brook is a relatively small, high-gradient stream, parts of its floodplain are broad in southern reaches within the Project Site. Floodplain levees with moderately well drained alluvium support a forest association similar to the *American sycamore-Boxelder* community. Dominant trees include American sycamore (*Platanus occidentalis*), eastern cottonwood (*Populus deltoides*), American elm, red maple, and occasional silver maple (*Acer saccharinum*). The understory is largely colonized by the invasive winged euonymus (*Euonymus alatus*) with occasional spicebush and witch-hazel (*Hamamelis virginiana*). Well drained portions of the floodplain include Christmas fern (*Polystichum acrosticoides*) and round-leaved pyrola (*Pyrola americana*) in the herbaceous layer along with poison ivy (*Toxicodendron radicans*). A garter snake (*Thamnophis sirtalis*) was observed in this floodplain forest.

The very poorly drained floodplain includes red maple swamps and smaller areas with hemlock and white pine. These very poorly drained floodplain forests do not fit well into the floristic descriptions provided in by Metzler and Barrett (2006). The shrub layer is typically dominated by species such as winterberry *(Ilex verticillata*), arrowwood (*Viburnum dentatum*), and silky dogwood (*Cornus amomum*). Skunk cabbage (*Symplocarpus foetidus*), jewelweed (*Impatiens capensis*), and fowl mana (*Glyceria striata*) are common in the herbaceous stratum.

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

These wetland forests support several resident and neotropical migrant songbirds including common yellowthroat (*Geothlypis trichas*), yellow warbler, and warbling vireo (*Vireo gilvus*). ATV and dirt bike trails wind through the forested areas and create serious erosion on steep slopes and poorly drained floodplains (see photos in **Attachment C**). This degradation contributes to high turbidity within the brook.

Ketch Brook

Ketch Brook corresponds to the Freshwater Aquatic Key Habitat with Cold Water Stream as the Sub-habitat type in the CWAP. Ketch Brook is a perennial watercourse and tributary to the Scantic River. It flows north to south through three of properties that make up the Project Site and forms the northwestern boundary of a fourth (see **Figure A-1**). The corridor associated with the brook is forested, generally with a closed canopy. The Brook has a stony bottom throughout most of the Project Site with a strong preponderance of shallow riffles and only a few quiet pools. Beaver have constructed several impoundments creating pools in the northern most reaches of the stream. Painted turtle (*Chrysemys picta*) were observed in a backwater impoundment near the Eversource electric transmission line crossing of Ketch Brook.

The southern reaches of the stream meander more and in places undercut floodplain banks and even terrrace escarpments. Ketch Brook is thought to support a diverse collection of aquatic fauna, including brown trout (*Salmo trutta*), fallfish (*Semotilus corporalis*), beaver (*Castor canadensis*), and invertebrates such as mussels, stoneflies, caddisflies, and odonates (damselflies and dragonflies). Red shouldered hawk and belted kingfisher were observed above the stream.

The high aquatic habitat values attributed to this stream are diminished by uncontrolled use of ATVs within its stream channel and floodplain. These illicit activities contribute to bank erosion and turbid water conditions in the brook.

Vernal Pools

Six vernal pools were surveyed from mid-March to early May within the Project Site. All the pools were observed within the forested wetlands. These included classic vernal pools formed in kettle holes and cryptic pools within larger wetland systems. Obligate species identified within the pools included adult wood frogs (*Lithobates sylvaticus*), wood frog egg masses, wood frog larvae, spotted salamander (*Ambystoma maculatum*) egg masses, and fairy shrimp (*Eubranchipus sp.*). Vernal pools are critical habitat essential for obligate species to complete part of their life-cycle. They provide habitat to facultative species such as green frog (*Lithobates clamitans*), gray tree frog (*Dryophytes versicolor*), and spring peeper (*Pseudacris crucifer*) and invertebrates such as predacious diving beetles, water striders, and caddisfly.

Manmade Features

Approximately 40.9 acres of the Project Site includes some pockets of land development related to agriculture, including tobacco barns that are likely still in use, greenhouses, and some laydown areas used to store agricultural equipment. This development falls under the Manmade designation of Key Habitat 10, Sub-habitat Urban and Man-made Features in the CWAP. These features may provide shelter and nesting areas for some wildlife including small rodents and bird species such as house sparrows and European starlings. Additionally, one pair of American Kestrel may be using a tobacco barn south of Plantation Road as a nesting site based on repeated observations at the same barn.

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

Cover Type Conversions

Site clearing and grading operations will be required is some portions of the Project Site to facilitate construction of the solar array. These activities will convert some of the existing cover types. **Table 2** above reports these changes which are depicted in **Figure A-4** in **Attachment A**. Approximately 208.3 acres of the agricultural fields will be converted to solar array panels and associated improvements with a permanent grassland cover type. Grass cover with legumes will be established under the array and along the perimeters of the arrays. The grassland cover will be mown approximately one to two times per year to prevent vegetation from overtopping the solar array panels. The active sand and gravel quarries on parcels 027-49-017C, 057-65-001, and 048-65-007 will be closed and brought to a grade of approximately eight feet above the water table. Approximately 81 acres of the newly graded sand and gravel pits and early successional shrubland will be converted to solar array panels. Additionally, approximately 42.2 cres of deciduous forest and 15.2 acres of coniferous forest will be cleared to accommodate the solar arrays and allow for an adequate perimeter around the array that will permit sufficient sun penetration and ensure that the panels are not shaded by the trees. These cleared areas will also be planted in grasses and legumes.

The project avoids work in or adjacent to the six vernal pools, Ketch Brook, and all of the forested wetlands. Best management practices will be employed during construction to prevent sedimentation and/or runoff from entering these sensitive resources.

Wildlife and Plant Surveys

The following section provide an overview of the completed and proposed field investigations to detect state and federally listed species along with GCN species identified in the CWAP. It also addresses the survey findings and potential Project-related effects to observed state-listed and GCN species and mitigative measures to minimize negative effects. For state-listed species where suitable habitat is present, occupancy will be assumed and a protection plan is provided.

Breeding Bird Surveys

Bird surveys were conducted by VHB wildlife scientists between 7:00 AM and 3:00 PM on April 28, 2020 and between 6:45 AM and 10:00 AM on May 4, 2020. Incidental species observations were also recorded throughout the day and during other field investigations. VHB biologists conducted transect surveys intended to maximize opportunities to observe listed species (see **Figure A-5** in **Attachment A**). Birds were identified based on visual observations and auditory identification of calls and songs. All birds within visual and auditory range were recorded. The surveys were conducted on clear days with low wind speeds that minimized interference with acoustic observations. Temperatures were seasonably appropriate during the survey windows with temperatures ranging between 40°F and 61°F[2] on April 28 and between 43°F and 59°F on May 5.

2 Weather station: Bradley International Airport Station, Windsor Locks, CT https://www.wunderground.com/weather/us/ct/windsor-locks/KBDL?cm_ven=localwx_pwsdash

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

State-listed bird species and their habitat preferences are provided in **Table 2**. The habitat types that were most closely monitored included the perimeters of the agricultural fields and the early successional scrub-shrub cover within the recovering sand and gravel quarries and the capped landfills adjacent to the Project Site boundary. VHB wildlife scientists separated to observe a pair of American kestrel south of Plantation Road and a second pair hunting over the southern gravel pit and off-site closed landfills simultaneously to confirm that two pairs. No other state-listed bird species were detected during the surveys.

Sharp-shinned hawk (*Accipiter striatus*) are common migrants in Connecticut in the spring and fall and recent records for short-eared owl (*Asio flammeus*) are only for wintering individuals. Call back surveys using recordings from the Audubon Birds Application amplified with Bluetooth speakers were played for short-eared owl and savannah sparrow (*Passerculus sandwichensis*) at early successional habitats around the gravel pits. After each recording was played the biologists stopped to listen for return calls for approximately two to five-minute intervals.

Surveys for red-headed woodpecker (*Melanerpes erythrocephalus*) and sharp-shinned hawk will be conducted in late May and mid-June.

Table 2 State-listed Bird Species Provided in the NDDB Preliminary Assessments

Common Name	Scientific Name	State Status	Habitat Type(s)[1]
Sharp-shinned hawk	*Accipiter striatus*	Endangered	Forest and forest edges; require dense forest with closed canopy for breeding
Short-eared owl	*Asio flammeus*	Threatened	Winter habitat large open areas within woodlots, stubble fields, marshes, weedy fields, dumps, gravel pits, rock quarries, and shrub thickets. If food is plentiful, winter habitat may be used for breeding.
American kestrel	*Falco sparverius*	Special concern	Open areas with short ground vegetation and sparse trees, meadows, grasslands, parks, and farm fields. Require nesting cavity.
Savannah sparrow	*Passerculus sandwichensis*	Special concern	Grassy fields with damp soils
Red-headed woodpecker	*Melanerpes erythrocephalus*	Endangered	Deciduous woodlands with snags, recent clearings, beaver swamps, farmland, grasslands with scattered trees, forest edges, and roadsides.

1 Habitat types based on descriptions from Bevier, ed. 1994, The Atlas of Breeding Birds of Connecticut and from the Cornell Lab of Ornithology (allaboutbirds.org).

An inventory of potential breeding birds provided in **Table B-1 in Attachment B** was developed based on information from field observations, the Atlas of Breeding Birds of Connecticut (Bevier ed. 1994), New England Wildlife (DeGraaf and Yamasaki 2001), and NDDB data. All observed species from the survey efforts have been indicated in **Table B-1**. A total of 54 bird species have been identified in the Project Site and seven of these species appear in the CWAP as species of GCN; GCN species that were observed are annotated in **Table B-1**. According to the USFWS IPaC tool, there are no federal-listed bird species within the Project Site (see **Attachment D** for IPaC Official Species Lists).

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

State-Listed Species and Habitat within the Project Site

The State-listed bird species include three species that prefer open, grassy and scrub-shrub habitats and edge habitat, including savannah sparrow, short-eared owl, and American kestrel and two species that prefer forest interiors and forest edges, the sharp-shinned hawk and red-headed woodpecker. Savannah sparrows nest on the ground and the reclaimed portions of gravel pits undergoing revegetation provide marginally suitable habitat for breeding, as do the capped landfills proximate to the Project Site boundary. The forested interiors and edges where snags are present provide potentially suitable nesting habitat for red-headed woodpecker and sharp-shinned hawk. At least two suspected breeding pairs of American kestrels were observed within the Project Site. There was no evidence of usage of the nest box along Plantation Road.

While dated and currently under revision, The Atlas of Breeding Birds of Connecticut (Atlas of BBC; Bevier ed., 1994) is the most comprehensive review to date of Connecticut's breeding birds. The Atlas indicates that several of the State-listed species from the NDDB records are scarce within Hartford County during the five-year span (1982-1986) that the breeding bird surveys for the atlas were completed. Savannah sparrow had two confirmed breeding pairs and four probable pairs, one confirmed pair of red-headed woodpecker which according to the Atlas of BBC is one of the rarest breeding birds in the state, three breeding pairs of sharp-shinned hawk, and there are no entries for short-eared owl in the Atlas of BBC. The American kestrel has the most abundant breeding record in the Atlas of BBC with 12 confirmed breeding pairs.

The preferred habitat of short-eared owl is open country such as grasslands, marshes, and meadows. According to CTDEEP fact sheet, there are presently no confirmed breeding populations of short-eared owl in the state, though there is a small wintering population (CTDEEP, 1999). A review of the citizen-scientist reported eBird records hosted by the Cornel Lab of Ornithology indicates that there have been only 12 reported sightings of short-eared owl in Hartford County in the between 1990 and 2020 and all of these sighting were made between the months of October through April, indicating that wintering populations are relatively rare. Though the Project Site supports some habitat types that may be suited to the wintering habitat requirements of the short-eared owl, VHB wildlife scientists have not observed this species.

Potential Impacts of Solar Arrays on Birds

A literature review by Harrison et al. (2016) evaluated peer-reviewed publications concerning the impact of solar photovoltaic (PV) developments on birds found relatively little scientific evidence of a direct impact. The review concluded that it is likely that different avian species may be affected differently by solar developments, dependent on the habitat around a solar PV development, the spatial requirements of a given species and the foraging behavior of that species (Harrison et al., 2016). One potential effect considered the polarized light effect from the solar panels that may cause birds to mistake the solar panels for water and thus result in collisions (Bryant et al., 1984). However, the limited number of mortality studies that have been conducted suggests that the incidence of bird mortality associated with bird collisions with PV developments is very low (DeVault et al., 2014; Walston et al., 2016). According to the literature review, there is likely to be a higher risk of bird collision with infrastructure associated with solar PV developments such as overhead powerlines (Harrison et al., 2016).

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

Two other forms of direct impact are possible. The Project will result in the loss or conversion of some of the cover types utilized as habitat for some species and temporary disturbance during construction will displace some species. A summary of the areas of the existing cover types and proposed post-Project cover types is provided in **Table 1**.

The largest alteration will involve the conversion of agricultural fields to permanent grass and legume cover in the solar array fields. Although some species, such as European starling, mourning dove (*Zenaida macroura*) and American robin (*Turdus migratorius*) may prefer cultivated fields over grass fields, these species are common and are not limited by the availability of cultivated fields because they use other habitats readily. The management of the fields in permanent grass cover is unlikely to attract additional grassland bird species as the solar panels breakup the continuity of the cover in a similar way that trees and shrubs would. Species that utilize edge habitat are likely to continue to be attracted to the edges of the solar array development. Several of the generalist species observed within the agricultural fields are also likely to continue to forage in the grassland associated with the solar array.

Approximately 57.4 acres of forested upland will be cleared for the Project which will result in some habitat loss for forest-dwelling species. The latest Core Forest GIS coverage available (June, 2019) shows that there is no Core Forest resource on or adjacent to the Project Site.

There will be no reduction in habitat area of the forested wetlands, vernal pools, and aquatic and riparian habitats associated with Ketch Brook, or the scrub-shrub cover within the powerline ROW.

Mitigative Actions

To avoid the potential disturbance of birds during the breeding season, the Applicant proposes the following time-of-year schedule:

- If construction activities are to occur during the nesting period between early May through mid-August, vegetation removal work (forest tree removal and agricultural clearing) should be cleared before May 1st and after August 31st.
- Install nest boxes for American kestrel in suitable areas.

Herpetofauna

Reptile Surveys

Observations of reptiles and amphibians were recorded during vernal pool surveys (see separate report in **Exhibit K**) and when incidentally encountered during other investigations. Correspondence from the NDDB reported the potential for wood turtle (*Glyptemys insculpta*), a state species of special concern, to occur within the Project Site. A dedicated wood turtle survey was performed from the late morning of May 5, 2020 through the afternoon hours. VHB biologists used the survey methodology described within Flanagan et al. 2013: wood turtles are most likely to be observed within 10 meters (m) of waterways from spring through July 1 on warm days with temperatures within the 50-75°F range. Three biologists walked the length of Ketch Brook upstream from the railroad crossing to the eastern limits of the Project Site: one biologist waded through the stream and paid particular attention to calm pools where turtles may have been resting and sandy and muddy banks; the two other biologists each walked within 10 m of opposite sides of the

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

stream bank where topography allowed.[3] Wood turtles were not detected during this survey, but it will be repeated in late May or June when temperatures are warmer and the western stretch of Ketch Brook will be targeted.

Species that were observed or have the potential to occur within the Project Site are included in **Table B-2** in **Attachment B. Some** observations of non-listed species included painted turtle (*Chrysemys picta*) and garter snake (*Thamnophis sp*.).

State-Listed Herpetofauna and Potential Project Impacts

Wood turtle

Wood turtles require riparian habitats bordered by floodplain, woodland, or meadow. They hibernate in the banks of the river in submerged tree roots and in summer move to adjacent old fields, woodlands and power line corridors (Klemens, 1993). Unlike box turtles, wood turtles have home ranges of several acres, throughout which they freely roam. Because of their extensive overland movements, roads traversing wood turtle habitat contribute significantly to mortality due to vehicle conflicts (Klemens, 1993). Suitable habitat for this species may be present within the riparian corridor of Ketch Brook. The powerline ROW crossing of Ketch Brook and the railroad ROW are potential nesting sites. There is no work proposed within Ketch Brook and buffer zones are proposed from the edge of the riparian wetlands.

Wood turtles have been negatively impacted by the loss of suitable habitat and can be displaced by soil disturbance during their hibernation period. Construction activities near riverbanks and wetlands containing hibernating wood turtle could potentially harm this species. Construction activities during the turtle's active period can result in mortality from interactions with clearing equipment, earth-moving equipment, and other vehicles.

Mitigative Measures

Gravel Pit Solar will employ the following mitigative actions to prevent the incidental take or harm to the state-listed wood turtle.

- Entrenched silt fence will be used to isolate the work area from undisturbed areas that may provide habitat for a listed species. Plastic or netted fence will not be used.
- In areas where silt fence is used for exclusion it will be removed as soon as the area is stabilized to allow for reptile/amphibian passage to resume.
- A contractor awareness program will be developed and implemented to ensure that contractors can identify these species and have been instructed on proper care and handling of herpetofauna individuals should one need to be removed from the work area.
- The work area, including staging and storage areas, will be examined by construction personnel in a walk-over or sweep prior to work each day.

[3] In some cases, the stream embankment bordered on steep escarpments that could not be surveyed, in such areas the survey methodology was modified.

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

- To the extent possible, construction vehicles and equipment will be parked along access routes and in active work areas and not in potential habitat.
- Any State-Listed species encounters will be reported to the CTDEEP NDDB.

Mammals

VHB wildlife scientists documented observations of mammals during the several field investigations performed within the Project Site between early March 2020 and early May 2020. Direct and indirect observations, along with species that may utilize the Project Site, are documented in **Table B-3** in **Attachment B**. Notable field observations include North American beaver (*Castor canadensis*) activity along the Ketch Brook riparian corridor in the form of several beaver dams and tree girdling, raccoon prints (*Procyon lotor*), and white-tailed deer (*Odocoileus virginianus*).

Mammals within the Project Site rely on the forested areas to provide cover and breeding areas. Agricultural fields may be foraged at certain times of the year as when corn is ripening. The approximately X acres of forested area that will be cleared will not eliminate core forest blocks. Although the proposed solar array will be fenced for safety and security reasons, adequate corridors will be maintained to facilitate wildlife passage. Wildlife corridors are depicted in **Figure A-6** in **Attachment A**.

Federal-Listed Mammals

The CTDEEP NDDB did not report the potential presence of any state-listed mammals. According to the USFWS IPaC-generated Official Species List, the only federally listed species with the potential to occur within the Project Site is the federally threated northern long-eared bat (*Myotis septentrionalis*). The forested areas of the Project Site offer suitable summer roosting habitat this species.

Northern long-eared bat

The northern long-eared bat was listed under the federal ESA as a federally threatened species on April 2, 2015 and USFWS issued the Final 4(d) Rule to protect the species on January 14, 2016.[4] During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags (dead trees). Males and non-reproductive females may also roost in cooler places, like caves and mines. Northern long-eared bats seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices. They sometimes roost in anthropogenic structures like barns and sheds (USFWS, 2015). Known northern long-eared bat hibernacula within Connecticut have been mapped by CTDEEP. There are no known hibernacula within East Windsor and at the time of the map's publication (February 2016) there were no known maternity roosting trees within the entire State.

[4] On January 28, 2020 there was a federal court ruling that determined that the USFWS's decision to list the NLEB as threatened rather than endangered was not supported by the best available scientific data and that the USFWS made procedural errors in finalizing the listing. The federal judge ruled that USFWS must reconsider the listing, but until the new rule is published the threatened designation and 4(d) rule remain in effect.

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

Potential Effects of Solar Farms on Bats

Based on a literature review that has evaluated peer-reviewed publications concerning the potential impact of solar PV developments on bats, there are currently no experimental observations or theoretical scientific literature on the effect that solar panels may have on bats (Harrison et al., 2016). Generalized risks that require further scientific investigation include proximate risk such as fatal collisions with solar panels and the associated infrastructure, indirect risks such as loss of habitat from the construction of solar array developments, and potential effects on feeding behavior as some bat prey (e.g. insects) may be attracted to the reflective properties of solar panels. An experimental study that evaluated the navigational capabilities of bats over smooth plates (the plates used in the experiment were wood, plastic, and metal) reported that bats were apparently able to use echolocation to differentiate between water bodies and smooth plates and no collision mortalities were recorded (Greif and Siemers, 2010). Although smooth plates are not the same as solar panels, the study suggests that at least some species of bats may be adept at avoiding collision with flat surfaces (Greif and Siemers, 2010).

Mitigative Measures

VHB does not plan to conduct bat surveys to determine presence or potential absence of northern long-eared bat as part of the environmental review and so the Applicant will operate under the assumption that the northern long-eared bat may be present within the Project Site. To minimize the possibility of "incidental take" of roosting bat species, the Applicant will follow the guidance provided in the USFWS Final 4(d) Rule (USFWS, 2017). The Applicant will not perform any tree removal activities during the bat pupping season between June 1 and July 31 (USFWS, 2017), which coincides with the nesting period of birds between May 15 and August 31. If any bats are encountered during tree clearing activities outside of that window, then tree clearing will be immediately stopped and the Applicant will contact the Bat Program within the CTDEEP Wildlife Division to determine the proper next steps.

Invertebrates

According to the CTDEEP NDDB correspondence there are three state-listed species of insect potentially occurring in the Project Site. Descriptions of each species are provided below.

Bog Copper

The Bog Copper (*Lycaena epixanthe*), a State-Species of Special Concern, is a small butterfly that ranges in color from orange-red to brown (U.S. Forest Service, accessed 5-11-20). This species is restricted to acid fens and bogs where it nectars on its almost exclusive host cranberry (*Vaccinium macrocarpon* and *V. oxycoccos*). The bog substrate, usually *Sphagnum* moss, must be saturated or nearly so most or all of the year and the area must be sunny. Fen or bog habitats are not present on the Project Site and neither species of cranberry have been observed. Surveys are not proposed for this species since it is unlikely to occur within the Project Site.

Big sand tiger beetle

The big sand tiger beetle (*Cicindela formosa generosa*) is a State Species of Special Concern that inhabits exposed sandy substrates where its larvae are subterranean and trap insects in shallow pits they construct.

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

Adults remain active until middle and late September before overwintering. Adults resume activity in late spring. Wagner (2015) notes this species has a strong affinity to areas mapped as Windsor sands. The parent material for these soils were originally deposited as paraglacial dunes. A small area of the Project Site within the southern portion of parcel 016-50-001 is mapped as Windsor loamy sand, however, this area is forested (see the Soil Scientist Report in **Exhibit H** for additional information).

Open areas of unconsolidated sand are present within and adjacent to the active sand and gravel quarries, however, such areas undergo routine disturbance from the sand and gravel mining operations and from ATV and dirt bike use. VHB biologists walked transects within the sand and gravel quarry within parcel 027-49-017C when operations were not active in March and April 2020, though this large and rather conspicuous species was not observed. Further surveys will be conducted in warmer weather during the months of May and June. VHB biologists are unable to survey the sand and gravel quarries within parcels 057-65-001 and 048-65-007 due to active operations on these parcels.

Scribbled sallow moth

The scribbled sallow moth (*Sympistis perscripta*) is a state Species of Special Concern. It is an uncommon moth associated with infertile, droughty, open habitats such as those found within Eversource powerline ROW and open roadsides where its larval host plant, Canada toadflax (*Nuttallanthus canadensis*), is found (New York Natural Heritage Program, 2020). Scribbled sallow moth completes one generation per year in Connecticut. Flight season for adults occurs from late May into early June. Wagner et al. (2008) reports that the infrequently observed caterpillars have been seen mostly in late June while feeding on the host plant.

VHB biologists plan to survey inactive sand pits and powerline ROW for the host plant Canada toadflax during its flowering period in July.

Freshwater Mussels

The CTDEEP NDDB correspondence included records for one State-listed freshwater mussel species. During wetland delineations along Ketch Brook and during wood turtle surveys, VHB biologists observed unidentified mussel shells within and along the banks of the brook. The shells were likely left over from depredation by raccoon.

VHB did not conduct further searches for freshwater mussels during the field investigations as no work is proposed that would impact Ketch Brook where the mussels would be found.

Eastern pearlshell

The eastern pearlshell mussel (*Margaritifera margaritifera*) is a state Species of Special Concern. According to the CTDEEP, the eastern pearlshell does not have specific substrate requirements but is most often found in streams and small rivers that support trout or salmon populations (cold water fishery) (CTDEEP, 2003). Ketch Brook is considered a cold-water stream and may provide suitable habitat for this mussel species.

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

Mitigative Measures

There is no work proposed that will impact Ketch Brook within the Project Site. Mitigation will consist of good housekeeping practices and enhanced erosion and sediment controls installed along slopes that drain to Ketch Brook.

Fish

The CTDEEP NDDB correspondence included records for one State-listed fish species with the potential to occur within the Project Site. VHB biologists do not have plans to conduct fish assemblage surveys within Ketch Brook because the proposed work will not impact this resource. During field visits some fish species observations have been made, including brown trout (*Salmo trutta*) and fallfish (*Semotilus corporalis*).

American brook lamprey

The America brook lamprey is a State Endangered species that prefers cold, clear streams of small to medium size. Adults prefer gravel or sandy riffle areas, whereas ammocoetes are most often found in sandy areas. Ammocoetes transform into adults in the late summer to early fall and spawn the following spring, after which the adults die (Jacobs and O'Donnell, 2009). American brook lamprey populations have been found in a few streams of the Connecticut River drainage, typically above the first barrier to sea lamprey.

While Ketch Brook is a cold-water stream that may provide potentially suitable habitat for this species, the frequent use of ATVs within Ketch Brook and the riparian corridor creates severe turbidity issues that negatively impact the habitat quality.

Mitigative Measures

There is no work proposed that will impact Ketch Brook within the Project Site. Mitigation will consist of good housekeeping practices and enhanced erosion and sediment controls installed along slopes that drain to Ketch Brook.

Vascular Plants

State-Listed Plant Species

Correspondence with the CTDEEP NDDB indicated that there are records for four state-listed vascular plants in the vicinity of the Project Site that are protected under the CT ESA.

Short-awned meadow foxtail

Short-awned meadow foxtail (*Alopecurus aequalis*) is a state Threated species. Plant of man-made or disturbed habitats, banks of rivers or lake shallows. This plant flowers May through September and surveys targeting this species will be conducted during this timeframe.

Purple milkweed

Purple milkweed (*Asclepias purpurascens*), a state species of special concern, is a plant of open areas such as woodland edges, powerlines, along railroads, and roadsides but is known to penetrate into woodlands

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

(Farnsworth and DiGregorio, 2002). It prefers wet, mesic to dry soils that are not high in organic material. Surveys for this plant will be undertaken in June-July during its flowering period.

Dwarf huckleberry

Dwarf huckleberry (*Gaylussacia bigeloviana*) is a state Threatened species. This plant species occurs in bogs and acid fens which are not present within the Project Site. The Morris Road Poor Fen is separated from the Site by a railroad grade. No similar habitat is present within the Site and therefore surveys are not proposed.

Climbing fern

Climbing fern (*Lygodium palmatum*) is a state Species of Special Concern. This plant species is a wintergreen low climber entwinning itself over other plants. Surveys along the floodplain of Ketch Brook, the Eversource electric transmission ROW and edges of woodlands were conducted in early to mid-March and April before spring leaf out when this species is easiest to detect. No observations were made.

Mitigative Measures

VHB biologists will perform plant surveys for the State-listed plants for which there is suitable habitat within the Project Site during the blooming period for each plant. Any observed occurrences of the state-listed plant species will be cordoned off with protective flagging to prevent disturbance to these areas during construction. If avoidance is impracticable, additional coordination will be undertaken to comply with the CT ESA.

Pollinator Habitat Enhancement

The Applicant will plant the Project Site's road-facing perimeter with a vegetative buffer that will feature native trees, shrubs, and pollinator seed mixes to provide a visual screen to abutters and as habitat for native pollinators, where possible. Pollinators are essential for food production. Research has shown that where habitat needs are met, wild native bees contribute substantially to crop pollination (Pollinator Health Task Force, 2016). With the serious decline and difficulty of procuring hives of European honey bees for crop pollination, protecting and restoring habitat for native pollinators has become ever more important. Pollinator habitat includes native flowering plants that support bees, birds, butterflies, bats, and other animals that provide pollination services essential to the survival of flowering plants (Pollinator Health Task Force, 2016).

Today, pollinators face a variety of challenges, including habitat loss due to development, altered land use patterns, and climate change, as well as exposure to pests, pathogens, pesticides, and other stressors (Pollinator Health Task Force, 2016). One of the overarching goals of the Pollinator Partnership Action Plan is the restoration or enhancement of seven million acres of land for pollinators over the next five years (from 2016 through 2021).

To address the challenges facing pollinators, the State of Connecticut passed Bill No. 231: An Act Concerning Pollinator Health on May 6, 2016 (State of Connecticut, 2016). The Act is intended to protect

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

pollinator populations through restrictions on the use of the class of pesticides known as neonicotinoids and the increase and preservation of pollinator habitats.

The Applicant is evaluating different planting modules that will be applied to the road-side Project perimeters. Native plants under consideration include red oak (Quercus rubra), red maple, white spruce (Picea glauca), serviceberry (Amelanchier canadensis), eastern red cedar (Juniperus virginiana), arrowwood (Viburnum dentatum), northern bayberry (Myrica pensylvanica), red chokeberry (Aronia arbutifolia), and winged suman (Rhus copallina). Additionally, a pollinator seed mix would be applied between the tree/shrub line and the mowed area abutting the street shoulder where possible.

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

References

Bevier, L. R. (Ed.). Atlas of Breeding Birds of Connecticut. 1994. Bulletin 113. State Geological and Natural History Survey of Connecticut. 461 p.

Bowers-Altman, J. (undated). Freshwater Mussels of New Jersey. New Jersey Endangered and Nongame Species Program, New Jersey Department of Environmental Protection. http://www.conservewildlifenj.org/downloads/cwnj_657.pdf. Accessed May 15, 2020.

Connecticut Department of Energy and Environmental Protection. December 1999. Short-eared owl fact sheet. https://portal.ct.gov/DEEP/Wildlife/Fact-Sheets/Short-eared-Owl. Accessed May 20, 2020.

Connecticut Department of Energy and Environmental Protection. 2003. A Field Guide to Freshwater Mussels of Connecticut. Bureau of Natural Resources.

Connecticut Department of Energy and Environmental Protection. 2015. Connecticut Wildlife Action Plan.

Connecticut Department of Energy and Environmental Protection. February 2016. Northern long-eared bat areas of concern in Connecticut to assist with Federal Endangered Species Act Compliance. http://www.ct.gov/deep/lib/deep/endangered_species/images/nleb_approved2_16.pdf.

Connecticut Department of Energy and Environmental Protection. June 2019. Forestland Habitat Impact Map. https://www.arcgis.com/home/item.html?id=f9175844f49b4385a6096bcd200ad931. Accessed May 20, 2020.

Connecticut Environmental Conditions Online. March 2011. Connecticut Critical Habitats. https://cteco.uconn.edu/guides/resource/CT_ECO_Resource_Guide_Critical_Habitat.pdf.

Cornell Lab of Ornithology. eBird Observations from 1900-2020 for Hartford County, Connecticut. https://ebird.org/barchart?bmo=1&emo=12&byr=1900&eyr=2020&r=US-CT-003. Accessed May 20, 2020.

DeGraaf, R.M. and Yamasaki, M. 2001. New England Wildlife: Habitat, Natural History, and Distribution. University Press of New England, Hanover, NH.

DeVault, T. L., Seamns, T.W., Schmidt J.A., Belant, J.L., Blackwell, B.F., Moores, N., Tyson, L.A., Van Pelnt, L. 2014. Bird use of solar photovoltaic installations at US airports: implications for aviation safety. Landsc. Urban Plan. 122**,** 122–128

Farnsworth, Elizabeth J. and Mario J. DiGregorio. 2002. *Asclepias purpurascens* L. (Purple milkweed) Conservation and Research Plan. New England Plant Conservation Program, Framingham, Massachusetts

Fernald, M. L. 1970. Gray's Manual of Botany, Eight Edition. D. Van Nostrand Co, New York, New York, 1632 pp.

Flanagan, Melissa, Vanessa Roy-McDougall, graham Forbes, and glen Forbes. 2013. Survey methodology for the detection of Wood Turtles (*Glyptemys insculpta*). canadian Field-naturalist 127(3): 216–223.

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

Greif, S. and Siemers, B. M. 2010. Innate recognition of water bodies in echolocating bats. Nature Communications. Nature Publishing Group, 1, November, p. 107.

Haines, A. 2011. Flora Novae Angliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England. Yale University Press. New Haven and London.

Harrison, C., Llyod, H., and Field, C. 2016. Evidence review of the impact of solar farms on birds, bats, and general ecology. Manchester Metropolitan University. Natural England, 1st ed.

Jacobs, R. P., O'Donnell, E. B., and Connecticut DEEP. (2009). A Pictorial Guide to Freshwater Fishes of Connecticut. American Brook Lamprey. Hartford, CT. Available online: https://portal.ct.gov/DEEP/Fishing/Freshwater/Freshwater-Fishes-of-Connecticut/American-Brook Lamprey. Accessed May 11, 2020.

Keys, Jr., J. C., C. Carpenter, S. Hooks, F. Koenig, W. H. McNab, W. Russell, and M. L. Smith. 1995. Ecological units of the Eastern United States – first approximation. U.S. Department of Agriculture, Forest Service, Atlanta, GA.

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

Kunz, T.H. (1982) Lasionycteris noctivagans. Mammalian Species, 172: 1-5.

Massachusetts Natural Heritage & Endangered Species Program. 2015. Rapids clubtail (Gomphus quadricholor) Species Description. http://www.mass.gov/eea/docs/dfg/nhesp/species-and conservation/nhfacts/gomphus-quadricolor.pdf. Accessed June 10, 2017.

Metzler, K., and J. Barrett. 2006. The vegetation of Connecticut: A preliminary classification. State Geological and Natural History Survey, Report of Investigations No. 12. Connecticut Natural Diversity Database, Hartford.

National Audubon Society. The Audubon Bird Guide Application. http://www.audubon.org/apps. Downloaded April 10, 2020.

Natural Resource Conservation Service. 2011. Pollinator Habitat Conservation Reserve Program Job Sheet No. CP42.

Nedeau, E. J. 2008. Freshwater Mussels and the Connecticut River Watershed. Connecticut River Watershed Council, Greenfield, Massachusetts. 132 pp.

New York Natural Heritage Program. 2020. Online Conservation Guide for *Sympistis perscripta*. Available from: https://guides.nynhp.org/scribbled-sallow-moth/. Accessed May 11, 2020.

Pollinator Health Task Force. June 2016. Pollinator Partnership Action Plan. Washington DC.

State of Connecticut. 2016. Substitute Senate Bill No. 231/Public Act No. 16-17. An Act Concerning Pollinator Health. Enacted January 1, 2017.

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

U.S. Fish and Wildlife Service. 2015. Northern long-eared bat (*Myotis septentrionalis*) Fact Sheet. https://www.fws.gov/midwest/endangered/mammals/nleb/nlebFactSheet.html. Accessed May 15, 2020.

U.S. Fish and Wildlife Service. Official Species Consultation. Information for Planning and Consultation. https://ecos.fws.gov/ipac/. Accessed May 8, 2020.

U.S. Fish and Wildlife Service. May 2017. Northern long-eared bat (*Myotis septentrionalis*) status: Threatened with 4(d) Rule. https://www.fws.gov/Midwest/endangered/mammals/nleb/index.html. Accessed May 8, 2020.

U.S. Forest Service, Eastern Region. The Bog Copper (*Lycaena epixanthe*). https://www.fs.fed.us/wildflowers/pollinators/pollinator-of-the-month/bog_copper.shtml. Accessed May 11, 2020.

Wagner, D. L., D. F. Schweitzer, J. B. Sullivan, and R. C. Reardon. 2008. Owlet Caterpillars of Eastern North America (Lepidoptera: Noctudiae).

Wagner, D. L. 2015. Connecticut Expansion Project: Invertebrate Habitat Assessment. Prepared for AECOM. http://www.nae.usace.army.mil/Portals/74/docs/Topics/Tennessee%20Pipeline%20Project/Connecticut/Attachment%20K/Attachment%20K(D)%20Terrestrial%20Invertebrate%20Report.pdf.

Walston, L. J., Rollins, K. E., LaGory, K. E., Smith, K. P. and Meyers, S. A. 2016. A preliminary assessment of avian mortality at utility-scale solar energy facilities in the United States. Renewable Energy, 92, July, pp. 405–414.

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

Ref: 42569.00
May 20, 2020

Attachment A – Figures

Figure A-1: Site Location Map

Figure A-2: Natural Diversity Data Base State-listed Species Coverage & CT Critical Habitats

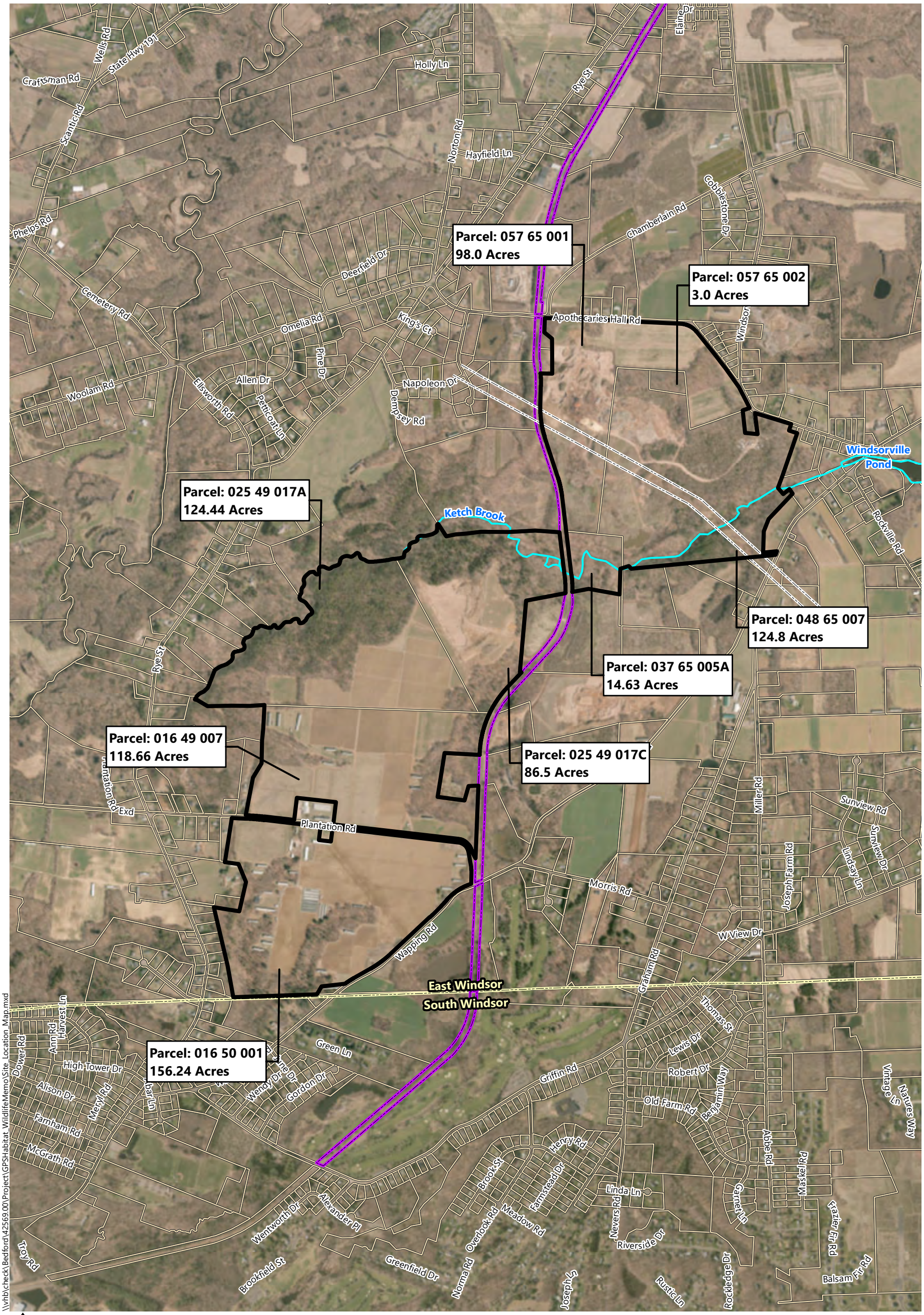
Figure A-3: Habitat Cover Types

Figure A-4: Converted Habitat Cover Types

Figure A-5: Bird Survey Routes

Figure A-6: Wildlife Corridors

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300



\\vhb\check\Bedford\42569.00\Project\GPSHabitat_WildlifeMemo\Site_Location_Map.mxd

0 700 1400 2800 Feet

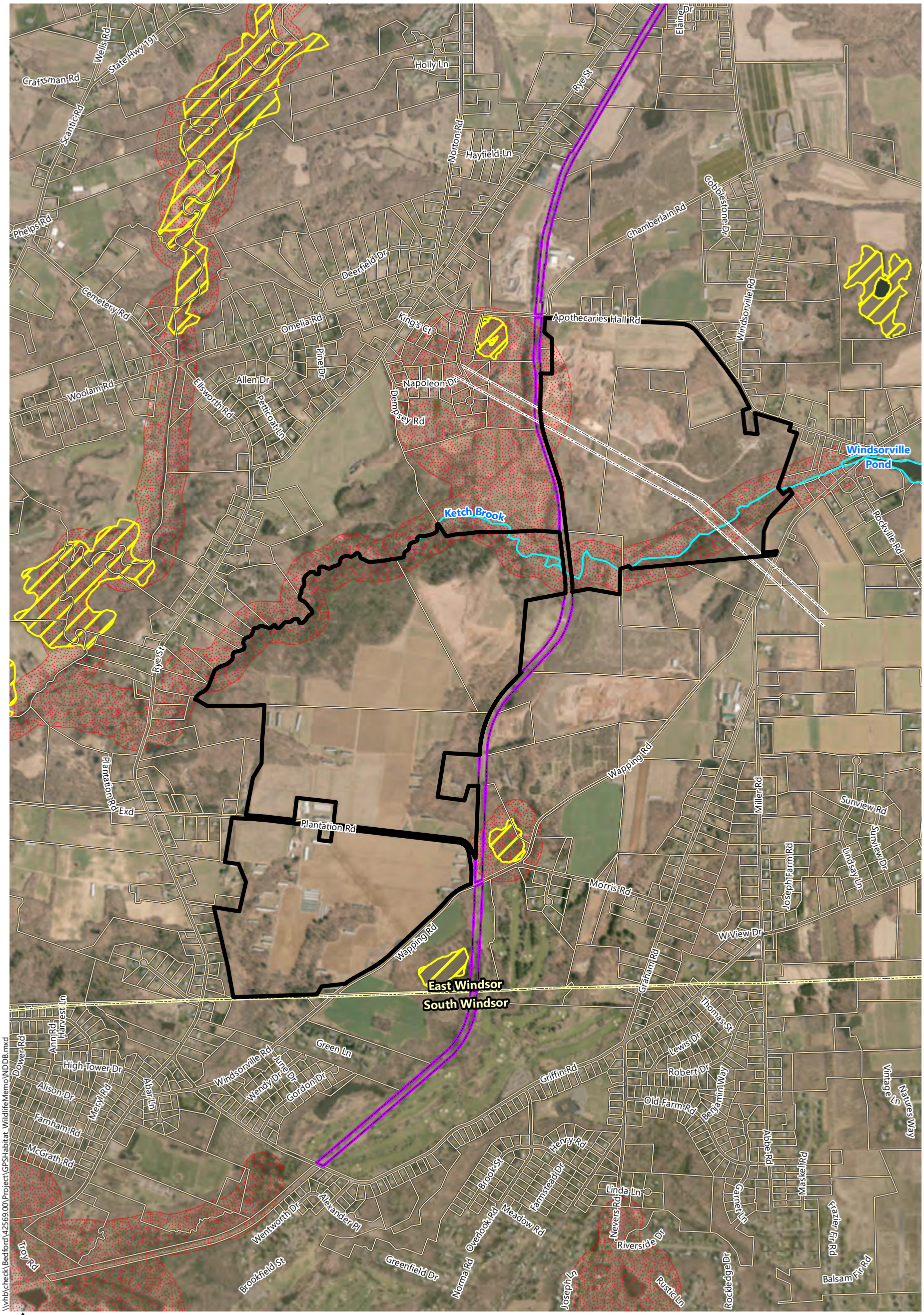
- Property Boundary
- Adjacent Parcels
- Town Boundary
- Approximate Railroad Boundary
- Approximate Eversource ROW
- Stream

Gravel Pit Solar | East Windsor, Connecticut

Figure A-1
Site Location Map

Source: VHB, CTDEEP, ESRI

May 21, 2020



\\vhb\check\Bedford\42569.00\Project\GPSHabitat_WildlifeMemo\NDDB.mxd

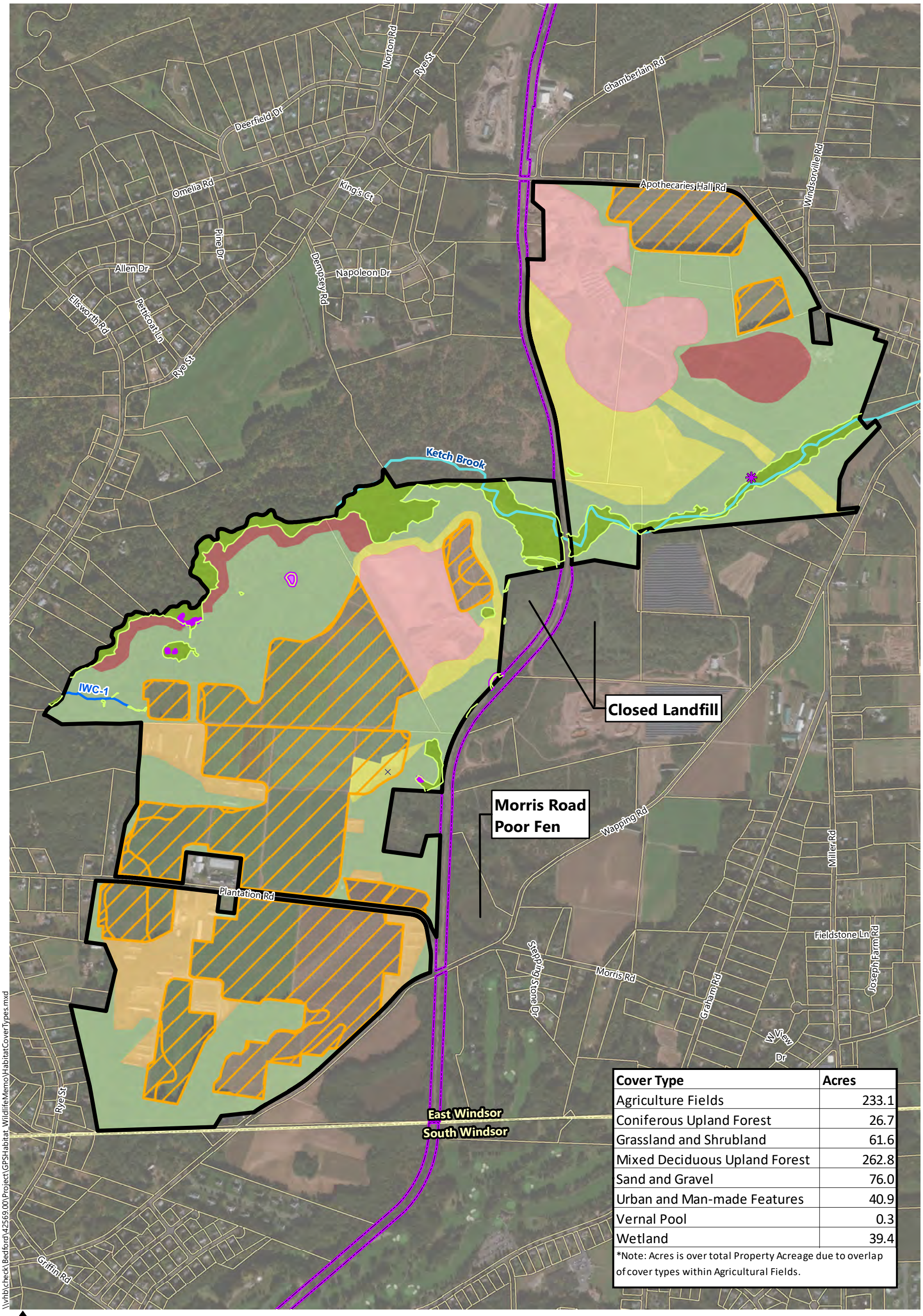
0 700 1400 2800 Feet

- Property Boundary
- Adjacent Parcels
- Town Boundary
- Approximate Railroad Boundary
- Approximate Eversource ROW
- Stream
- CT Critical Habitat
- *Potential locations of state-listed species according to CT Natural Diversity Data Base*

Gravel Pit Solar | East Windsor, Connecticut

Figure A-2
Natural Diversity Data Base
State-listed Species Coverage

Source: VHB, CTDEEP, ESRI



Cover Type	Acres
Agriculture Fields	233.1
Coniferous Upland Forest	26.7
Grassland and Shrubland	61.6
Mixed Deciduous Upland Forest	262.8
Sand and Gravel	76.0
Urban and Man-made Features	40.9
Vernal Pool	0.3
Wetland	39.4

*Note: Acres is over total Property Acreage due to overlap of cover types within Agricultural Fields.

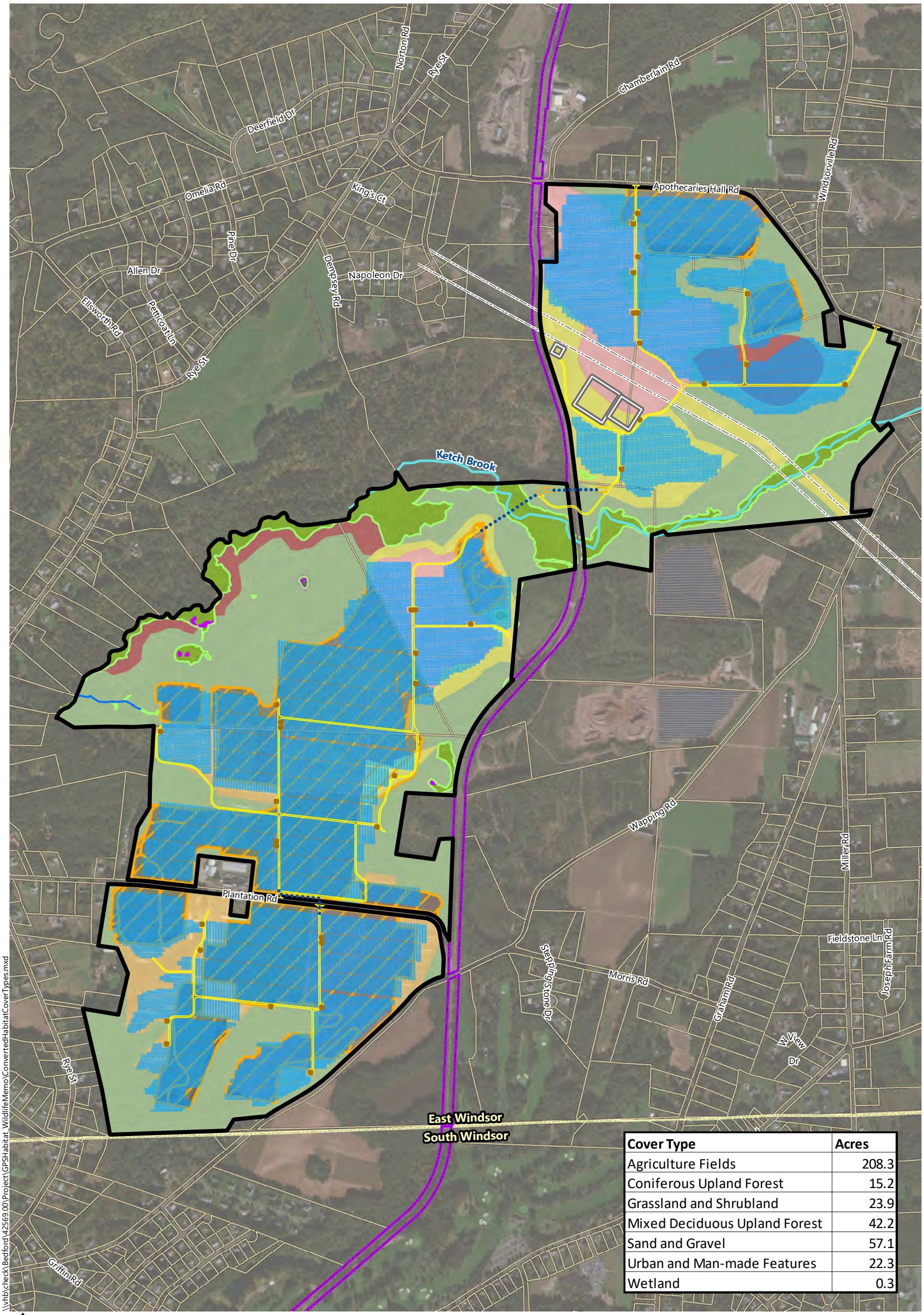
0 500 1000 2000 Feet

- Property Boundary
- Adjacent Parcels
- Town Boundary
- Approximate Railroad ROW
- Connecticut Inland Wetlands
- Delineated Wetland Edge
- Vernal Pool
- Stream/River
- Delineated Intermittent Watercourse
- Beaver Impoundment Pool
- Sand and Gravel Quarries
- *Early Successional Grassland and Shrubland*
- *Urban and Man-Made Features*
- *Coniferous Upland Forest*
- *Mixed Deciduous Upland Forest*

Gravel Pit Solar | East Windsor, Connecticut

Figure A-3
Habitat Cover Types

Source: VHB, CTDEEP, ESRI



Cover Type	Acres
Agriculture Fields	208.3
Coniferous Upland Forest	15.2
Grassland and Shrubland	23.9
Mixed Deciduous Upland Forest	42.2
Sand and Gravel	57.1
Urban and Man-made Features	22.3
Wetland	0.3

0 500 1000 2000 Feet

- Property Boundary
- Adjacent Parcels
- Town Boundary
- Approximate Railroad Boundary
- Approximate Eversource ROW
- Wetland Resource Areas
- Delineated Wetland Edge
- Vernal Pool
- Stream/River
- Delineated Intermittent Watercourse

Gravel Pit Solar

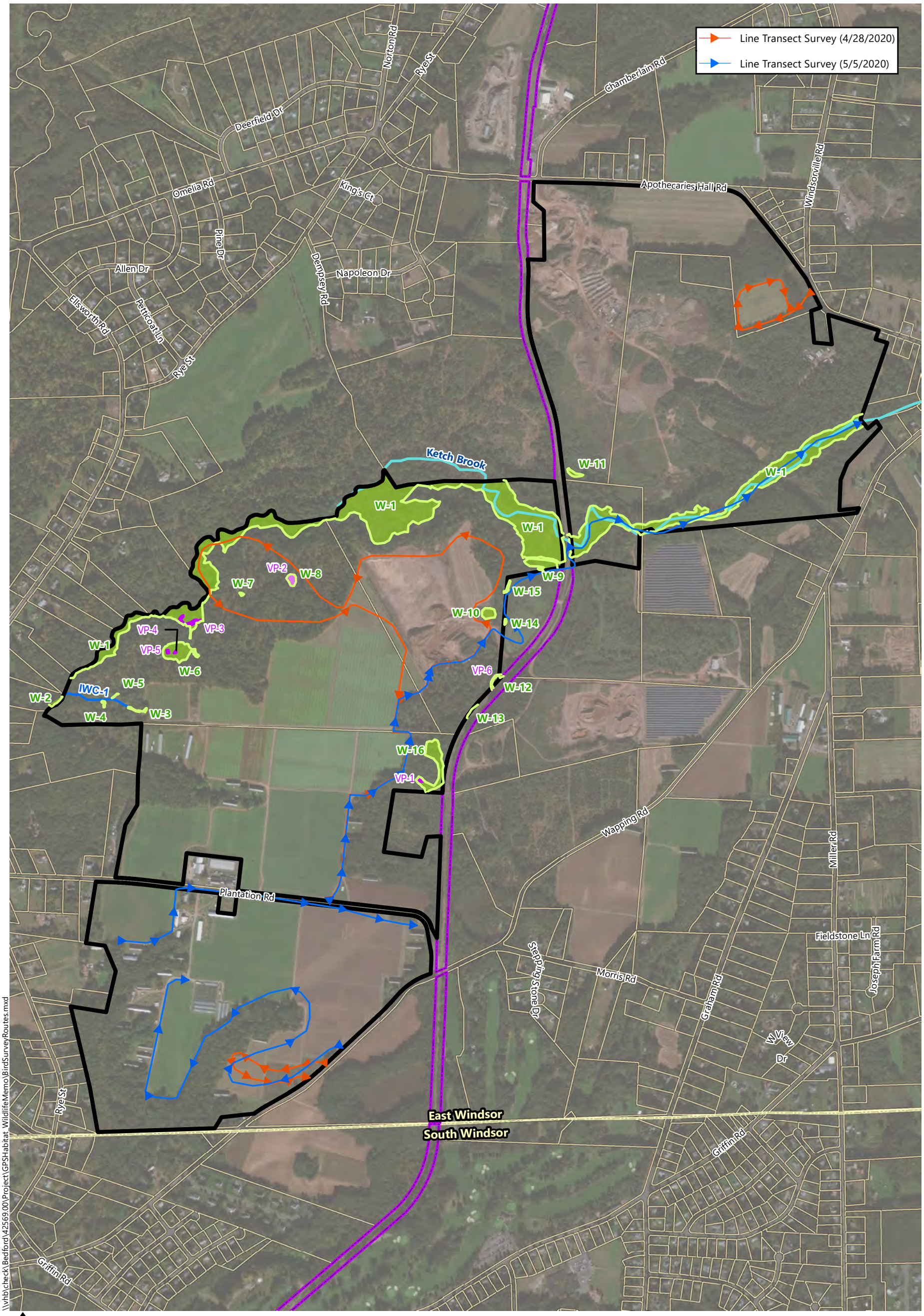
- Agricultural Fields
- Sand and Gravel Quarries
- Early Successional Grassland and Shrubland
- Urban and Man-Made Features
- Coniferous Upland Forest
- Mixed Deciduous Upland Forest
- Solar Array
- Equipment Pad
- Substation
- Boring Pit
- Proposed Road
- Potential Cable Route

East Windsor, Connecticut

Figure A-4
Converted Habitat Cover Types

Source: VHB, CTDEEP, ESRI

May 21, 2020



\\vhb\check\Bedford\42569.00\Project\GPSHabitat_WildlifeMemo\BirdSurveyRoutes.mxd

0 500 1000 2000 Feet

- Property Boundary
- Adjacent Parcels
- Town Boundary
- Approximate Railroad ROW
- Connecticut Inland Wetlands
- Delineated Wetland Edge
- Vernal Pool
- Stream/River
- Delineated Intermittent Watercourse

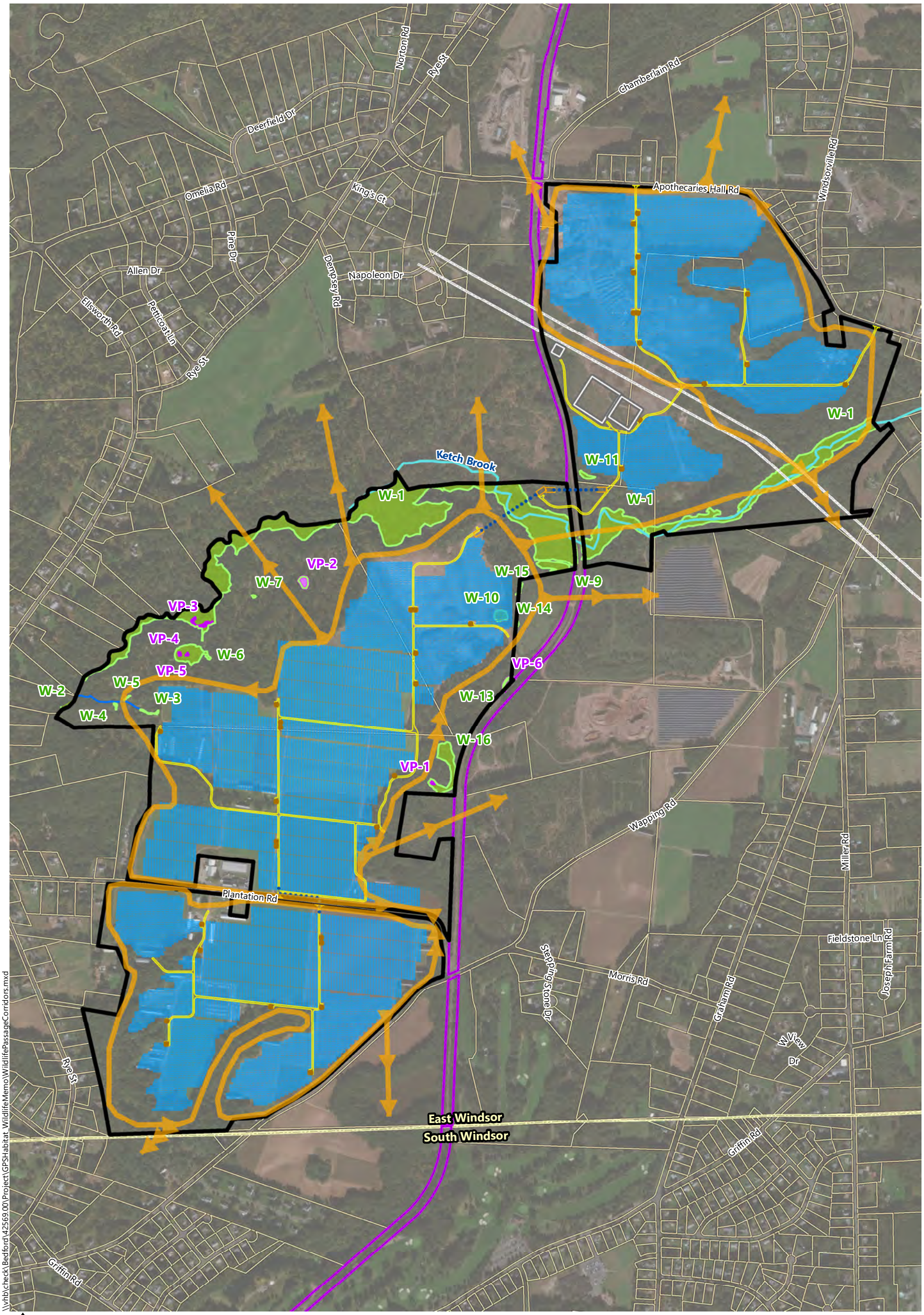
Gravel Pit Solar

East Windsor, Connecticut

Figure A-5
Bird Survey Routes

Source: VHB, CTDEEP, ESRI

May 21, 2020



0 500 1000 2000 Feet

- Property Boundary
- Adjacent Parcels
- Town Boundary
- Approximate Railroad Boundary
- Approximate Eversource ROW
- Wetland Resource Areas
- Delineated Wetland Edge
- Vernal Pool
- Stream/River
- Delineated Intermittent Watercourse
- Solar Array
- Equipment Pad
- Substation
- Boring Pit
- Proposed Road
- Wildlife Passage Corridors
- Potential Cable Route

Gravel Pit Solar

East Windsor, Connecticut

Figure A-6
Wildlife Passage Corridors

Source: VHB, CTDEEP, ESRI

Ref: 42569.00
May 20, 2020

Attachment B – Species Observation and Potential Occurrence Tables

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

Table B-1 Observed and Potential Bird Species

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Least Bittern[B] (S-T)									
Great Blue Heron[B]							P	**O**	
Green Heron[B]		P					P	**O**	
Turkey Vulture[B]		P	P	P	P	P			
Canada Goose[B]	O								
Wood Duck[B]							P	O	
Hooded Merganser[B]							P	**O**	
Mallard[B]					P		P	P	
Sharp-shinned Hawk[M] (S-E)	P	P	P						
Cooper's Hawk[B]	P	P	P	P	P	P			
Northern Goshawk[B] (S-T)	P	P	P			P			
Red-shouldered Hawk[B]	P		**O**	**O**			**O**		

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern
Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Broad-winged Hawk[B] (S-SC)	P	P			P	P			
Red-tailed Hawk[B]	P	O	O	P	P	O	P		
Rough-legged Hawk[M]			P	P	P	P	P		
American Kestrel[B] (S-SC)		P	**O**	**O**	P	P			
Ring-necked Pheasant[B]			P						
Ruffed Grouse[B]									
Wild Turkey[B]	P	P	P	P	P	P			
Northern Bobwhite[B]									
Killdeer[B]	P	P							
Spotted Sandpiper[B]		O							
Wilson's (Common) Snipe[M]			P				P		
American Woodcock[B]			P	P	P				
Rock Dove[B]									P
Mourning Dove[B]	O	P	O	O	P	O			
Black-billed Cuckoo[B]			P	P					
Yellow-billed Cuckoo[B]			P						

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern

Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.

CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Eastern Screech-Owl[B]			P	P	P				
Great Horned Owl[B]		P	P	P	P	P			
Barred Owl[B]	P	P	P	P	P	P			
Northern Saw-whet Owl[B (S-SC)]	P	P	P	P	P				
Common Nighthawk[B (S-E)]									
Whip-poor-will[B (S-SC)]									
Chimney Swift[B]									P
Ruby-throated Hummingbird[B]			P						P
Belted Kingfisher[B]							O		
Red-bellied Woodpecker[B]				O	O				
Pileated Woodpecker[B]				O	O				
Yellow-bellied Sapsucker[B]									
Downy Woodpecker[B]				O	O				
Hairy Woodpecker[B]				O	O				
Northern Flicker[B]	P	P	O	O	P	O			P

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern

Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Eastern Wood-Pewee[B]				P	P				
Acadian Flycatcher[B]									
Willow Flycatcher[B]									
Least Flycatcher[B]									
Eastern Phoebe[B]			O		O	O	O		O
Great Crested Flycatcher[B]				O	O	P			
Eastern Kingbird[B]			P	P	P	P			
Northern Shrike[M]									
White-eyed Vireo[B]									
Yellow-throated Vireo[B]			P	P					
Warbling Vireo[B]				O	O	O			
Red-eyed Vireo[B]				P	P				
Blue Jay[B]	O		P	O	O	O			
American Crow[B]	P		O	O	P	P			O
Fish Crow[B]			P	P	P				
Horned Lark [B (S-E)]		P							
Purple Martin[B (S-SC)]									
Tree Swallow[B]	O	O	O			O			
Northern Rough-winged Swallow[B]									

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern

Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.

CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Bank Swallow[B]									
Barn Swallow[B]	O	O							O
Black-capped Chickadee[B]			P	O	O				
Tufted Titmouse[B]			O	O	O				
Red-breasted Nuthatch[B]									
White-breasted Nuthatch[B]			O	O	O				
Brown Creeper[B]				P	P				
Carolina Wren[B]			O	O	O				
House Wren[B]						P			P
Winter Wren[B]									
Golden-crowned Kinglet[B]									
Ruby-crowned Kinglet[M]									
Blue-gray Gnatcatcher[B]				O	O				
Eastern Bluebird[B]	O		O						
Veery[B]				P	P				
Hermit Thrush[B]				P	P				
Wood Thrush[B]				P	P				

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern

Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
American Robin[B]	O		O	O	P	O			
Gray Catbird[B]	O		O	O		O			
Northern Mockingbird[B]		O	O						
Brown Thrasher[B (S-SC)]			P						
European Starling[B]	O		O			O			P
Cedar Waxwing[B]			P	P	P	P	P		
Blue-winged Warbler[B]	O		P			P			
Golden-winged Warbler[B (S-E)]									
Nashville Warbler[B]							P		
Yellow Warbler[B]		P	O				O		
Yellow-rumped warbler[M]					O				
Chestnut-sided Warbler[B]			P	P	P	P			
Black-throated Green Warbler[B]				P	P				
Pine Warbler[B]				O	P				
Prairie Warbler[B]			O						
Black–and-white Warbler[B]			P	P	P				

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern
Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
American Redstart[B]			P	P	P	P			
Worm-eating Warbler[B]				P	P				
Ovenbird[B]				P					
Northern Waterthrush[B]					P				
Louisiana Waterthrush[B]					P				
Common Yellowthroat[B]			O			P			
Hooded Warbler[B]									
Canada Warbler[B]									
Scarlet Tanager[B]				O	P				
Eastern Towhee[B]			P	P		P			
American Tree Sparrow[M]			P						
Chipping Sparrow[B]	O		O			O			
Field Sparrow[B]			O						
Savannah Sparrow[B] (S-SC)			P						
Grasshopper Sparrow[B] (S-E)									
Vesper Sparrow[B] (S-E)									

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern

Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.

CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Fox Sparrow[M]									
Song Sparrow[B]	P	O	O			O			
Swamp Sparrow[B]									
White-throated Sparrow[M]	P		O			P			
Dark-eyed Junco [B]	P		O			O			
Lapland Longspur[M]									
Snow Bunting[M]	P		P						
Northern Cardinal[B]			O	O	O	O			
Rose-breasted Grosbeak[B]	P	P		O					
Indigo Bunting[B]			P			P			
Bobolink[B (S-SC)]			P						
Red-winged Blackbird[B]	O		O		P	P			
Eastern Meadowlark[B (S-T)]		P	P						
Common Grackle[B]	O	P	O	O	P	P			
Brown-headed Cowbird[B]	O	O	O	O	P	O			
Orchard Oriole[B]									
Baltimore Oriole[B]			O	O					
Pine Grosbeak[M]									

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern

Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Ketch Brook**	**Vernal Pools**	**Manmade Features**
Purple Finch[B]									
House Finch[B]									P
Common Redpoll[M]									
Pine Siskin[M]				P	P				
American Goldfinch[B]	P		O	O	P	O			
Evening Grosbeak[B]									
House Sparrow[P]	P					P			O

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern

Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.

CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

Table B-2 Observed and Potential Amphibian and Reptile Species

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Vernal Pool**	**Ketch Brook**	**Manmade Features**
AMPHIBIANS AND REPTILES									
Marbled Salamander[B]	P	P			P		P		
Spotted Salamander[B]	P	P					O		
Red Spotted Newt[B]	P	P			P		P	P	
Northern Dusky Salamander[B]	P	P					P	P	
Northern Redback Salamander[B]	P	P							
Four-toed Salamander[B]									
Northern Two-Lined Salamander[B]	P	P						P	
American Toad[B]	P	P	P		P	P	P		

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern
Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Vernal Pool**	**Ketch Brook**	**Manmade Features**
Fowler's Toad[B]		P	P		P	P	P		
Northern Spring Peeper[B]	P	P			O		O		
Gray Treefrog[B]		O			P		O		
American Bullfrog[B]									
Green Frog[B]					O		O	O	
Wood Frog[B]	P	P			P		O		
Pickerel Frog[B]		P				P	P	P	
Common Snapping Turtle[B]		P	P	P	P	P	P	P	
Painted Turtle[B]								O	
Spotted Turtle[B (S-SC)]	P	P	P	P	P	P	P	P	
Wood Turtle[B (S-SC)]	P	P	P	P	P	P	P	P	
Eastern Box Turtle[B (S-SC)]	P	P	P		P	P		P	
Common Musk Turtle[B]								P	
Northern Water Snake[B]							P	P	P
Northern Red-bellied Snake[B]	P	P	P						P
Common Garter Snake[B]	P	P	P			P	P	P	P

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern

Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Vernal Pool**	**Ketch Brook**	**Manmade Features**
Eastern Ribbon Snake[B] (S-SC)		P					P	P	P
Eastern Hognose Snake[B] (S-SC)		P	P			P			
Northern Ringneck Snake[B]	P	P							
Eastern Worm Snake[B]	P	P	P	P					
Northern Black Racer[B]		P	P		P	P			P
Eastern Smooth Green Snake[B] (S-SC)		P	P		P	P			
Black Rat Snake[B]		P	P		P	P			P
Eastern Milk Snake[B]		P	P		P	P			P

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern
Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

Table B-3 Observed and Potential Mammal Species

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	Sand and Gravel Quarries	Early Successional	Mixed Deciduous & Coniferous Upland Forest	Mixed Deciduous & Coniferous Wetland Forest	Edge	Vernal Pool	Ketch Brook	Manmade Features
Virginia Opossum[B]		P	P	P	P	P			
Masked Shrew [B]	P	P	P		P	P			
Water Shrew[B]	P	P				P	P	P	
Northern Short-tailed Shrew[B]	P	P	P		P	P			
Star-nosed Mole[B]					P	P	P	P	
Little Brown Bat[B] (S-E)	P	P	P	P	P	P	P	P	P
Silver-haired Bat[M] (S-SC)	P	P	P	P	P	P	P	P	
Eastern Pipistrelle[B]	P	P	P	P	P	P	P	P	P
Big Brown Bat[B]	P	P	P	P	P	P	P	P	P
Red Bat[B] (S-SC)	P	P	P	P	P	P	P	P	
Hoary Bat[M] (S-SC)	P	P	P	P	P	P	P	P	
Northern Long-eared Bat[B] (S-E and federally Threatened)	P	P	P	P	P	P	P	P	P
Eastern Cottontail[B]	P	P	P		P	P			
New England Cottontail[B]		P	P		P	P			
Snowshoe Hare[B]	P	P	P			P			
Eastern Chipmunk[B]	P	P	O		P				

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern

Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.

CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Vernal Pool**	**Ketch Brook**	**Manmade Features**
Woodchuck[B]	P	P	P	P	P				
Gray Squirrel[B]	O	O				O			
Red Squirrel[B]	P	P							
Southern Flying Squirrel[B]		P							
Beaver[B]								O	
White-footed Mouse[B]	P	P	P		P				P
Southern Red-backed Vole[B]	P	P	P	P	P				
Meadow Vole[B]	P	P	P		P	P			
Woodland Vole[B]		P	P		P				
Muskrat[B]						P	P	P	
Southern Bog Lemming[B (S-SC)]		P	P		P	P			
Norway Rat[B]			P	P	P				P
House Mouse			P	P	P				P
Meadow Jumping Mouse[B]	P	P	P		P	P			
Coyote[B]	P	P	P		P	P			
Red Fox[B]	P	P	P	P	P	P			
Gray Fox[B]		P	P			P			

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern

Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

	Terrestrial Habitats						Aquatic Habitats		Other
	Agricultural Field	**Sand and Gravel Quarries**	**Early Successional**	**Mixed Deciduous & Coniferous Upland Forest**	**Mixed Deciduous & Coniferous Wetland Forest**	**Edge**	**Vernal Pool**	**Ketch Brook**	**Manmade Features**
Raccoon[B]	P	P	P	P	P	P	O		
Ermine[B]	P	P	P	P	P	P			P
Fisher[B]	P	P	P						
Long-tailed Weasel[B]	P	P	P	P	P	P			P
Mink[B]	P	P		P		P	P	P	
Striped Skunk[B]	P	P	P	P	P	P			P
River Otter[B]	P	P		P		P	P	P	
White-tailed Deer[B]	P	O	O	P	P	P			
Black Bear[B]	P	P	P	P	P	P	P	P	
Bobcat[B]	P	P	P	P	P	P	P	P	

P = Potential to occur O = observed by VHB from Sept. 2019 to May 2020 **O** = GCN Species in the 2015 CWAP. B = breeding in Connecticut M = migrant/visitor
S-E = State-endangered S-T= State-threatened S-SC = State-Special Concern
Source: DeGraaf, Richard M. and Mariko Yamasaki. 2001. New England Wildlife: Habitat, Natural History and Distribution, University Press of New England, Hanover, New Hampshire, 2001.
CTDEEP. 2015. Connecticut Wildlife Action Plan. http://www.ct.gov/deep/cwp/view.asp?a=2723&q=329520&deepNav_GID=1719#Revision

Ref: 42569.00
May 20, 2020

Attachment C – Photos

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

Ref: 42569.00
May 20, 2020

Attachment D – USFWS Official Species List

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
http://www.fws.gov/newengland

In Reply Refer To: May 08, 2020
Consultation Code: 05E1NE00-2020-SLI-2503
Event Code: 05E1NE00-2020-E-07489
Project Name: Gravel Pit Solar

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2020-SLI-2503

Event Code: 05E1NE00-2020-E-07489

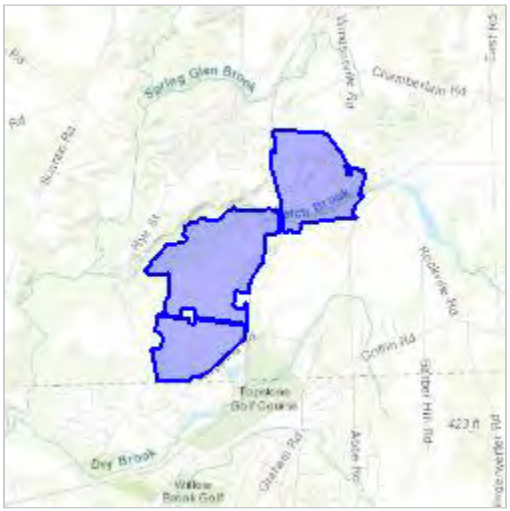
Project Name: Gravel Pit Solar

Project Type: ** OTHER **

Project Description: Development of a solar panel array in East Granby, CT.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/41.88112151152117N72.56331645640603W



Counties: Hartford, CT

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Appendix J
CT DEEP NDDB Correspondence

Connecticut Department of

ENERGY &
ENVIRONMENTAL
PROTECTION

December 31, 2019

Ms. Susan Moberg
Vanasse Hangen Brustlin
100 Great Meadow Road, Suite 200
Wethersfield. CT 06109
smoberg@VHB.com

Project: Preliminary Assessment for Gravel Pit Solar I, Development of a Solar Photovoltaic Electric Generating Facility on a 451Acre Site (Collection of 5 Properties) Located south of Apothecaries Hall Road in East Windsor, Connecticut
NDDB Preliminary Assessment No.: 201914275

Dear Susan Moberg,

I have reviewed Natural Diversity Data Base maps and files regarding the area delineated on the map provided for the Gravel Pit Solar I, Development of a Solar Photovoltaic Electric Generating Facility on 451Acre Site (Collection of 5 Properties) Located south of Apothecaries Hall Road in East Windsor, Connecticut.

According to our records there are known extant populations of State Listed Species known that occur within or close to the boundaries of this property. I have attached a list of these species to this letter. Please be advised that this is a preliminary review and not a final determination. A more detailed review will be necessary to move forward with any subsequent environmental permit applications submitted to DEEP for the proposed project. **This preliminary assessment letter cannot be used or submitted with your permit applications at DEEP**. This letter is valid for one year.

To prevent impacts to State-listed species, field surveys of the site should be performed by a qualified biologist when these target species are identifiable. A report summarizing the results of such surveys should include:

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

7. Protection strategies and/or mitigation for state listed species included in this letter.
The site surveys report should be sent to our CT DEEP-NDDB Program (deep.nddbrequest@ct.gov) for further review by our program biologists along with an updated request for another NDDB review. Incomplete reports may not be accepted.

If you do not intend to do site surveys to determine the presence or absence of state-listed species, assume they are present and please provide a protection plan to let us how you will protect the state-listed species from being impacted by this project. You may submit these protection plans with your new request for an NDDB review.

Natural Diversity Data Base information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Energy and Environmental Protection's Natural History Survey and cooperating units of DEEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substitutes for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available. The result of this review does not preclude the possibility that listed species may be encountered on site and that additional action may be necessary to remain in compliance with certain state permits.

Please contact me if you have further questions at (860) 424-3592, or dawn.mckay@ct.gov .
Thank you for consulting the Natural Diversity Data Base.
Sincerely,

Dawn M. McKay

Dawn M. McKay
Environmental Analyst 3

Species List for NDDB Request

Scientific Name	Common Name	State Status
Freshwater Community - Other Classification		
Alluvial swamp		
Poor fen		
Invertebrate Animal		
Lycaena epixanthe	Bog copper	SC
Margaritifera margaritifera	Eastern pearlshell	SC
Sympistis perscripta	Scribbled sallow moth	SC
Cicindela formosa generosa	Big sand tiger beetle	SC
Terrestrial Community - Other Classification		
Dry acidic oak forest on stratified sand and gravel		
Floodplain forest		
Vascular Plant		
Alopecurus aequalis	Short-awned meadow foxtail	T
Asclepias purpurascens	Purple milkweed	SC
Gaylussacia bigeloviana	Dwarf huckleberry	T
Lygodium palmatum	Climbing fern	SC
Vertebrate Animal		
Accipiter striatus	Sharp-shinned hawk	E
Asio flammeus	Short-eared owl	T
Falco sparverius	American kestrel	SC
Glyptemys insculpta	Wood turtle	SC
Lethenteron appendix	American brook lamprey	E
Melanerpes erythrocephalus	Red-headed woodpecker	E
Passerculus sandwichensis	Savannah sparrow	SC

E = Endangered, T = Threatened, SC = Special Concern, * Extirpated

Connecticut Department of
ENERGY &
ENVIRONMENTAL
PROTECTION

79 Elm Street • Hartford, CT 06106-5127 www.ct.gov/deep Affirmative Action/Equal Opportunity Employer

March 4, 2020

Susan Moberg
Vanasse Hangen Brustlin
100 Great Meadow Rd Suite 200
Wethersfield, CT 06109
smoberg@VHB.com

Project: Preliminary Assessment of Gravel Pit Solar IV, 250 acres north and south of Plantation Road in East Windsor, CT
NDDB Preliminary Assessment No.: 202002957

Dear Ms. Moberg,

I have reviewed Natural Diversity Database maps and files regarding the area delineated on the map provided for a preliminary assessment of the Gravel Pit Solar IV, on 250 acres north and south of Plantation Road in East Windsor, Connecticut.

According to our records there are known populations of State Listed Species that occur in the vicinity of this property. This property is primarily highlighted due to its proximity to riparian habitat and freshwater resources on surrounding properties including the Scantic River, Ketch Brook and the Morris Road Poor Fen. I have attached a list of species known from this area. Project design should consider maintaining or creating vegetated buffers to protect water quality and habitat for surrounding resources. We have not visited this site and were not provided any project plan details. Depending on the habitat available, these or other species may be present. Please be advised that this is a preliminary review and not a final determination. A more detailed review will be necessary to move forward with any environmental permit applications submitted to DEEP for the proposed project. **This preliminary assessment letter cannot be used or submitted with permit applications at DEEP**. This letter is valid for one year.

To better evaluate the property and to plan for management activities that may enhance habitat or prevent impacts to State-listed species, field surveys of the site should be performed by a qualified biologist with the appropriate scientific collecting permits at a time when these target species are identifiable. A report summarizing the results of such surveys should include:

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

proper experience with target taxon and have a CT scientific collectors permit to work with state listed species for this specific project.

The site surveys report should be sent to our CT DEEP-NDDB Program (deep.nddbrequest@ct.gov) for further review by our program biologists along with an updated request for another NDDB review. Incomplete reports may not be accepted.

If you do not intend to do site surveys to determine the presence or absence of state-listed species, then you should presume species are present and let us know how you will protect the state-listed species from being impacted by this project. You may submit these best management practices or protection plans with your new request for an NDDB review. After reviewing your new NDDB request form and the documents describing how you will protect this species from project impacts we will make a final determination and provide you with a letter from our program to use with DEEP-Permits.

Natural Diversity Database information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Energy and Environmental Protection's Natural History Survey, cooperating units of DEEP, landowners, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the NDDB should not be substitutes for onsite surveys necessary for a thorough environmental impact assessment. The result of this review does not preclude the possibility that listed species may be encountered on site and that additional action may be necessary to remain in compliance with certain state permits.

Please contact me if you have further questions at (860) 424-3378, or karen.zyko@ct.gov . Thank you for consulting the Natural Diversity Data Base.

Sincerely,

Karen Zyko
Environmental Analyst

Species List for NDDB Request

Scientific Name	Common Name	State Status
Vertebrate Animal		
Falco sparverius	American kestrel	SC
Glyptemys insculpta	Wood turtle	SC
Invertebrate Animal		
Lycaena epixanthe	Bronze copper	SC
Margaritifera margaritifera	Eastern pearlshell	SC
Vascular Plant		
Gaylussacia bigeloviana	Dwarf huckleberry	T
Critical Habitat		
Poor fen		

Additional Species Information:
American kestrel: Habitat for this bird consists of open grassy or shrubby areas with short vegetation and natural tree cavities or nest boxes for nesting. This bird is limited by habitat availability in Connecticut and it can benefit from adding and maintaining artificial nest boxes.

Poor fens are natural peatlands (bogs) occupying topographically defined basins; influenced by acidic ground water; on deep, poorly decomposed peats; dominated primarily by ericaceous shrubs.
Poor fens are primarily threatened by inputs of salts, minerals, and nutrients in both stormwater runoff and groundwater.

E = State Endangered, T = State Threatened, SC = State Special Concern
FE = Federally Endangered, FT = Federally Threatened

Appendix K
Vernal Pool Survey Technical Memorandum

Memorandum

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

Date: May 18, 2020

Project #: 42569.00

From: Jeff Peterson, PWS
Chelsea Glinka ENV SP

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

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 726 acres. 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.

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

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

Common Name	Scientific name
Jefferson Salamander	*Ambystoma jeffersonianum*
Blue-spotted Salamander complex	*Ambystoma laterale*
Spotted Salamander	*Ambystoma maculatum*
Marbled Salamander	*Ambystoma opacum*
Wood Frog	*Lithobates sylvaticus*
Eastern Spadefoot Toad	*Scaphiopus holbrookii*
Fairy Shrimp	*Eubranchipus sp.*

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 aerials 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 in 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 envelops 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

Pond ID	Area (SF)	Inlet/Outlet Flowing	Obligate Indicators	Fish Present	Vernal Pool Classification
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

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.

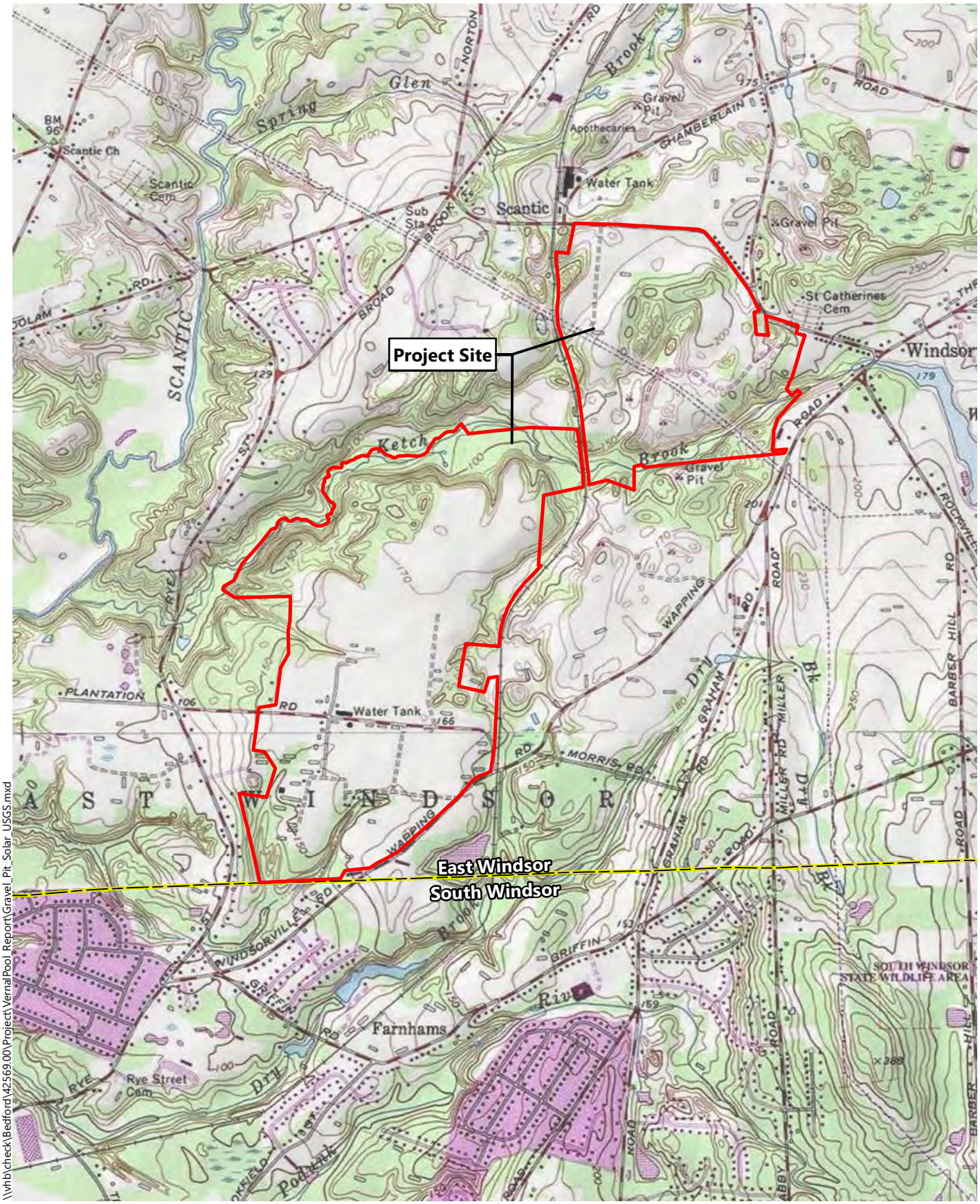
Klemens, M. W. 1993. Amphibians and reptiles of Connecticut and adjacent regions. State Geological and Natural History Survey of Connecticut, Bulletin No. 112, Connecticut Department of Environmental Protection, Hartford, CT.

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)



\\vhb\check\Bedford\42569.00\Project\VernalPool Report\Gravel_Pit_Solar_USGS.mxd

0 1000 2000 4000 Feet

Gravel Pit Solar | East Windsor, Connecticut

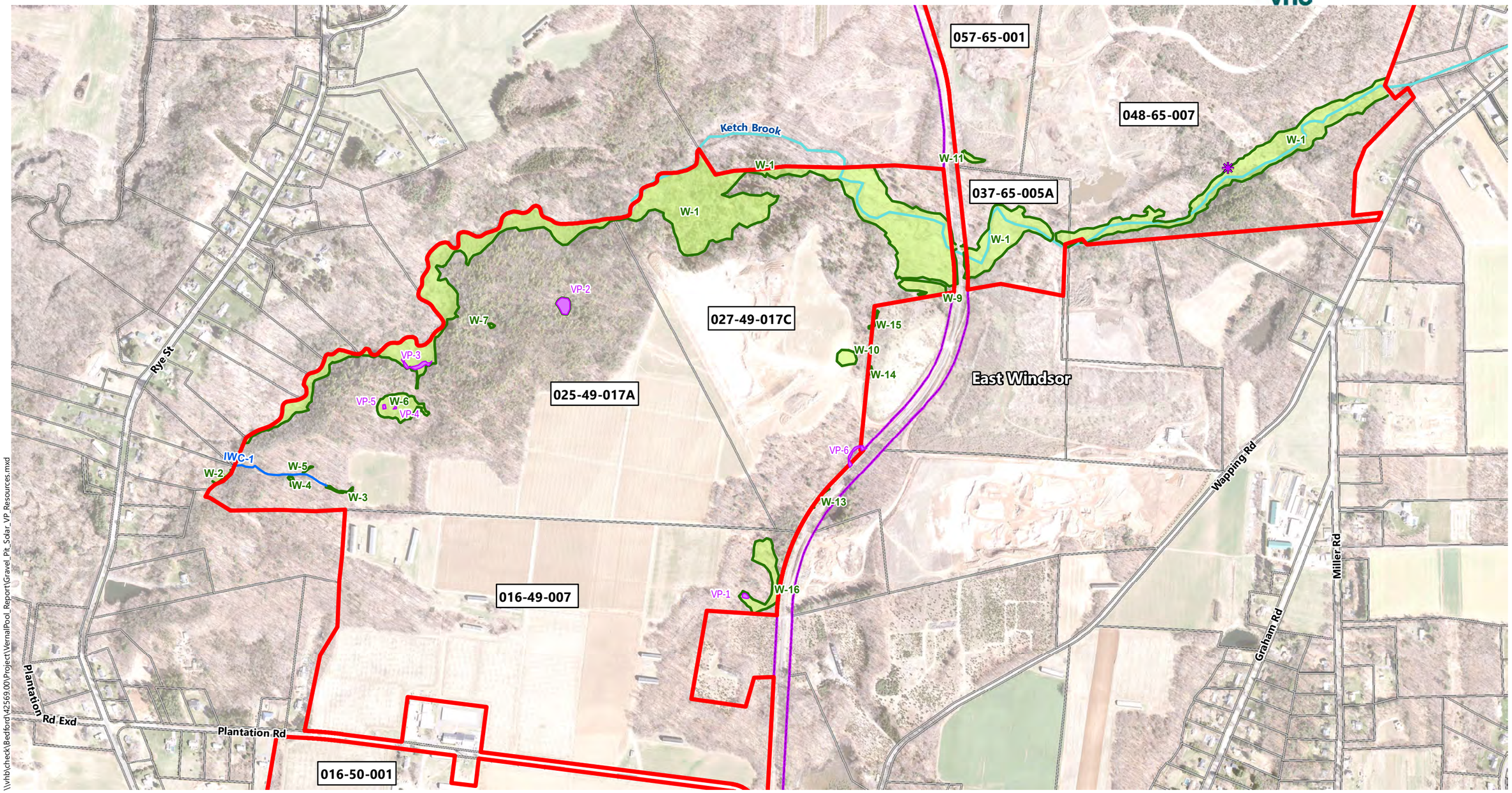
USGS Overview Map

Legend

Project Site

Town Boundary

Source: VHB, CTDEEP



\\vhb\check\Bedford\42569.00\Project\VernalPool_Report\Gravel_Pit_Solar_VP_Resources.mxd

0 350 700 1400 Feet

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

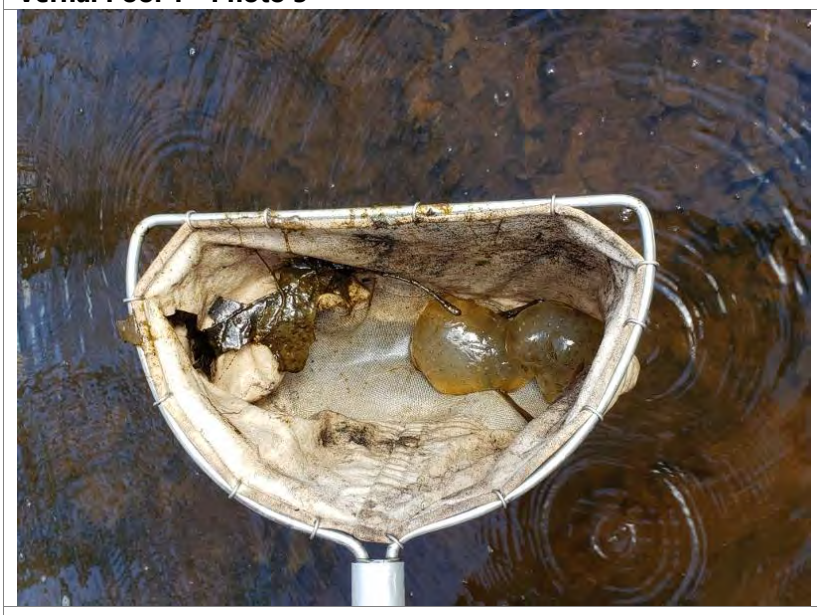
Vernal Pool Resources

Source: VHB, CTDEEP, FEMA, ArcGIS Online

Gravel Pit Solar
Vernal Pool Survey Photo Log

Vernal Pool 1 Photos

Vernal Pool 1 - Photo 1	**Description:**
	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.
Vernal Pool 1 - Photo 2	**Description:**
	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.

Vernal Pool 1 - Photo 3	**Description:**
	A view of two spotted salamander egg masses. Dip net surveys within Vernal Pool 1 yielded a count of 14 spotted salamander egg masses.
Vernal Pool 1 - Photo 4	**Description:**
	One of several adult wood frogs that were observed along the perimeter of the pool on April 7, 2020.

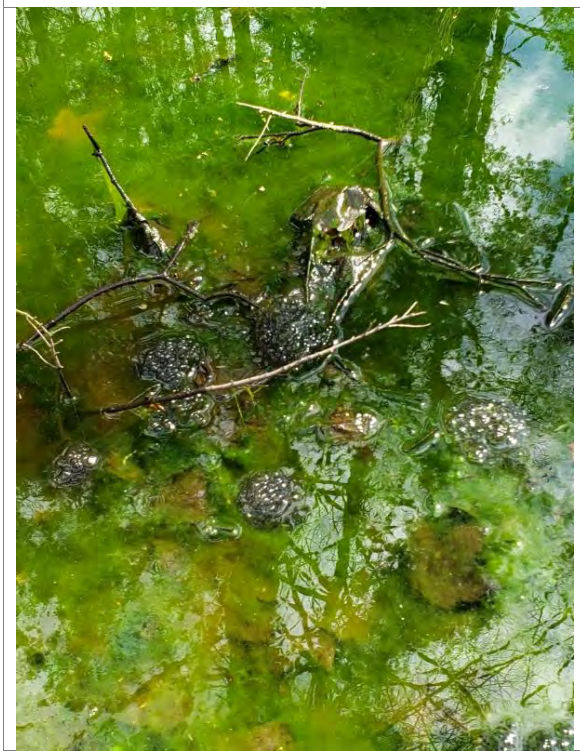
Vernal Pool 2 Photos

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.

Vernal Pool 2 - Photo 3	**Description:**
	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.
Vernal Pool 2 - Photo 4	**Description:**
	A cluster of spotted salamander egg masses on submerged branches. On April 7, 2020 VHB biologists inventoried an estimated 65 spotted salamander egg masses.

Vernal Pool 3 Photos

Vernal Pool 3 - Photo 1	**Description:**
	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 .
Vernal Pool 3 - Photo 2	**Description:**
	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.

Vernal Pool 3 - Photo 3	**Description:**
	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.
Vernal Pool 3 - Photo 4	**Description:**
	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.

Vernal Pool 4 Photos

Vernal Pool 4 - Photo 1	**Description:**
	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.
Vernal Pool 4 - Photo 2	**Description:**
	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.

Vernal Pool 4 - Photo 3	**Description:**
	A westerly view of the root mound left by the tree throw that created Vernal Pool 4.
Vernal Pool 4 - Photo 4	**Description:**
	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

Vernal Pool 5 - Photo 1	**Description:**
	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.
Vernal Pool 5 - Photo 2	**Description:**
	A raft of wood frog egg masses attached to submerged branches. VHB biologists counted approximately 80 egg masses on March 26, 2020.

Vernal Pool 5 - Photo 3	**Description:**
	A raft of wood frog egg masses above the deciduous leaf substrate.
Vernal Pool 5 - Photo 4	**Description:**
	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.

Vernal Pool 6 Photos

Vernal Pool 6 - Photo 1	**Description:**
	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.
Vernal Pool 6 - Photo 2	**Description:**
	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.

Vernal Pool 6 - Photo 3	**Description:**
	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.
Vernal Pool 6 - Photo 4	**Description:**
	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

Wetland 10 - Photo 1	**Description:**
	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.
Wetland 10 - Photo 2	**Description:**
	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.

Beaver Impoundment - Photo 1	**Description:**
	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.
Beaver Impoundment - Photo 2	**Description:**
	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.

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 ☐ No ☑	Project/property name: Gravel Pit Solar			Pool Type: Development: ☐	Reference: ☐
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: Current	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 ☑
- during construction ☐
- post construction ☐

Polarized sunglasses used? Yes ☑ No ☐

Comments:

Temporary flagging used to mark egg masses? Yes ☐ No ☑

AMPHIBIAN EGG MASS COUNTS *(required)*

Wood frogs: ☑ 1-25 ☐ 26-49

condition	Abundance categories			
If condition mixed, note "some","many" or "most"	~~50~~	☐	250-300	☐
	50-75	☐	300-400	☐
	75-100	☐	400-500	☐
	100-150	☐	500-750	☐
	150-200	☐	750-1000	☐
intact: All	200-250	☐	1000-1250	☐
breaking up:			>1250	☐
hatching:				

Describe estimation method used for a large raft:

Actual count: 25

Spotted Salamanders:

Condition:

	Total Number
intact: All	
breaking up:	1st visit: 1 2nd visit: 14
hatching:	

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)

			Flowing	Not flowing
Inlet observed?	No ☑	Yes ☐	☐	☐
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 ☑
- Leaf Litter ☑
- Sand/Silt ☐
- Silt/clay ☐
- Peat ☐
- 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		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:	X	
high:		

Dominant vegetation *(optional)*

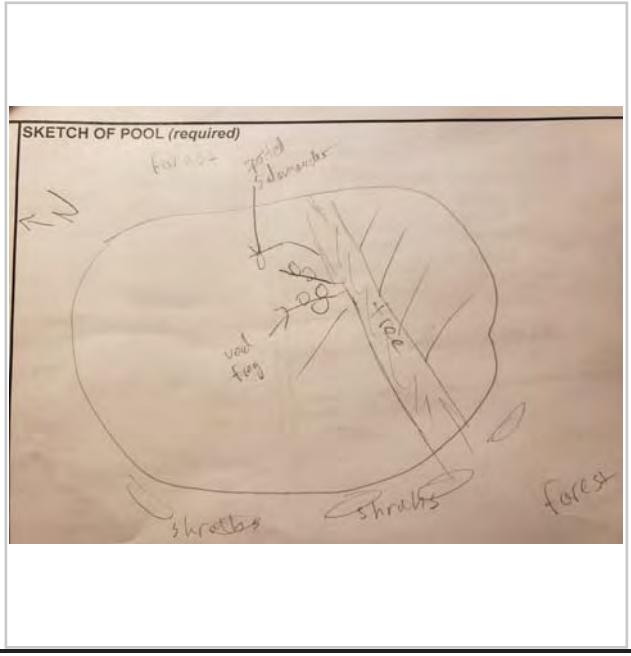
Trees/saplings:	red & silver maple, white pine
Shrubs/Vines:	Multiflora rose, speckled alder
Herbs:	jewelweed

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: ☐ Reference ☐

*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	☐	Spring Peeper	☐
Pickerel Frog	☐	Gray Tree Frog	☐
Bull Frog	☐	Pickerel Frog	☐
Eastern Toad	☐	Painted Turtle	☐
Spotted Turtle	☐	Snapping Turtle	☐
N. Water Snake	☐	Blue-spot. salam.	☐

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	☐
2. Surface pollen	☐
3. Dark, tannin-colored water	☑ Low
4. Deep water	☐
5. Turbidity	☐
6. Dense shrubs	☐
7. Other (specify)	☐

ADDITIONAL NOTES: *(optional)*

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 ☐ No ☑	Project/property name: Gravel Pit Solar			Pool Type: Development: ☐	Reference: ☐
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:

Current	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 ☐

Comments:

Temporary flagging used to mark egg masses? Yes ☐ No ☑

AMPHIBIAN EGG MASS COUNTS *(required)*

Wood frogs: ☐ 1-25 ☐ 26-49

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

Abundance categories

~~<50~~	☐	250-300	☐
50-75	☐	300-400	☐
75-100	☐	400-500	☐
100-150	☐	500-750	☐
150-200	☐	750-1000	☐
200-250	☑	1000-1250	☐
		>1250	☐

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)

			Flowing	Not flowing
Inlet observed?	No ☑	Yes ☐	☐	☐
Outlet observed?	No ☑	Yes ☐	☐	☐
finfish observed?	No ☑	Yes ☐		

Estimated water depth range? 1-4.5 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: 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(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° 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	

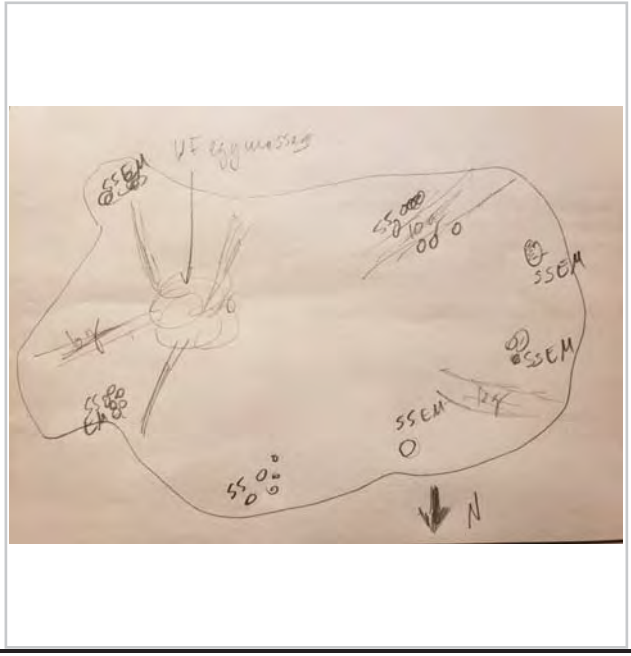
Dominant vegetation *(optional)*
- Trees/saplings: eastern hemlock, yellow birch, red maple, pin oak
- Shrubs/Vines: yellow birch
- Herbs:

VERNAL POOL DATA SHEET, *p. 2*

Survey Date: 3/24/2020	Investigator(s): C. Glinka, M. Murphy	Town: East Windsor	**CAWS Pool #:**	VP2	CAWS Project #:
Project/property name: Gravel Pit Solar				Pool Type:	Development: ☐ Reference ☐

*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	☐	Spring Peeper	☐
Pickerel Frog	☐	Gray Tree Frog	☐
Bull Frog	☐	Pickerel Frog	☐
Eastern Toad	☐	Painted Turtle	☐
Spotted Turtle	☐	Snapping Turtle	☐
N. Water Snake	☐	Blue-spot. salam.	☐

Other Observed Fauna (Pool & Fringe):

predacious diving beetles, water striders, caddisfly casings

*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	☐
2. Surface pollen	☐
3. Dark, tannin-colored water	☑ Low
4. Deep water	☑ Low
5. Turbidity	☐
6. Dense shrubs	☐
7. Other (specify)	☐

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 ☐ No ☑	Project/property name: Gravel Pit Solar		Pool Type:	Development: ☐	Reference: ☐
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: Current	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 ☐

Comments:

Temporary flagging used to mark egg masses? Yes ☐ No ☑

AMPHIBIAN EGG MASS COUNTS *(required)*

Wood frogs: ☐ 1-25 ☐ 26-49

condition	Abundance categories			
If condition mixed, note "some","many" or "most"	~~50~~	☐	250-300	☐
	50-75	☐	300-400	☐
	75-100	☐	400-500	☐
	100-150	☑	500-750	☐
	150-200	☐	750-1000	☐
intact: All	200-250	☐	1000-1250	☐
breaking up:			>1250	☐
hatching:				

Describe estimation method used for a large raft:

Actual count: ~120; counted in groups of approximately 10

Spotted Salamanders:

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

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)

			Flowing	Not flowing
Inlet observed?	No ☑	Yes ☐	☐	☐
Outlet observed?	No ☐	Yes ☑	☑	☐
finfish observed?	No ☑	Yes ☐		

Estimated water depth range? 1-2 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:	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 ☑
- Leaf Litter ☑
- Sand/Silt ☐
- Silt/clay ☐
- Peat ☐
- 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%	shrubland		meadow	
pasture		lawn		building	
exposed soil		grading		ag. field	
road ☐	busy (>1 car/10 min.)	yes ☐	no ☐		
parking lot ☐					

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

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: ☐ Reference ☐

*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	☐	Spring Peeper	☐
Pickerel Frog	☐	Gray Tree Frog	☐
Bull Frog	☐	Pickerel Frog	☐
Eastern Toad	☐	Painted Turtle	☐
Spotted Turtle	☐	Snapping Turtle	☐
N. Water Snake	☐	Blue-spot. salam.	☐

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 ☑	moderate
2. Surface pollen ☐	
3. Dark, tannin-colored water ☐	
4. Deep water ☐	
5. Turbidity ☐	
6. Dense shrubs ☐	
7. Other (specify) ☐	

ADDITIONAL NOTES: *(optional)*

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 ☐ No ☑	Project/property name: Gravel Pit Solar			Pool Type: Development: ☐	Reference: ☐
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

Current: 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 ☑
- 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~~

condition

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

intact: All

breaking up:

hatching:

Abundance categories

~~50~~	☐	250-300	☐
50-75	☑	300-400	☐
75-100	☐	400-500	☐
100-150	☐	500-750	☐
150-200	☐	750-1000	☐
200-250	☐	1000-1250	☐
		>1250	☐

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)

			Flowing	Not flowing
Inlet observed?	No ☑	Yes ☐	☐	☐
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 ☑
- Leaf Litter ☑
- Sand/Silt ☐
- Silt/clay ☐
- Peat ☐
- 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? 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

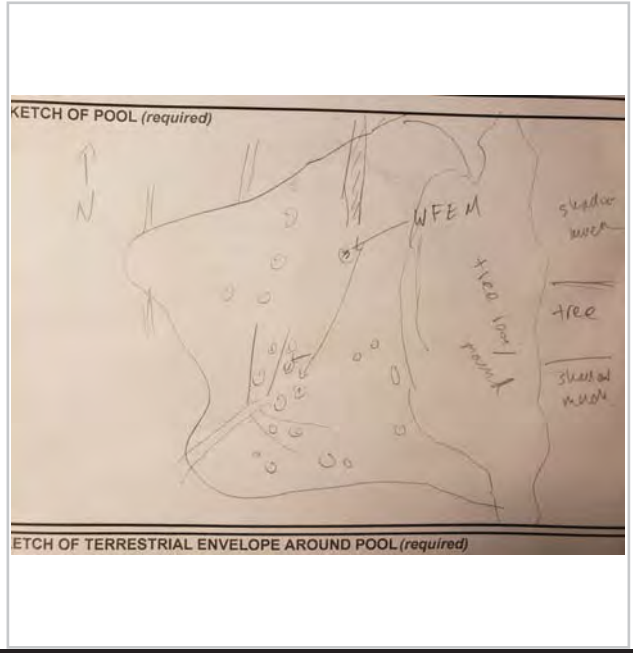
Herbs: skunk cabbage

VERNAL POOL DATA SHEET, *p. 2*

Survey Date: 3/26/2020	Investigator(s): C. Glinka, M. Murphy	Town: East Windsor	**CAWS Pool #:**	VP4	CAWS Project #:
Project/property name: Gravel Pit Solar				Pool Type:	Development: ☐ Reference ☐

*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	☐	Spring Peeper	☐
Pickerel Frog	☐	Gray Tree Frog	☐
Bull Frog	☐	Pickerel Frog	☐
Eastern Toad	☐	Painted Turtle	☐
Spotted Turtle	☐	Snapping Turtle	☐
N. Water Snake	☐	Blue-spot. salam.	☐

Other Observed Fauna (Pool & Fringe):

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 ☑	moderate
2. Surface pollen ☐	
3. Dark, tannin-colored water ☑	low
4. Deep water ☐	
5. Turbidity ☐	
6. Dense shrubs ☐	
7. Other (specify) ☐	

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 ☐ No ☑	Project/property name: Gravel Pit Solar			Pool Type: Development: ☐	Reference: ☐
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

Current: 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~~

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

Abundance categories

~~50~~	☐	250-300	☐
50-75	☐	300-400	☐
75-100	☑	400-500	☐
100-150	☐	500-750	☐
150-200	☐	750-1000	☐
200-250	☐	1000-1250	☐
		>1250	☐

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

Spotted Salamanders:

Condition:
intact:
breaking up:
hatching:

Total Number: 0

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)*

			Flowing	Not flowing
Inlet observed?	No ☑	Yes ☐	☐	☐
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 ☐
- Bedrock ☐
- Leaf Litter ☑
- Silt/clay ☐
- 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? 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)*

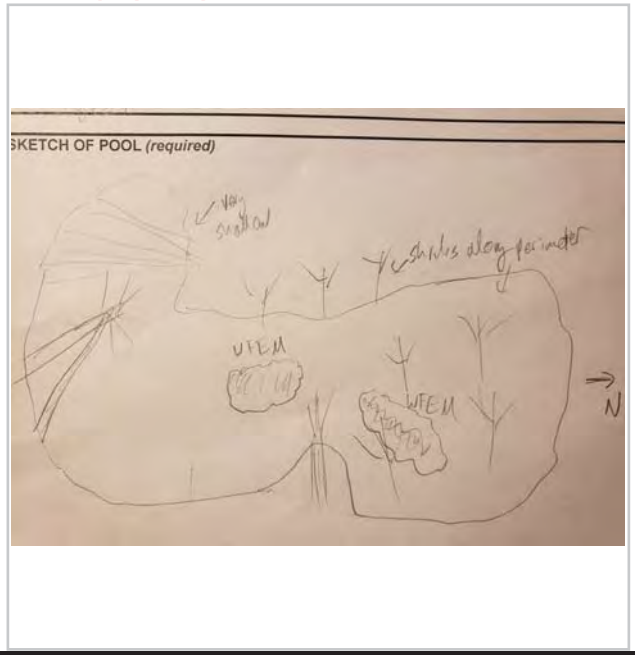
- Trees/saplings: eastern hemlock, red maple
- Shrubs/Vines: spice bush
- Herbs: skunk cabbage

VERNAL POOL DATA SHEET, *p. 2*

Survey Date: 3/26/2020	Investigator(s): C. Glinka, M. Murphy	Town: East Windsor	**CAWS Pool #:**	VP5	CAWS Project #:
Project/property name: Gravel Pit Solar				Pool Type:	Development: ☐ Reference ☐

*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	☐	Spring Peeper	☐
Pickerel Frog	☐	Gray Tree Frog	☐
Bull Frog	☐	Pickerel Frog	☐
Eastern Toad	☐	Painted Turtle	☐
Spotted Turtle	☐	Snapping Turtle	☐
N. Water Snake	☐	Blue-spot. salam.	☐

Other Observed Fauna (Pool & Fringe):

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 ☑	moderate
2. Surface pollen ☐	
3. Dark, tannin-colored water ☑	low
4. Deep water ☐	
5. Turbidity ☐	
6. Dense shrubs ☐	
7. Other (specify) ☐	

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 ☐ No ☑	Project/property name: Gravel Pit Solar		Pool Type: Development: ☐ Reference: ☐	
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:

Current	Within last 24 hours
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 ☑
- during construction ☐
- post construction ☐

Polarized sunglasses used? Yes ☑ No ☐

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~~

condition	Abundance categories			
If condition mixed, note "some","many" or "most"	50-75	☐	250-300	☐
	75-100	☐	300-400	☐
	100-150	☐	400-500	☐
	150-200	☐	500-750	☐
intact: All	200-250	☐	750-1000	☐
breaking up:			1000-1250	☐
hatching:			>1250	☐

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

Spotted Salamanders:

Condition:

	Total Number
intact:	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)

			Flowing	Not flowing
Inlet observed?	No ☑	Yes ☐	☐	☐
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)

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' 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:	X	
high:		

Dominant vegetation *(optional)*

Trees/saplings:	red maple
Shrubs/Vines:	spice bush
Herbs:	skunk cabbage, jewlweed

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: ☐ Reference ☐

*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	☑	Spring Peeper	☐
Pickerel Frog	☐	Gray Tree Frog	☐
Bull Frog	☐	Pickerel Frog	☐
Eastern Toad	☐	Painted Turtle	☐
Spotted Turtle	☐	Snapping Turtle	☐
N. Water Snake	☐	Blue-spot. salam.	☐

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 ☐	
2. Surface pollen ☑	moderate
3. Dark, tannin-colored water ☑	moderate
4. Deep water ☐	
5. Turbidity ☐	
6. Dense shrubs ☐	
7. Other (specify) ☐	

ADDITIONAL NOTES: *(optional)*

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__X__

(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__X__ No_____

(3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?
Yes__X__ No_____

B. Condition of the Critical Terrestrial Habitat

(1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes__X__ No_____ (100%)

(2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes__X__ 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

CAUTION! *This rating system is designed strictly as a planning tool, not as an official assessment tool.* It will enable you to determine the relative ecological value of pools within your community. A Tier I rating—which will most likely apply to only a minority of sites—denotes exemplary pools; Management Recommendations should be applied at these sites. For pools rated as Tier II, proceed with care; you need more information! Tier II pools will probably constitute the majority of your vernal pool resources; Management Recommendations should be applied at these sites to the maximum extent practicable. Tier II pools might also be likely candidates for restoration efforts (e.g., reforestation of the critical terrestrial habitat).

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__x__

(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__x__ No_____

(3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?
Yes__x__ No_____

B. Condition of the Critical Terrestrial Habitat

(1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes__x__ No_____ (100%)

(2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes__x__ No_____ (100%)

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

CAUTION! *This rating system is designed strictly as a planning tool, not as an official assessment tool.* It will enable you to determine the relative ecological value of pools within your community. A Tier I rating—which will most likely apply to only a minority of sites—denotes exemplary pools; Management Recommendations should be applied at these sites. For pools rated as Tier II, proceed with care; you need more information! Tier II pools will probably constitute the majority of your vernal pool resources; Management Recommendations should be applied at these sites to the maximum extent practicable. Tier II pools might also be likely candidates for restoration efforts (e.g., reforestation of the critical terrestrial habitat).

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__X__

(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__X__

(3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?
Yes__X__ No_____

B. Condition of the Critical Terrestrial Habitat

(1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes__X__ No_____ (100%)

(2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes__X__ No_____ (100%)

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

CAUTION! *This rating system is designed strictly as a planning tool, not as an official assessment tool.* It will enable you to determine the relative ecological value of pools within your community. A Tier I rating—which will most likely apply to only a minority of sites—denotes exemplary pools; Management Recommendations should be applied at these sites. For pools rated as Tier II, proceed with care; you need more information! Tier II pools will probably constitute the majority of your vernal pool resources; Management Recommendations should be applied at these sites to the maximum extent practicable. Tier II pools might also be likely candidates for restoration efforts (e.g., reforestation of the critical terrestrial habitat).

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__X__

(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__X__

(3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?
Yes__X__ No_____

B. Condition of the Critical Terrestrial Habitat

(1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes__X__ No_____ (100%)

(2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes__X__ No_____ (100%)

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

CAUTION! *This rating system is designed strictly as a planning tool, not as an official assessment tool.* It will enable you to determine the relative ecological value of pools within your community. A Tier I rating—which will most likely apply to only a minority of sites—denotes exemplary pools; Management Recommendations should be applied at these sites. For pools rated as Tier II, proceed with care; you need more information! Tier II pools will probably constitute the majority of your vernal pool resources; Management Recommendations should be applied at these sites to the maximum extent practicable. Tier II pools might also be likely candidates for restoration efforts (e.g., reforestation of the critical terrestrial habitat).

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__X__

(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__X__

(3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?
Yes__X__ No_____

B. Condition of the Critical Terrestrial Habitat

(1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes__X__ No_____ (100%)

(2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes__X__ No_____ (100%)

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

CAUTION! *This rating system is designed strictly as a planning tool, not as an official assessment tool.* It will enable you to determine the relative ecological value of pools within your community. A Tier I rating—which will most likely apply to only a minority of sites—denotes exemplary pools; Management Recommendations should be applied at these sites. For pools rated as Tier II, proceed with care; you need more information! Tier II pools will probably constitute the majority of your vernal pool resources; Management Recommendations should be applied at these sites to the maximum extent practicable. Tier II pools might also be likely candidates for restoration efforts (e.g., reforestation of the critical terrestrial habitat).

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__x__

(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__x__

(3) Are there 25 or more egg masses (regardless of species) present in the pool by the conclusion of the breeding season?
Yes__x__ No_____

B. Condition of the Critical Terrestrial Habitat

(1) Is at least 75% of the vernal pool envelope (100 feet from pool) undeveloped?
Yes__x__ No_____ (75%)

(2) Is at least 50% of the critical terrestrial habitat (100-750 feet) undeveloped?
Yes__x__ No_____ (70%)

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

CAUTION! *This rating system is designed strictly as a planning tool, not as an official assessment tool.* It will enable you to determine the relative ecological value of pools within your community. A Tier I rating—which will most likely apply to only a minority of sites—denotes exemplary pools; Management Recommendations should be applied at these sites. For pools rated as Tier II, proceed with care; you need more information! Tier II pools will probably constitute the majority of your vernal pool resources; Management Recommendations should be applied at these sites to the maximum extent practicable. Tier II pools might also be likely candidates for restoration efforts (e.g., reforestation of the critical terrestrial habitat).

Appendix L
Stormwater Management Report

The contents of this Exhibit were not completed at the time of this Filing.
[05/22/2020]

Appendix M
SHPO Correspondence and Cultural Resources Survey

May 13, 2020

Ms. Marena Wisniewski
National Register Specialist/Architectural Historian
Department of Economic and Community Development
State Historic Preservation Office
450 Columbus Boulevard, Suite 5
Hartford, Connecticut 06103

RE: Phase IA Cultural Resources Assessment Survey of the Proposed Gravel Pits Solar Project in East Windsor, Connecticut

Ms. Wisniewski:

Heritage Consultants, LLC has completed a Phase IA cultural resources assessment survey on behalf of VHB for the Gravel Pits Solar Project in East Windsor, Connecticut. This work was completed in April of 2020 and included both a review of the archaeological potential of the Project Site, as well as photo-documentation of historic buildings within the area of the proposed solar facility. The report for this effort is attached for your review and comment.

Please do not hesitate to contact me at 860-299-6328 or at dgeorge@heritage-consultants.com with any questions you may have. I look forward to consulting with you, as does the remainder of the project team, during our teleconference scheduled for May 19 at 2-3 pm. As always, thank you for your time and consideration.

David George, M.A., R.P.A.

David R. George

Principal Investigator
Heritage Consultants, LLC

P.O. Box 310249 • Newington, Connecticut 06131
Phone (860) 299-6328
Email: dgeorge@heritage-consultants.com

MAY 2020

PHASE IA CULTURAL RESOURCES ASSESSMENT SURVEY OF THE PROPOSED GRAVEL PITS SOLAR PROJECT IN EAST WINDSOR, CONNECTICUT

PREPARED FOR:

1 CEDAR STREET #400,
PROVIDENCE, RHODE ISLAND 02903

PREPARED BY:

55 EAST CEDAR STREET
NEWINGTON, CONNECTICUT 06111

ABSTRACT

This report presents the results of a Phase IA cultural resources assessment survey for the proposed Gravel Pit Solar, LLC, Gravel Pit Solar II, LLC, Gravel Pit Solar III, LLC, and Gravel Pit Solar IV, LLC (collectively Gravel Pit Solar) Project in the Town of East Windsor, Connecticut. The Project includes development of a 120-megawatt (MW) alternating current (AC) ground-mounted solar photovoltaic system. The 517-acre Project Site is situated on portions of eight parcels, totaling approximately 726 acres, located near Apothecaries Hall Road, Plantation Road, Wapping Road, and Windsorville Road in the Town of East Windsor, Connecticut. The current investigation consisted of detailed background research, a pedestrian survey and photo-documentation of the 517-acre Project Site to determine its archaeological sensitivity, and photo-documentation and examination of historic standing structures within the Project Site.

The results of the survey indicate that 238.9 acres of land within the Project Site retain a moderate sensitivity for intact archaeological deposits. This acreage is divided between forested areas and agricultural fields. It is recommended that the moderate sensitivity areas within the forested zones be subjected to Phase IB cultural resources reconnaissance survey using a systematic subsurface testing regime. It is further recommended that moderate sensitivity areas within agricultural fields be subjected to systematic pedestrian survey augmented by limited shovel testing where artifacts are recovered. The remaining 278.1 acres possess a no/low potential for producing archaeological sites; no additional archaeological examination of these areas is recommended prior to construction.

The survey also identified 41 historic period buildings that are situated on or immediately adjacent to the Project Site, a portion of which is a functioning tobacco and vegetable farm with historical roots. The historic buildings include tobacco sheds, several English style barns, residences, a water tower, and ancillary structures. A preliminary review of these buildings, some of which were documented through the Connecticut Trust for Historic Preservation's Barn Survey, revealed that many exhibit a high level of integrity. It is recommended that additional examination documentation of these buildings take place prior to final design and implementation of the Project so that their National Register of Historic Places eligibility can be ascertained. Subsequent research should also consider potential direct or indirect affects to local historic buildings, whether they be within or near to the Project Site.

TABLE OF CONTENTS

CHAPTER I: INTRODUCTION iv
Project Description and Methods Overview 1
Project Results and Management Recommendations Overview 1
Project Personnel 2
Organization of the Report 2

CHAPTER II: NATURAL SETTING 3
Introduction 3
Ecoregions of Connecticut 3
North-Central Lowlands Ecoregion 3
Hydrology in the Vicinity of the Project Site 4
Soils Comprising the Project Site 4
Agawam Soils (Soil Code 29A): 4
Haven Soils (Soil Code 32A): 4
Enfield Soils (Soil Code 32A): 5
Manchester Soils (Soil Code 37E) : 5
Udorthent Soils (Soil Code 305): 5
Summary 5

CHAPTER III: PREHISTORIC SETTING 7
Prehistoric Setting 7
Introduction 7
Paleo-Indian Period (12,000 to 10,000 Before Present [B.P.]) 7
Archaic Period (10,000 to 2,700 B.P.) 8
Early Archaic Period (10,000 to 8,000 B.P.) 8
Middle Archaic Period (8,000 to 6,000 B.P.) 8
Late Archaic Period (6,000 to 3,700 B.P.) 9
The Terminal Archaic Period (3,700 to 2,700 B.P.) 9
Woodland Period (2,700 to 350 B.P.) 10
Early Woodland Period (ca., 2,700 to 2,000 B.P.) 10
Middle Woodland Period (2,000 to 1,200 B.P.) 11
Late Woodland Period (ca., 1,200 to 350 B.P.) 11
Summary of Connecticut Prehistory 12

CHAPTER IV: HISTORIC OVERVIEW 13
Introduction 13
Native American History of East Windsor 13
History of the Town of East Windsor 13
Conclusions 17

CHAPTER V: PREVIOUS INVESTIGATIONS 18
Introduction 18

Previously Recorded Archaeological Sites and National/State Register of Historic Places Properties/Districts in the Vicinity of the Project Site 18

CHAPTER VI: METHODS 19
Introduction 19
Research Framework 19
Archival Background Research & Literature Review 19
Field Methodology and Data Synthesis 19
Curation 20

CHAPTER VII: RESULTS OF THE INVESTIGATION & MANAGEMENT RECOMENDATIONS 21
Introduction 21
Results of Phase IA survey 21
Overall Sensitivity of the Proposed Project Site and Archaeological Assessment 21
Sensitivity of the Proposed Project Site and Built Resources 23

BIBLIOGRAPHY 26

LIST OF FIGURES

Figure 1. Excerpt from a USGS 7.5' series topographic quadrangle image showing the location of the Project Site in East Windsor, Connecticut.

Figure 2. Draft plan of the proposed Gravel Pits Solar facility in East Windsor, Connecticut.

Figure 3. Map of soils located in the vicinity of the Project Site in East Windsor, Connecticut.

Figure 4. Excerpt from an 1813 historic map showing the location of the Project Site in East Windsor, Connecticut.

Figure 5. Excerpt from an 1855 historic map showing the location of the Project Site in East Windsor, Connecticut.

Figure 6. Excerpt from an 1869 historic map showing the location of the Project Site in East Windsor, Connecticut.

Figure 7. Excerpt from a 1931 historic map showing the location of the Project Site in East Windsor, Connecticut.

Figure 8. Excerpt from a 1934 aerial photograph showing the location of the Project Site in East Windsor, Connecticut.

Figure 9. Excerpt from a 1941 aerial photograph showing the location of the Project Site in East Windsor, Connecticut.

Figure 10. Excerpt from a 1951 aerial photograph showing the location of the Project Site in East Windsor, Connecticut.

Figure 11. Excerpt from a 1963 aerial photograph showing the location of the Project Site in East Windsor, Connecticut.

Figure 12. Excerpt from a 2016 aerial photograph showing the location of the Project Site in East Windsor, Connecticut.

Figure 13. Excerpt from a 2019 aerial photograph showing the location of the Project Site in East Windsor, Connecticut.

Figure 14. Digital map showing the location of previously identified archaeological sites in the vicinity of the Project Site in East Windsor, Connecticut.

Figure 15. Digital map depicting the locations of previously identified National/State Register of Historic Places properties in the vicinity of the Project Site in East Windsor, Connecticut.

Figure 16. Excerpt from a 2019 aerial image depicting the locations of no/low and moderate archaeologically sensitive zone throughout the Project Site in East Windsor, Connecticut.

Figure 17; Sheets 1-5. Excerpt of a recent aerial image depicting photo locations, numbers, and directions within the northern portion of the Project Site in East Windsor, Connecticut.

Figure 18. Excerpt of a 2019 aerial image depicting the locations of historic and modern buildings within or immediately adjacent to the Project Site in East Connecticut (note the colored dots represent historic buildings and the "x" marks denote modern constructions).

LIST OF PHOTOS

Photo 1. Overview photo of the northern portion of the Project Site facing northeast.

Photo 2. Overview photo of the northern portion of the Project Site facing north.

Photo 3. Overview photo of the northern portion of the Project Site facing south.

Photo 4. Overview photo of the northern portion of the Project Site facing south.

Photo 5. Overview photo of the northern portion of the Project Site facing south.

Photo 6. Overview photo of the northern portion of the Project Site facing southeast.

Photo 7. Overview photo of the northern portion of the Project Site facing southeast.

Photo 8. Overview photo of the northern portion of the Project Site facing southeast.

Photo 9. Overview photo of the northern portion of the Project Site facing northeast.

Photo 10. Overview photo of the northern portion of the Project Site facing south.

Photo 11. Overview photo of the northern portion of the Project Site facing south.

Photo 12. Overview photo of the northern portion of the Project Site facing southeast.

Photo 13. Overview photo of the northern portion of the Project Site facing northeast.

Photo 14. Overview photo of the northern portion of the Project Site facing northeast.

Photo 15. Overview photo of the northern portion of the Project Site facing east.

Photo 16. Overview photo of the northern portion of the Project Site facing south.

Photo 17. Overview photo of the central portion of the Project Site facing northeast.

Photo 18. Overview photo of the central portion of the Project Site facing northwest.

Photo 19. Overview photo of the central portion of the Project Site facing north.

Photo 20. Overview photo of the central portion of the Project Site facing northeast.

Photo 21. Overview photo of the central portion of the Project Site facing southwest.

Photo 22. Overview photo of the central portion of the Project Site facing northeast.

Photo 23. Overview photo of the central portion of the Project Site facing east.

Photo 24. Overview photo of the central portion of the Project Site facing west.

Photo 25. Overview photo of the central portion of the Project Site facing southeast.

Photo 26. Overview photo of the central portion of the Project Site facing west.

Photo 27. Overview photo of the central portion of the Project Site facing east.

Photo 28. Overview photo of the central portion of the Project Site facing south.

Photo 29. Overview photo of the central portion of the Project Site facing southwest.

Photo 30. Overview photo of the central portion of the Project Site facing northeast.

Photo 31. Overview photo of the central portion of the Project Site facing south.

Photo 32. Overview photo of the central portion of the Project Site facing southwest.

Photo 33. Overview photo of the southern portion of the Project Site facing east.

Photo 34. Overview photo of the southern portion of the Project Site facing northwest.

Photo 35. Overview photo of the southern portion of the Project Site facing south.

Photo 36. Overview photo of the southern portion of the Project Site facing northeast.

Photo 37. Overview photo of the southern portion of the Project Site facing northeast.

Photo 38. Overview photo of the southern portion of the Project Site facing southeast.

Photo 39. Overview photo of the southern portion of the Project Site facing east.

Photo 40. Overview photo of the southern portion of the Project Site facing north.

Photo 41. Overview photo of the southern portion of the Project Site facing southeast.

Photo 42. Overview photo of the southern portion of the Project Site facing south.

Photo 43. Overview photo of the southern portion of the Project Site facing west.

Photo 44. Overview photo of the southern portion of the Project Site facing west.

Photo 45. Overview photo of the southern portion of the Project Site facing east.

Photo 46. Overview photo of the southern portion of the Project Site facing south.

Photo 47. Overview photo of the southern portion of the Project Site facing north.

Photo 48. Overview photo of the southern portion of the Project Site facing west.

Photo 49. Overview photo of the southern portion of the Project Site facing south.

Photo 50. Overview photo of the southern portion of the Project Site facing east.

Photo 51. Photo of Tobacco Shed Number 32 facing southwest.

Photo 52. Photo of Tobacco Shed Number 33 facing northwest.

Photo 53. Photo of Tobacco Shed Number 27 facing southwest.

Photo 54. Photo of Tobacco Shed Number 29 facing west.

Photo 55. Photo of Tobacco Shed Number 28 facing west.

Photo 56. Photo of Tobacco Shed Number 25 facing west.

Photo 57. Photo of Tobacco Shed Number 1 facing west.

Photo 58. Photo of Tobacco Shed Number 24 facing southwest.

Photo 59. Photo of Tobacco Shed Number 23 facing southeast.

Photo 60. Photo of Tobacco Shed Number 5 facing west.

Photo 61. Photo of Tobacco Shed Number 22 facing southwest.

Photo 62. Photo of Tobacco Shed Number 21 facing west.

Photo 63. Photo of Tobacco Shed Number 20 facing west.

Photo 64. Photo of Tobacco Shed Number 19 facing west.

Photo 65. Photo of Tobacco Shed Number 18 facing southwest.

Photo 66. Photo of Tobacco Shed Number 17 facing west.

Photo 67. Photo of Tobacco Shed Number 16 facing east.

Photo 68. Photo of Tobacco Shed Number 15 facing west.

Photo 69. Photo of Tobacco Shed Number 12 facing west.

Photo 70. Photo of Tobacco Shed Number 13 facing north.

Photo 71. Photo of Tobacco Shed Number 14 facing west.

Photo 72. Photo of Tobacco Shed Number 11 facing southwest.

Photo 73. Photo of Tobacco Shed Number 10 facing east.

Photo 74. Photo of Tobacco Shed Number 9 facing east.

Photo 75. Photo of Tobacco Shed Number 8 facing northwest.

Photo 76. Photo of Tobacco Shed Number 2 facing southwest.

Photo 77. Photo of Tobacco Shed Number 3 facing southwest.

Photo 78. Photo of Tobacco Shed Number 4 facing southeast.

Photo 79. Photo of Tobacco Shed Number 6 facing northeast.

Photo 80. Photo of Tobacco Shed Number 31 facing east.

Photo 81. Photo of Tobacco Shed Number 30 facing west.

Photo 82. Photo of Tobacco Shed Number 29 facing northeast.

Photo 83. Photo of a water tower in the southern portion of the Project Site facing north (note this tower will not be directly impacted by the Project).

Photo 84. Photo of a historic structure in the southern portion of the Project Site facing northwest.

Photo 85. Photo of a historic structure in the southern portion of the Project Site facing northwest.

Photo 86. Photo of a historic residence in the southern portion of the Project Site facing west.

Photo 87. Photo of a historic structure in the southern portion of the Project Site facing northwest.

Photo 88. Photo of a historic structure in the southern portion of the Project Site facing west.

Photo 89. Photo of a historic structure in the southern portion of the Project Site facing west.

Photo 90. Photo of a historic structure in the southern portion of the Project Site facing west.

Photo 91. Photo of a historic structure in the southern portion of Project Site facing north.

Photo 92. Photo of the location of a historic structure identified on an 1855 map of the Project Site (see Figure 7; note that there are no remains of this structure.

CHAPTER I
INTRODUCTION

This report presents the results of a Phase IA cultural resources assessment survey (the Survey) of the proposed Gravel Pit Solar (GPS) Project in the Town of East Windsor, Connecticut (Figures 1 and 2). Vanasse Hangen Brustlin (VHB), the primary environmental and engineering consultant in support of the Project, requested that Heritage Consultants, LLC (Heritage) complete the Survey as part of the planning process for the proposed Project, which includes development of a 120 MW AC ground-mounted solar photovoltaic system. The 517-acre Project Site is situated on portions of eight parcels of land located near Apothecaries Hall Road, Plantation Road, Wapping Road, and Windsorville Road in the Town of East Windsor, Connecticut. It is surrounded by land that has various uses, including a golf course, housing developments, an electrical transmission line corridor, a railroad, agricultural fields, and wooded areas. Heritage completed this investigation on behalf of VHB in March of 2020. All work associated with this undertaking was performed in accordance with the *Environmental Review Primer for Connecticut's Archaeological Resources* (Poirier 1987) promulgated by the Connecticut State Historic Preservation Office (CT-SHPO).

Project Description and Methods Overview

GPS is proposed in part due to the Project's selection in the 2018 Zero Carbon request for proposals solicited by the Connecticut Department of Energy and Environmental Protection (CT DEEP) and the 2019 Long-Term Contract request for proposals solicited by the Rhode Island Public Utilities Commission (PUC). The Project is a new 120 MW-AC solar power generating facility that will be constructed on a 517-acre Project Site located within eight parcels. The land is situated along Apothecaries Hall Road, Plantation Road, Wapping Road, and Windsorville Road in East Windsor, Connecticut (Figures 1 and 2). GPS is advancing the Project to design and permitting through the Connecticut Siting Council review process and will also obtain other federal and state permits, as necessary.

This Phase IA cultural resources assessment survey consisted of the completion of the following tasks: 1) a contextual overview of the region's prehistory, history, and natural setting (e.g., soils, topography, ecology, hydrology, etc.); 2) a literature search to identify and discuss previously recorded cultural resources in the region encompassing the Project Site; 3) a review of readily available historic maps and aerial imagery depicting the Project Site to identify potential historic resources and/or areas of past disturbance; 4) a pedestrian survey and photo-documentation of the Project Site in order to determine its archaeological sensitivity; 5) photo-documentation and preliminary examination of historic standing structures within the Project Site; and 6) preparation of the current Phase IA cultural resources assessment survey report.

Project Results and Management Recommendations Overview

The review of historic maps and aerial images of the Project Site and files maintained by the CT-SHPO indicated that there are no previously identified archaeological sites or National/State Register of Historic Places properties located within 1.6 km (1 mile) of the Project Site. This is likely due to a lack of professional surveys in this part of East Windsor rather than an actual absence of cultural resources.

Heritage also combined data from the historic map and aerial image analysis, as well as pedestrian survey, to stratify the Project Site into zones of no/low and/or moderate/high archaeological sensitivity.

Upon completion of the above-referenced analysis and pedestrian survey, it was determined that portions of the Project Site contain steeps slopes and wet soils or have been impacted by sand and gravel operations, an existing electrical transmission line corridor, and a north to south trending railroad that bisects the Project Site. These areas encompass 278.1 acres of land and they retain little, if any, intact deposits. Thus, they were assessed as retaining a no/low archaeological sensitivity. The remaining 238.9 acres of land consist of level, well drained farmland and forested areas. While some of these areas have been impacted by the cultivation of tobacco and vegetables, they may yield intact archaeological sites below the plow zone. Thus, they were assessed as possessing a moderate potential to yield archaeological sites. It is recommended that the moderate sensitivity areas be subjected to archaeological examination as part of a Phase IB cultural resources reconnaissance survey, the recommended methods for which are described in Chapter VII.

Historic research, analysis of maps and aerial images, and the pedestrian survey, revealed that the Project Site and the immediate surroundings contain numerous historic standing structures associated with a portion of a farm owned by Edward and Dorothy Markowski. They include residences, tobacco sheds, English style barns, a water tower, and ancillary farm buildings. Some of these structures, including the water tower, four of the tobacco sheds, and three other buildings, will not be impacted directly by the Project. The historic structures located within and immediately adjacent to the Project Site retain a high level of integrity, are of importance to the historical landscape, and some may be considered dwindling resources. It is recommended that additional examination and documentation of exteriors and interiors (where possible) of the buildings take place prior to final design and implementation of the Project so that their National Register of Historic Places eligibility can be determined. Subsequent research should also consider potential direct or indirect effects of the Project on the historic buildings, whether they be situated within or near to the Project Site.

Project Personnel

Key personnel for this project included Mr. David R. George, M.A., R.P.A, who served as Principal Investigator for this effort; he was assisted by Mr. Cory Atkinson, M.A., and Mr. Timothy Das, B.A., who completed the fieldwork portion of the project. Dr. Kristen Keegan prepared the historic background research portion of the report, while Mr. Stephen Anderson, B.A., completed all GIS tasks associated with the undertaking. Ms. Stacey Vairo, M.F.S., completed the preliminary review and interpretation of the historic standing structures located within the Project Site. Finally, Ms. Elizabeth Correia, M.A., assisted with compilation of the report and the associated figures.

Organization of the Report

The natural setting of the region encompassing the Project Site is presented in Chapter II; it includes a brief overview of the geology, hydrology, and soils, of the Project region. The prehistory of the development region is outlined briefly in Chapter III. The history of the region encompassing the Project Site is chronicled in Chapter IV, while a discussion of previous archaeological investigations in the vicinity of the Project Site is presented in Chapter V. The methods used to complete this investigation are discussed in Chapter VI. Finally, the results of this investigation and management recommendations for the Project Site and the identified cultural resources are presented in Chapter VII.

CHAPTER II
NATURAL SETTING

Introduction

This chapter provides a brief overview of the natural setting of the region containing the Project Site. Previous archaeological research has documented that a few specific environmental factors can be associated with both prehistoric and historic period site selection. These include general ecological conditions, as well as types of fresh water sources and soils present. The remainder of this section provides a brief overview of the ecology, hydrological resources, and soils present within the Project Site and the larger region in general.

Ecoregions of Connecticut

Throughout the Pleistocene and Holocene Periods, Connecticut has undergone numerous environmental changes. Variations in climate, geology, and physiography have led to the "regionalization" of Connecticut's modern environment. It is clear, for example, that the northwestern portion of the state has quite different natural characteristics than the coastline. Recognizing this fact, Dowhan and Craig (1976), as part of their study of the distribution of rare and endangered species in Connecticut, subdivided the state into various ecoregions. Dowhan and Craig (1976:27) defined an ecoregion as:

> "an area characterized by a distinctive pattern of landscapes and regional climate as expressed by the vegetation composition and pattern, and the presence or absence of certain indicator species and species groups. Each ecoregion has a similar interrelationship between landforms, local climate, soil profiles, and plant and animal communities. Furthermore, the pattern of development of plant communities (chronosequences and toposequences) and of soil profile is similar in similar physiographic sites. Ecoregions are thus natural divisions of land, climate, and biota."

Dowhan and Craig defined nine major ecoregions for the State of Connecticut. They are based on regional diversity in plant and animal indicator species (Dowhan and Craig 1976). Only one of the ecoregions is germane to the current investigation: North-Central Lowlands ecoregion. A brief summary of this ecoregion is presented below. It is followed by a discussion of the hydrology and soils found in and adjacent to the Project Site.

North-Central Lowlands Ecoregion

The North-Central Lowlands ecoregion consists of a broad valley located between 40.2 and 80.5 km (25 and 50 mi) to the north of Long Island Sound (Dowhan and Craig 1976). It is characterized by extensive floodplains, backwater swamps, and lowland areas situated near large rivers and tributaries. Physiography in this region is composed of a series of north-trending ridge systems, the easternmost of which is referred to as the Bolton Range (Bell 1985:45). These ridge systems comprise portions of the terraces that overlook the larger rivers such as the Connecticut and Farmington Rivers. The bedrock of the region is composed of Triassic sandstone, interspersed with durable basalt or "traprock" (Bell 1985). Soils found in the upland portion of this ecoregion are developed on red, sandy to clayey glacial till, while those soils situated nearest to the rivers are situated on widespread deposits of stratified sand, gravel, silt, and alluvium resulting from the impoundment of glacial Lake Hitchcock.

Hydrology in the Vicinity of the Project Site

The Project Site is situated within a region that contains to several sources of freshwater, including Pecks Brook, Ketch Brook, Spring Glen Brook, and Windsorville Pond, as well as unnamed streams, ponds, and wetlands. These freshwater sources may have served as resource extraction areas for Native American and historic populations. Previously completed archaeological investigations in Connecticut have demonstrated that streams, rivers, and wetlands were focal points for prehistoric occupations because they provided access to transportation routes, sources of freshwater, and abundant faunal and floral resources.

Soils Comprising the Project Site

Soil formation is the direct result of the interaction of several variables, including climate, vegetation, parent material, time, and organisms present (Gerrard 1981). Once archaeological deposits are buried within the soil, they are subject to several diagenic processes. Different classes of artifacts may be preferentially protected, or unaffected by these processes, whereas others may deteriorate rapidly. Cyclical wetting and drying, freezing and thawing, and compression can accelerate the chemical and mechanical decay processes for animal bones, shells, lithics, ceramics, and plant remains. Lithic and ceramic artifacts are largely unaffected by soil pH, whereas animal bones and shells decay more quickly in acidic soils such as those that are present in within the current Project Site. In contrast, acidic soils enhance the preservation of charred plant remains.

A review of the soils within the Project Site is presented below. The Project Site is characterized by the presence of five major soil types: Agawam, Haven, Enfield, Manchester, and Udorthent soils (Figure 3). A review of the first four of these soils shows that they consist of well drained sandy loams; they are the types of soils that are typically correlated with prehistoric and historic use and occupation. Descriptive profiles for each soil type are presented below; they were gathered from the National Resources Conservation Service. The final soil type, Udorthents, are typical of areas that have been largely disturbed in the past and no longer retain archaeological sensitivity.

<u>Agawam Soils (Soil Code 29A):</u>

The Agawam series consists of very deep, well drained soils that have formed in sandy, water deposited materials. They are typically found on outwash plains and high stream terraces where slope ranges from 0 to 15 percent. A typical profile associated with Haven soils is as follows: **Ap**--0 to 11 inches; dark grayish brown (10YR 4/2) fine sandy loam; light brownish gray (10YR 6/2) dry; weak medium and coarse subangular blocky structure; very friable; common fine and medium roots; strongly acid; abrupt smooth boundary; **Bw1**--11 to 16 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak medium and coarse subangular blocky structure; very friable; common fine and medium roots; strongly acid; abrupt smooth boundary; **Bw2**--16 to 26 inches; light olive brown (2.5Y 5/4) fine sandy loam; weak medium subangular blocky structure; very friable; common fine and medium roots; strongly acid; clear smooth boundary; **2C1**--26 to 45 inches; olive(5Y 5/3) loamy fine sand; massive; very friable; few fine roots; strongly acid; clear smooth boundary; **2C2**--45 to 55 inches; olive brown (2.5Y 4/4) loamy fine sand; massive; very friable; strongly acid; abrupt smooth boundary; and **2C3**--55 to 65 inches; olive (5Y 5/3) loamy sand; single grain; loose; strongly acid.

<u>Haven Soils (Soil Code 32A):</u>

The Haven series consists of very deep, well drained soils that have formed in loamy over sandy and gravelly outwash. They are typically found on outwash plains, valley trains, terraces, and water-sorted moraine deposits where slope ranges from 0 through 15 percent. A typical profile associated with Haven soils is as follows: **Oi**--0 to 2 inches (0 to 5 centimeters); slightly decomposed plant material derived

from loose pine needles, leaves and twigs. **Oa**-- 2 to 3 inches (5 to 8 centimeters); black (5YR 2/1) highly decomposed plant material; **A**--3 to 6 inches (8 to 15 centimeters); dark grayish brown (10YR 4/2) loam; weak fine and medium granular structure; friable; many fine and coarse roots; very strongly acid; abrupt smooth boundary; **Bw1**-- 6 to 13 inches (15 to 33 centimeters); brown (7.5YR 4/4) loam; weak fine and medium subangular blocky structure; friable; common fine roots; many fine pores; very strongly acid; clear wavy boundary. **Bw2**-- 13 to 22 inches (33 to 56 centimeters); strong brown (7.5YR 5/6) loam; weak fine and medium subangular blocky structure; friable; common fine roots; many fine pores; 5 percent fine gravel; very strongly acid; gradual wavy boundary; **BC**-- 22 to 31 inches (56 to 79 centimeters); yellowish brown (10YR 5/6) gravelly loam; weak medium and fine subangular blocky structure; friable; few fine roots; common fine pores; 20 percent fine gravel; very strongly acid; clear wavy boundary; and **2C**-- 31 to 65 inches (79 to 165 centimeters); yellowish brown (10YR 5/4) to brownish yellow (10YR 6/6) stratified gravelly sand; single grained; loose; 30 percent fine gravel; very strongly acid.

Enfield Soils (Soil Code 32A):

The Enfield series consists of very deep, well drained loamy soils formed in a silty mantle overlying glacial outwash. They are found on level to sloping areas characterized by outwash plains and terraces. A typical profile associated with Enfield soils is as follows: **Ap**--0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable; many very fine and fine roots; 5 percent fine gravel; strongly acid; abrupt smooth boundary; **Bw1**--7 to 16 inches; strong brown (7.5YR 5/6) silt loam; weak medium subangular blocky structure; friable; common very fine and many fine roots; 5 percent fine gravel; strongly acid; clear wavy boundary. **Bw2**--16 to 25 inches; light olive brown (2.5Y 5/4) silt loam; weak medium subangular blocky structure; friable, few very fine and common fine roots; 5 percent fine gravel; strongly acid; abrupt wavy boundary; and **2C**--25 to 60 inches; brown (10YR 5/3) very gravelly sand; single grain; loose; stratified; 45 percent gravel and 5 percent cobbles; strongly acid.

Manchester Soils (Soil Code 37E):

The Manchester series consists of very deep, excessively drained soils that have formed in sandy and gravelly glacial outwash and stratified drift. They are found on outwash plains, terraces, kames, deltas, and eskers where slopes ranges from 0 to 45 percent. A typical profile associated with Manchester soils is as follows: **Ap**--0 to 9 inches; dark brown (7.5YR 3/2) gravelly sandy loam; weak medium granular structure; very friable; many fine and common medium roots; 20 percent gravel; strongly acid; clear smooth boundary; **Bw**--9 to 18 inches; reddish brown (5YR 4/3) gravelly loamy sand; very weak fine and medium granular structure; very friable; few fine roots; 25 percent gravel; strongly acid; clear wavy boundary; and **C**--18 to 65 inches; reddish brown (5YR 4/4) very gravelly sand; single grain; loose; 50 percent gravel; very strongly acid.

Udorthent Soils (Soil Code 305):

Udorthent soils occur within cuts (road, railroad, etc.), spoil piles, landfills, and gravel pits. The slope ranges from 0 to 25 percent and the runoff class is medium. The depth to a restrictive feature is greater than 60 inches. The drainage class is moderately well drained. Areas characterized by Udorthent soils are largely disturbed by cutting, smoothing, filling, or large-scale excavations. They do not retain archaeological sensitivity.

Summary

The natural setting of the Project Site is common throughout the North-Central Lowlands ecoregion. Streams and rivers of this area empty into the Connecticut River, which in turn, drains into the Long Island Sound. Further, the landscape in general is dominated by sandy loamy soil types with some

wetland soils intermixed. In addition, low slopes dominate the region. Thus, in general, the project region was well suited to Native American occupation throughout the prehistoric era. This portion of East Windsor was also used throughout the historic era, as evidenced by the presence of numerous historic residences, barns, outbuildings, and agricultural fields throughout the region; thus, archaeological deposits dating from the prehistoric and historic era may be expected near or within the proposed Project Site.

CHAPTER III
PREHISTORIC SETTING

Introduction

Prior to the late 1970s and early 1980s, very few systematic archaeological surveys of large portions of the state of Connecticut had been undertaken. Rather, the prehistory of the region was studied at the site level. Sites chosen for excavation were highly visible and they were in such areas as the coastal zone, e.g., shell middens, and Connecticut River Valley. As a result, a skewed interpretation of the prehistory of Connecticut was developed. It was suggested that the upland portions of the state, i.e., the northeastern and northwestern hills ecoregions, were little used and rarely occupied by prehistoric Native Americans, while the coastal zone, i.e., the eastern and western coastal and the southeastern and southwestern hills ecoregions, were the focus of settlements and exploitation in the prehistoric era. This interpretation remained unchallenged until the 1970s and 1980s when several town-wide and regional archaeological studies were completed. These investigations led to the creation of several archaeological phases that subsequently were applied to understand the prehistory of Connecticut. The remainder of this chapter provides an overview of the prehistoric setting of the region encompassing the Project Site.

Paleo-Indian Period (12,000 to 10,000 Before Present [B.P.])

The earliest inhabitants of the area encompassing the State of Connecticut, who have been referred to as Paleo-Indians, arrived in the area by circa (ca.), 12,000 B.P. (Gramly and Funk 1990; Snow 1980). Due to the presence of large Pleistocene mammals at that time and the ubiquity of large fluted projectile points in archaeological deposits of this age, Paleo-Indians often have been described as big-game hunters (Ritchie and Funk 1973; Snow 1980); however, as discussed below, it is more likely that they hunted a broad spectrum of animals.

While there have been numerous surface finds of Paleo-Indian projectile points throughout the State of Connecticut, only two sites, the Templeton Site (6-LF-21) in Washington, Connecticut and the Hidden Creek Site (72-163) in Ledyard, Connecticut, have been studied in detail and dated using the radiocarbon method (Jones 1997; Moeller 1980). The Templeton Site (6-LF-21) was occupied between 10,490 and 9,890 years ago (Moeller 1980). In addition to a single large and two small fluted points, the Templeton Site produced a stone tool assemblage consisting of gravers, drills, core fragments, scrapers, and channel flakes, which indicates that the full range of stone tool production and maintenance took place at the site (Moeller 1980). Moreover, the use of both local and non-local raw materials was documented in the recovered tool assemblage, suggesting that not only did the site's occupants spend quite some time in the area, but they also had access to distant stone sources, the use of which likely occurred during movement from region to region.

The only other Paleo-Indian site studied in detail in Connecticut is the Hidden Creek Site (72-163) (Jones 1997). The Hidden Creek Site is situated on the southeastern margin of the Great Cedar Swamp on the Mashantucket Pequot Reservation in Ledyard, Connecticut. While excavation of the Hidden Creek Site produced evidence of Terminal Archaic and Woodland Period components (see below) in the upper soil horizons, the lower levels of the site yielded artifacts dating from the Paleo-Indian era. Recovered Paleo-Indian artifacts included broken bifaces, side-scrapers, a fluted preform, gravers, and end-scrapers. Based on the types and number of tools present, Jones (1997:77) has hypothesized that the Hidden

Creek Site represented a short-term occupation, and that separate stone tool reduction and rejuvenation areas were present.

While archaeological evidence for Paleo-Indian occupation is scarce in Connecticut, it, combined with data from the West Athens Road and King's Road Site in the Hudson drainage and the Davis and Potts Sites in northern New York, supports the hypothesis that there was human occupation of the area not long after ca. 12,000 B.P. (Snow 1980). Further, site types currently known suggest that the Paleo-Indian settlement pattern was characterized by a high degree of mobility, with groups moving from region to region in search of seasonally abundant food resources, as well as for the procurement of high-quality raw materials from which to fashion stone tools.

Archaic Period (10,000 to 2,700 B.P.)

The Archaic Period, which succeeded the Paleo-Indian Period, began by ca. 10,000 B.P. (Ritchie and Funk 1973; Snow 1980), and it has been divided into three subperiods: Early Archaic (10,000 to 8,000 B.P.), Middle Archaic (8,000 to 6,000 B.P.), and Late Archaic (6,000 to 3,400 B.P.). These periods were devised to describe all non-farming, non-ceramic producing populations in the area. Regional archeologists recently have recognized a final "transitional" Archaic Period, the Terminal Archaic Period (3,400-2,700 B.P.), which was meant to describe those groups that existed just prior to the onset of the Woodland Period and the widespread adoption of ceramics into the toolkit (Snow 1980; McBride 1984; Pfeiffer 1984, 1990; Witthoft 1949, 1953).

Early Archaic Period (10,000 to 8,000 B.P.)

To date, very few Early Archaic sites have been identified in southern New England. As a result, researchers such as Fitting (1968) and Ritchie (1969), have suggested a lack of these sites likely is tied to cultural discontinuity between the Early Archaic and preceding Paleo-Indian Period, as well as a population decrease from earlier times. However, with continued identification of Early Archaic sites in the region, and the recognition of the problems of preservation, it is difficult to maintain the discontinuity hypothesis (Curran and Dincauze 1977; Snow 1980).

Like their Paleo-Indian predecessors, Early Archaic sites tend to be small and produce few artifacts, most of which are not temporally diagnostic. While Early Archaic sites in other portions the United States are represented by projectile points of the Kirk series (Ritchie and Funk 1973) and by Kanawha types (Coe 1964), sites of this age in southern New England are identified based on a series of ill-defined bifurcate-based projectile points. These projectile points are identified by the presence of their characteristic bifurcated base, and they generally are made from high quality raw materials. Moreover, finds of these projectile points have rarely been in stratified contexts. Rather, they occur commonly either as surface expressions or intermixed with artifacts representative of later periods. Early Archaic occupations, such as the Dill Farm Site and Sites 6LF64 and 6LF70 in Litchfield County, an area represented by camps that were relocated periodically to take advantage of seasonally available resources (McBride 1984; Pfeiffer 1986). In this sense, a foraging type of settlement pattern was employed during the Early Archaic Period.

Middle Archaic Period (8,000 to 6,000 B.P.)

By the onset of the Middle Archaic Period, essentially modern deciduous forests had developed in the region (Davis 1969). It is at this time that increased numbers and types of sites are noted in Connecticut (McBride 1984). The most well-known Middle Archaic site in New England is the Neville Site, which is in Manchester, New Hampshire and studied by Dincauze (1976). Careful analysis of the Neville Site indicated that the Middle Archaic occupation dated from between ca., 7,700 and 6,000 years ago. In fact, Dincauze (1976) obtained several radiocarbon dates from the Middle Archaic component of the

Neville Site. The dates, associated with the then-newly named Neville type projectile point, ranged from 7,740±280 and 7,015±160 B.P. (Dincauze 1976).

In addition to Neville points, Dincauze (1976) described two other projectile points styles that are attributed to the Middle Archaic Period: Stark and Merrimac projectile points. While no absolute dates were recovered from deposits that yielded Stark points, the Merrimac type dated from 5,910±180 B.P. Dincauze argued that both the Neville and later Merrimac and Stark occupations were established to take advantage of the excellent fishing that the falls situated adjacent to the site area would have afforded Native American groups. Thus, based on the available archaeological evidence, the Middle Archaic Period is characterized by continued increases in diversification of tool types and resources exploited, as well as by sophisticated changes in the settlement pattern to include different site types, including both base camps and task-specific sites (McBride 1984:96)

Late Archaic Period (6,000 to 3,700 B.P.)

The Late Archaic Period in southern New England is divided into two major cultural traditions that appear to have coexisted. They include the Laurentian and Narrow-Stemmed Traditions (Funk 1976; McBride 1984; Ritchie 1969a and b). Artifacts assigned to the Laurentian Tradition include ground stone axes, adzes, gouges, ulus (semi-lunar knives), pestles, atlatl weights, and scrapers. The diagnostic projectile point forms of this time period in southern New England include the Brewerton Eared-Notched, Brewerton Eared and Brewerton Side-Notched varieties (McBride 1984; Ritchie 1969a; Thompson 1969). In general, the stone tool assemblage of the Laurentian Tradition is characterized by flint, felsite, rhyolite and quartzite, while quartz was largely avoided for stone tool production.

In terms of settlement and subsistence patterns, archaeological evidence in southern New England suggests that Laurentian Tradition populations consisted of groups of mobile hunter-gatherers. While a few large Laurentian Tradition occupations have been studied, sites of this age generally encompass less than 500 m^2 (5,383 ft^2). These base camps reflect frequent movements by small groups of people in search of seasonally abundant resources. The overall settlement pattern of the Laurentian Tradition was dispersed in nature, with base camps located in a wide range of microenvironments, including riverine as well as upland zones (McBride 1978, 1984:252). Finally, subsistence strategies of Laurentian Tradition focused on hunting and gathering of wild plants and animals from multiple ecozones.

The second Late Archaic tradition, known as the Narrow-Stemmed Tradition, is unlike the Laurentian Tradition, and it likely represents a different cultural adaptation. The Narrow-Stemmed tradition is recognized by the presence of quartz and quartzite narrow stemmed projectile points, triangular quartz Squibnocket projectile points, and a bipolar lithic reduction strategy (McBride 1984). Other tools found in Narrow-Stemmed Tradition artifact assemblages include choppers, adzes, pestles, antler and bone projectile points, harpoons, awls, and notched atlatl weights. Many of these tools, notably the projectile points and pestles, indicate a subsistence pattern dominated by hunting and fishing, as well the collection of a wide range of plant foods (McBride 1984; Snow 1980:228).

The Terminal Archaic Period (3,700 to 2,700 B.P.)

The Terminal Archaic Period, which lasted from ca., 3,700 to 2,700 BP, is perhaps the most interesting, yet confusing of the Archaic Periods in southern New England prehistory. Originally termed the "Transitional Archaic" by Witthoft (1953) and recognized by the introduction of technological innovations, e.g., broadspear projectile points and soapstone bowls, the Terminal Archaic has long posed problems for regional archeologists. While the Narrow-Stemmed Tradition persisted through the Terminal Archaic and into the Early Woodland Period, the Terminal Archaic is coeval with what appears

to be a different technological adaptation, the Susquehanna Tradition (McBride 1984; Ritchie 1969b). The Susquehanna Tradition is recognized in southern New England by the presence of a new stone tool industry that was based on the use of high-quality raw materials for stone tool production and a settlement pattern different from the "coeval" Narrow-Stemmed Tradition.

The Susquehanna Tradition is based on the classification of several Broadspear projectile point types and associated artifacts. There are several local sequences within the tradition, and they are based on projectile point type chronology. Temporally diagnostic projectile points of these sequences include the Snook Kill, Susquehanna Broadspear, Mansion Inn, and Orient Fishtail types (Lavin 1984; McBride 1984; Pfeiffer 1984). The initial portion of the Terminal Archaic Period (ca., 3,700-3,200 BP) is characterized by the presence of Snook Kill and Susquehanna Broadspear projectile points, while the latter Terminal Archaic (3,200-2,700 BP) is distinguished by the use Orient Fishtail projectile points (McBride 1984:119; Ritchie 1971).

In addition, it was during the late Terminal Archaic that interior cord marked, grit tempered, thick walled ceramics with conoidal (pointed) bases made their initial appearance in the Native American toolkit. These are the first ceramics in the region, and they are named Vinette I (Ritchie 1969a; Snow 1980:242); this type of ceramic vessel appears with much more frequency during the ensuing Early Woodland Period. In addition, the adoption and widespread use of soapstone bowls, as well as the implementation subterranean storage, suggests that Terminal Archaic groups were characterized by reduced mobility and longer-term use of established occupation sites (Snow 1980:250).

Finally, while settlement patterns appeared to have changed, Terminal Archaic subsistence patterns were analogous to earlier patterns. The subsistence pattern still was diffuse in nature, and it was scheduled carefully. Typical food remains recovered from sites of this period consist of fragments of white-tailed deer, beaver, turtle, fish and various small mammals. Botanical remains recovered from the site area consisted of *Chenopodium* sp., hickory, butternut and walnut (Pagoulatos 1988:81). Such diversity in food remains suggests at least minimal use of a wide range of microenvironments for subsistence purposes.

Woodland Period (2,700 to 350 B.P.)

Traditionally, the advent of the Woodland Period in southern New England has been associated with the introduction of pottery; however, as mentioned above, early dates associated with pottery now suggest the presence of Vinette I ceramics appeared toward the end of the preceding Terminal Archaic Period (Ritchie 1969a; McBride 1984). Like the Archaic Period, the Woodland Period has been divided into three subperiods: Early, Middle, and Late Woodland. The various subperiods are discussed below.

<u>Early Woodland Period (ca., 2,700 to 2,000 B.P.)</u>

The Early Woodland Period of the northeastern United States dates from ca., 2,700 to 2,000 B.P., and it has thought to have been characterized by the advent of farming, the initial use of ceramic vessels, and increasingly complex burial ceremonialism (Griffin 1967; Ritchie 1969a and 1969b; Snow 1980). In the Northeast, the earliest ceramics of the Early Woodland Period are thick walled, cord marked on both the interior and exterior, and possess grit temper.

Careful archaeological investigations of Early Woodland sites in southern New England have resulted in the recovery of narrow stemmed projectile points in association with ceramic sherds and subsistence remains, including specimens of White-tailed deer, soft and hard-shell clams, and oyster shells (Lavin and Salwen: 1983; McBride 1984:296-297; Pope 1952). McBride (1984) has argued that the combination

of the subsistence remains and the recognition of multiple superimposed cultural features at various sites indicates that Early Woodland Period settlement patterns were characterized by multiple re-use of the same sites on a seasonal basis by small co-residential groups.

Middle Woodland Period (2,000 to 1,200 B.P.)

The Middle Woodland Period is marked by an increase in the number of ceramic types and forms utilized (Lizee 1994a), as well as an increase in the amount of exotic lithic raw material used in stone tool manufacture (McBride 1984). The latter suggests that regional exchange networks were established, and that they were used to supply local populations with necessary raw materials (McBride 1984; Snow 1980). The Middle Woodland Period is represented archaeologically by narrow stemmed and Jack's Reef projectile points; increased amounts of exotic raw materials in recovered lithic assemblages, including chert, argillite, jasper, and hornfels; and conoidal ceramic vessels decorated with dentate stamping. Ceramic types indicative of the Middle Woodland Period includes Linear Dentate, Rocker Dentate, Windsor Cord Marked, Windsor Brushed, Windsor Plain, and Hollister Stamped (Lizee 1994a:200).

In terms of settlement patterns, the Middle Woodland Period is characterized by the occupation of village sites by large co-residential groups that utilized native plant and animal species for food and raw materials in tool making (George 1997). These sites were the principal place of occupation, and they were positioned close to major river valleys, tidal marshes, estuaries, and the coastline, all of which would have supplied an abundance of plant and animal resources (McBride 1984:309). In addition to villages, numerous temporary and task-specific sites were utilized in the surrounding upland areas, as well as in closer ecozones such as wetlands, estuaries, and floodplains. The use of temporary and task-specific sites to support large village populations indicates that the Middle Woodland Period was characterized by a resource acquisition strategy that can best be termed as logistical collection (McBride 1984:310).

Late Woodland Period (ca., 1,200 to 350 B.P.)

The Late Woodland Period in southern New England dates from ca., 1,200 to 350 B.P., and it is characterized by the earliest evidence for the use of corn in the lower Connecticut River Valley (Bendremer 1993; Bendremer and Dewar 1993; Bendremer et al. 1991; George 1997; McBride 1984); an increase in the frequency of exchange of non-local lithics (Feder 1984; George and Tryon 1996; McBride 1984; Lavin 1984); increased variability in ceramic form, function, surface treatment, and decoration (Lavin 1980, 1986, 1987; Lizee 1994a, 1994b); and a continuation of a trend towards larger, more permanent settlements in riverine, estuarine, and coastal ecozones (Dincauze 1974; McBride 1984; Snow 1980).

Stone tool assemblages associated with Late Woodland occupations, especially village-sized sites, are functionally variable and they reflect plant and animal resource processing and consumption on a large scale. Finished stone tools recovered from Late Woodland sites include Levanna and Madison projectile points; drills; side-, end-, and thumbnail scrapers; mortars and pestles; nutting stones; netsinkers; and celts, adzes, axes, and digging tools. These tools were used in activities ranging from hide preparation to plant processing to the manufacture of canoes, bowls, and utensils, as well as other settlement and subsistence-related items (McBride 1984; Snow 1980). Finally, ceramic assemblages recovered from Late Woodland sites are as variable as the lithic assemblages. Ceramic types identified include Windsor Fabric Impressed, Windsor Brushed, Windsor Cord Marked, Windsor Plain, Clearview Stamped, Sebonac Stamped, Selden Island, Hollister Plain, Hollister Stamped, and Shantok Cove Incised (Lavin 1980, 1988a, 1988b; Lizee 1994a; Pope 1953; Rouse 1947; Salwen and Ottesen 1972; Smith 1947). These types are

more diverse stylistically than their predecessors, with incision, shell stamping, punctation, single point, linear dentate, rocker dentate stamping, and stamp and drag impressions common (Lizee 1994a:216).

Summary of Connecticut Prehistory

In sum, the prehistory of Connecticut spans from ca., 12,000 to 350 B.P., and it is characterized by numerous changes in tool types, subsistence patterns, and land use strategies. For most of the prehistoric era, local Native American groups practiced a subsistence pattern based on a mixed economy of hunting and gathering wild plant and animal resources. It is not until the Late Woodland Period that incontrovertible evidence for the use of domesticated species is available. Further, settlement patterns throughout the prehistoric era shifted from seasonal occupations of small co-residential groups to large aggregations of people in riverine, estuarine, and coastal ecozones. In terms of the region containing the proposed Project Site, a variety of prehistoric site types may be expected. These range from seasonal camps utilized by Archaic populations to temporary and task-specific sites of the Woodland era.

CHAPTER IV
HISTORIC OVERVIEW

Introduction

As Chapter I states, the Project Site associated with GPS encompasses 517 acres of land in eight parcels. It is in the southeastern quarter of the Town of East Windsor, which is situated in Hartford County, Connecticut. Ketch Brook flows from east to west through the Project Site and forms a boundary of several of the parcels, which are set back from the surrounding roads except in the northeastern area, where two of them follow the line of Apothecaries Hall Road. An active railroad line also passes by several of the parcels from north to south. The remainder of this chapter provides a historical overview of the Project region, as well as data specific to the Project Site.

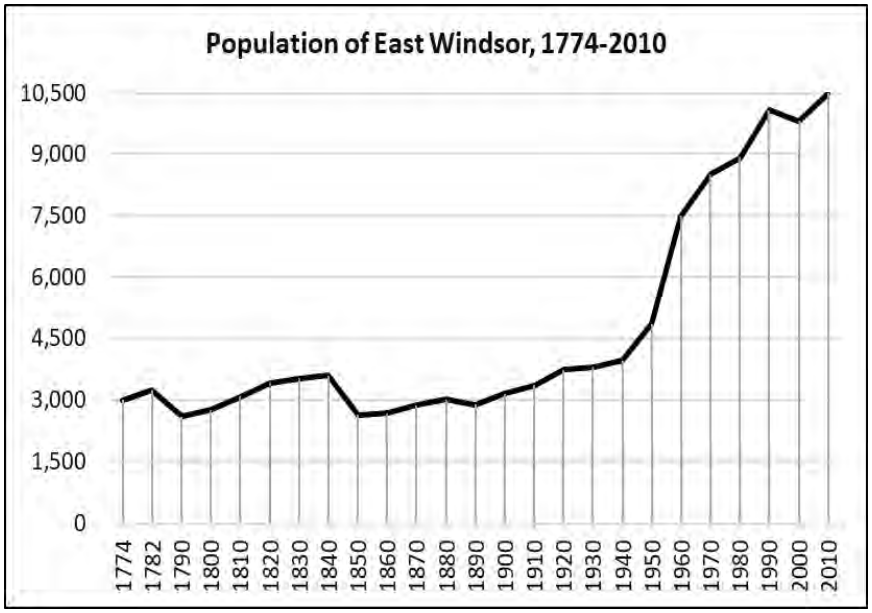
Native American History of East Windsor

East Windsor was formerly part of the Town of Windsor, and is also the parent town of both of the present Towns of South Windsor and Ellington. The Native Americans who lived in the Windsor area, on the west bank of the Connecticut River, were known to the colonists as the Poquonocks; a road and a village in Windsor still bear that name (Stiles 1891). The Native Americans who lived on the east side of the Connecticut River, in the areas that included the present South Windsor, were known to the colonists as the Podunks. Multiple Podunk villages were recorded along the bank of the river, and upland camps and seasonal villages have been found throughout the area. The primary Podunk village site during the contact period appears to have been situated beside the Connecticut River, near the border between South Windsor and East Hartford (Goodwin 1886, 1879; Spiess 1937). These lands were claimed by the sachem Aramamet, under the English colonists' convenient understanding of land ownership by an individual sovereign, and he also claimed parts of the future Hartford and Windsor lands on the river's west side (Stiles 1892). At the time of King Philip's War in 1675-1676, the Podunks were believed to be quite numerous, and to their misfortune they took the side of King Philip. Many of them fled from colonial retribution and the loss of their land, although a few nonetheless remained behind. The last mention of a Podunk Native American in the colonial records was in 1722, but local records mentioned small numbers as late as 1745 and even 1879 (Spiess 1937; Goodwin 1879; De Forest 1852).

History of the Town of East Windsor

Hartford County was the site of one of the two earliest loci of colonial settlement in Connecticut, with three of its towns dating to the 1630s, including Hartford, Windsor, and Wethersfield. The county extends southward from the Connecticut/Massachusetts border and flanks the Connecticut River on both sides. The earliest colonial development of the region depended on the agricultural and transportation advantages of the river and its valley; areas further from the Connecticut River valley were colonized later and usually grew more slowly through the early nineteenth century. Thereafter, the main source of differentiation in Hartford County towns' development was first, whether they had significant levels of industrialization, and later, whether they had significant levels of suburbanization. East Windsor, located on the east bank of the Connecticut River, had the expected agricultural and transport advantages, with only modest early industrial development. Its suburbanization began early in the twentieth century, then increased exponentially after the close of World War II. The following discussion outlines the history of East Windsor in more detail and discusses the presence or absence of historical resources in the vicinity of the Project Site.

As mentioned above, Windsor was one of three colonial communities planted near each other on the Connecticut River in the 1630s, the others being Hartford and Wethersfield. Initially the colonists settled on the west side of the river, but eventually they claimed a wide area on both sides of it. Colonists began moving permanently to the eastern and northern Windsor territory in 1680, after King Philip's War (1675-1676) had reduced both their fears and the numbers of the Native Americans living there (Crofut 1937). The Town's initial area was very large, and over time it was divided into the Towns of East Windsor, South Windsor, Ellington, Windsor Locks, and part of Bloomfield (Barry 1985). Its population spread out across the landscape in search of agricultural land, cultivating the higher-quality areas first. According to a census taken in 1762, the whole Town of Windsor supported 4,019 residents. In 1768, the section on the east side of the Connecticut River became the separate Town of East Windsor, and as of 1774, the new Town of East Windsor was home to 2,999 residents, and then 3,237 residents as of 1782 (see the population chart below; Keegan 2012; Barry 1985). East Windsor (still including South Windsor) sent as many as 400 men to fight in the Revolutionary War; in addition, East Windsor contained a great deal of excellent agricultural land whose products must have fed many soldiers during the war (Tarbox 1886; Destler 1973).



During the first 50 years of the new United States, Windsor and its municipal offspring remained agricultural in economy, their populations slowly rising but staying below 4,000 people through 1840, when the census reported only 3,600 residents in East Windsor. In 1845, South Windsor was created out of East Windsor, and as of the 1850 federal census both towns had populations of under 3,000 people (Keegan 2012; see the population chart above). Interestingly, and perhaps significantly in terms of their economic history, East Windsor and South Windsor were entirely bypassed by the turnpike system that developed between ca. 1790 and 1850, under which private companies undertook to build and/or improve roads in order to speed the movement of people and goods. Often, though not always, the presence of such roads did indeed foster the development of commerce and industry (Wood 1919). It is likely that instead of turnpikes, the Connecticut River was used for commercial transport by residents of these towns. This river access also encouraged some early industrial development. As of the federal census of industry taken in 1850, East Windsor had 13 firms making products worth at least $500 per year, two of them steam-operated textile manufacturers employing a total of 210 men and 115 women;

the remainder employed between 21 people and one person, including three cigar-makers (U.S. Census 1850).

Although the 1813 map of Connecticut is not precise enough for the Project Site parcels to be mapped against it, the details it shows are relevant. According to the map, "Catch" Brook (latterly known as Ketch Brook) hosted six small industrial facilities between the Scantic River to the west and the road presently known as Wapping Road to the east. These included three sawmills, two grist mills, and a distillery (Figure 4; Warren and Gillet 1813). By the time the 1855 map of Hartford County was compiled, however, the cartographer placed a cashmere textile factory and a sawmill much further to the east, near a large mill pond on the far side of the road. The area was also given the name of Windsorville at that time (Figure 5; Woodford 1855). It is possible that the older mills were already abandoned by this time, especially if the upstream mill dam reduced the flow of the brook. It should also be noted that the cartographer placed the course of Ketch Brook well to the south of its actual course. The map of the Town published in 1869 showed the same arrangement, although with a mill pond on the west side of the road supplying the woolen factory at Windsorville. It also added a cemetery and a Methodist church on the north side of Apothecaries Hall Road, while still placing the course of the brook too far to the south (Figure 6; Baker & Tilden 1869). Unlike some of the facilities shown in the 1813 map, it seems that none of the later facilities and buildings were within the Project Site, although some of them were certainly within 152 m (500 ft) of it.

By the 1890s, East Windsor's agricultural emphasis had shifted from food and feed crops such as rye, corn, and hay to the growing of tobacco. The distilleries that once made use of the rye had also closed. Windsorville, previously known as Ketch Mills, had a gin distillery that burned down in the 1840s; it was be replaced by a woolen textile mill. This facility burned down in 1889, taking with it a boarding house along with all its equipment (Stiles 1891:745-746). It is not certain when nineteenth-century railroad service came to East Windsor and South Windsor. No railroad was shown on the 1869 map (Baker & Tilden). In 1880, the Connecticut Central Railroad, a 32 km (20 mi) track extending from East Hartford to South Windsor and up to Springfield, Massachusetts, was leased by the New York & New England Railroad; the same line had also been leased in 1876 by the Connecticut Valley Railroad (Turner and Jacobus 1989). At whatever time it was built, however, its population effects in East Windsor appear to have been limited. As the population chart above shows, East Windsor had 3,158 residents as of 1900 and 4,859 residents as of 1950 (Keegan 2012). While this shows a continuing growth trend during the first half of the twentieth century, it was not a spectacular growth trend. In economy, these nineteenth- and twentieth-century towns were, and to some extent still are, focused on agriculture. According to a 1932 assessment of the Towns' economic activity, East Windsor's main industries included only agriculture and textiles (Connecticut 1932).

A map from 1931 included some land owners in the vicinity, including Apothecaries Hall Company owning part of the northernmost Project parcel and J. Titus owning land to the south of the eastern end of the Project Site (Figure 7; Dolph & Stewart 1931). The Apothecaries Hall Company was originally a drug store in Waterbury, Connecticut; it was founded in 1849 and incorporated in 1852 (Anderson 1896:874-875). The successful business made many different kinds of medicines and chemicals, including paint supplies and fertilizers (Wiehn and Heiss 2003:30). According to the 1930 federal census, Joseph A. Titus was a widowed, Lithuanian-born tobacco farmer who worked the farm with his son Andrew, also born in Lithuania; his household also included his daughter Ardella, who was born in the United States (United States Census 1930). The 1934 and 1941 aerial photographs confirms that the Titus farm was growing tobacco at the end of the Great Depression. Within the Project Site itself, fields in the southwestern and northern sections were also being used for growing tobacco, and the northern

and central fields also contained three tobacco barns. The rest of the Project Site was forested. A utility corridor crossed the parcels from southeast to northwest, and the railroad line still ran up the center of it (Figure 8 and 9; USGS 1941).

Tobacco growing in Connecticut goes back to the colonial era. Although it was not the overwhelmingly important activity that it was in more southern colonies, it was an important cash crop in the Connecticut River valley by 1700. In 1810, cigar making began at East Windsor and Suffield, and by 1830 a new way of curing tobacco for cigar wrappers called "sweating" was discovered by an East Windsor company. After that, all or most of the industry shifted to producing for cigars, and high profit margins encouraged farmers to try their hand at growing it from the Housatonic valley to New Haven and as far north as Vermont and Maine. By the late nineteenth century, competition and overproduction had brought about a gradual decrease of acreage, until only the "best lands in the immediate vicinity of the Connecticut river continued to be used," presumably because those lands produced the highest yield (McDonald 1936:5,14). An improvement in tobacco production, which occurred in 1896, was the development of a method for growing "shade tobacco," and consisted simply of building light cloth tents on poles over the plants. This caused the tobacco leaves to take on a more attractive color, and the technique rapidly spread throughout the market. It resulted in significant increases in the grower's profit base (McDonald 1936). These tents, and the associated barns for drying or "curing" the tobacco, are clearly visible in the 1941 aerial photograph mentioned above.

After 1950, although East Windsor saw further substantial population increases, its population only reached 10,482 residents as of 2010 (Keegan 2012). Some of this growth may be related to the construction of Interstate 91, since the highway section on the east side of the Connecticut River opened in 1959 (Oglesby 2014). During the later twentieth and early twenty-first centuries, East Windsor witnessed modest industrial development. In 2018, 9.6 percent of its 7,032 jobs were in the manufacturing sector; a far larger proportion, approximately 20 percent, were in a sector identified in an economic profile document as "Administrative and Waste Service." Nonetheless, as of 2014 the Town's largest employers were in retail, health care, auto sales, farming, and metal working, suggesting a very mixed economy (CERC 2019). The Town's 2016 planning document, like many of its era for similar towns, called for the continuing improvement of certain focused areas of commercial and industrial development, as well as village areas. At the same time, it also displayed a preference for the support of low-density residential and agricultural uses in the majority of the Town's area, and also the preservation of open space and cultural and historical resources. The location of the Project Site, in the southeasternmost section of the Town, were within the large area designated as rural residential (East Windsor 2016; Figure 10).

The appearance of the Project Site in the 1963 aerial photograph is consistent with this modest population growth: all the fields and barns were still present, and there was only a small amount of new housing development in the area. The cleared utility corridor, however, had been substantially widened by the middle of the twentieth century (Figure 11; USGS 1963). By the time of the 2016 aerial photograph, more housing and some solar centers had been built in the vicinity of the Project Site. The Project Site itself, however, remained undeveloped, except that the use of some of the fields and wooded areas had been turned to sand and gravel operations. A few agricultural fields, striped with the marks of tobacco tenting poles, remained. It appears, however, that the sites of the three tobacco barns mentioned above had been severely impacted by this activity. In addition, an access road and a parking area for trucks and trailers had been placed in the easternmost parcel (Figures 12 and 13; CT ECO 2016 and 2019). These impacts, being set back from the roads, seem likely to have remained invisible to passers-by, allowing the ground-view appearance of the area to remain apparently undisturbed.

Conclusions

The documentary record indicates that most of the Project Site contains historic structures and farm fields associated with tobacco production. This complex, known as the Markowksi Farm has roots that extend back to the beginning of the twentieth century, if not earlier. This complex of barns, buildings, and fields is large in scale and unusual in type, as most historic farms in Connecticut have been either abandoned or developed. Thus, the Markowksi Farm may be viewed as a historical landscape, the development of which should be undertaken carefully to preserve the historical fabric of the area.

CHAPTER V
PREVIOUS INVESTIGATIONS

Introduction

This chapter presents an overview of previous archaeological research completed within the vicinity of the Project Site in East Windsor, Connecticut. Specifically, this chapter reviews previously identified archaeological sites and National/State Register of Historic Places properties situated in the region (Figures 14 and 15). The discussions presented below are based on information currently on file at the CT-SHPO in Hartford, Connecticut. In addition, the electronic site files maintained by Heritage also were examined during this investigation. Both the quantity and quality of the information contained in the original cultural resources survey reports and State of Connecticut archaeological site forms are reflected below.

Previously Recorded Archaeological Sites and National/State Register of Historic Places Properties/Districts in the Vicinity of the Project Site

A review of data currently on file at the CT-SHPO, as well as the electronic site files maintained by Heritage, did not reveal any previously identified archaeological sites or National/State Register of Historic Places properties situated within 1.6 km (1 mi) of the Project Site (Figures 14 and 15). Although no archaeological sites have been previously identified in the region, the natural setting discussed in Chapter II suggests Native Americans may have once inhabited the area, and that prehistoric archaeological sites may yet be discovered within the Project Site. In addition, the larger project region has been in use as agricultural land since East Windsor's settlement and there may be archaeological evidence of occupation in the Project Site that may predate the establishment of the current farming operation. These types of resources likely have not been identified within the study region and the Project Site due to a lack of professional archaeological and historical surveys.

CHAPTER VI
METHODS

Introduction

This chapter describes the research design and field methodology used to complete the Phase IA cultural resources assessment survey of the Project Site in East Windsor, Connecticut. The following tasks were completed during this investigation: 1) study of the region's prehistory, history, and natural setting, as presented in Chapters II through IV; 2) a literature search to identify and discuss previously recorded cultural resources in Project region; 3) a review of historic maps, topographic quadrangles, and aerial imagery depicting the Project Site in order to identify potential historic resources and/or areas of past disturbance; and 4) pedestrian survey and photo-documentation of the Project Site to determine its archaeological sensitivity. These methods are in keeping with those required by the CT-SHPO in the document entitled: *Environmental Review Primer for Connecticut's Archaeological Resources* (Poirier 1987).

Research Framework

The current Phase IA cultural resources assessment survey was designed to assess the cultural resources sensitivity of the Project Site, as well as to visually examine the Project Site for any previously unidentified archaeological sites and/or historic resources during a pedestrian survey. The undertaking was comprehensive in nature, and project planning considered the distribution of previously recorded cultural resources located within the project region, as well as a visual assessment of the Project Site. The methods used to complete this investigation were designed to provide coverage of all portions of the Project Site. The fieldwork entailed not only pedestrian survey, but also photo-documentation and GPS recordation (see below).

Archival Background Research & Literature Review

Background research for this project included a review of a variety of historic maps depicting the proposed Project Site; an examination of USGS 7.5' series topographic quadrangles; an analysis of aerial images dating from 1934 through 2019; and a review of all archaeological sites and National/State Register of Historic Places on file with the CT-SHPO, as well as electronic cultural resources data maintained by Heritage. The intent of this background research was to identify all previously recorded cultural resources situated within the Project Site, and to provide a natural and cultural context for the project region. This information then was used to develop the archaeological and historical context of the Project Site, and to assess its sensitivity with respect to the potential for producing intact cultural resources.

Field Methodology and Data Synthesis

Heritage also performed fieldwork for the Phase IA cultural resources assessment survey of the Project Site associated with the proposed GPS facility in East Windsor, Connecticut. This included pedestrian survey, photo-documentation, and mapping of the Project Site. During the completion of the pedestrian survey, representatives from Heritage photo-documented all potential areas of impact using digital media. Additionally, Heritage personnel recorded all above ground cultural resources and archaeologically sensitive areas using a GPS unit with submeter accuracy. GPS recordation was completed using Heritage's Trimble R1 receiver, which is a rugged, compact, lightweight GNSS receiver that provides sub-meter positioning information to any one of Heritage's Samsung Galaxy S4 tablets

using Bluetooth connectivity. These components seamlessly transferred all field data to Heritage's GIS professionals. This system not only provided Heritage with accurate locational data for the investigations, but it also allowed our field staff to instantly transfer GPS data related to survey to Heritage's home office.

Curation

Following the completion and acceptance of the Final Report of Investigations, all project materials, including drawings, maps, photographs, and field notes will be curated with:

Dr. Sarah Sportman
Connecticut State Archaeologist
Office of Connecticut State Archaeology
Box U-1023
University of Connecticut
Storrs, Connecticut 06269

CHAPTER VII
RESULTS OF THE INVESTIGATION & MANAGEMENT RECOMMENDATIONS

Introduction

This chapter presents the results of the Phase IA cultural resources assessment survey of the Project Site in East Windsor, Connecticut. As stated in the introduction of this report, the goals of the investigation included completion of the following tasks: 1) a contextual overview of the region's prehistory, history, and natural setting (e.g., soils, ecology, hydrology, etc.); 2) a literature search to identify and discuss previously completed cultural resources surveys and previously recorded cultural resources in the project region; 3) a review of readily available historic maps and aerial imagery depicting the Project Site in order to identify potential historic resources and/or areas of past disturbance; 4) pedestrian survey and photo-documentation of the Project Site in order to determine its archaeological sensitivity and the type and condition of historic period structures there; and 5) preparation of the current Phase IA cultural resources assessment survey report. The results of the investigation are presented below.

Results of Phase IA survey

As outlined in Chapter I, the 517-acre Project Site will be a subset of eight parcels of land in the southern part of the Town of East Windsor. It is bounded generally by Windsorville Road to the south, Wapping Road to the east, Apothecaries Hall Road to the north, and Ketch Brook to the west. The Project Site contains a variety of landscape types including agricultural fields, wooded areas, and large sand and gravel mining operations. In addition, an electrical transmission line corridor crosses the northern portion of the Project Site from northwest to southeast, and a railroad extends from north to south through the center of the Project Site. In general, the Project Site is relatively level and is situated at elevations ranging from 32.8 m to 67.7 to m (100 to 222 ft). The predominant soil types located throughout the Project Site are Agawam, Haven, Enfield, and Manchester sandy loams, which are found on slopes of 0 to 15 percent. Also present are Udorthent soils, which are located within the heavily disturbed areas associated with sand and gravel pits in the northern portion of the Project Site. The remainder of this chapter presents the result of an archaeological review of the Project Site followed by a discussion of historic built resources noted during survey and their integrity and preliminary assessment applying the National Register of Historic Places criteria for evaluation (36 CFR 60.4 [a-d]).

<u>Overall Sensitivity of the Project Site, Archaeological Assessment, & Management Recommendations</u>

Field data associated with local soil conditions, slopes, aspect, distance to water, and previous disturbance collected during the pedestrian survey of the Project Site was used in conjunction with the analysis of historic maps, aerial images, and data regarding previously identified archaeological sites, and National and State Register of Historic Places properties to stratify the Project Site into zones of no/low and/or moderate/high archaeological sensitivity. In general, historic period archaeological deposits are relatively easy to identify on the current landscape because the features associated with them tend to be relatively permanent constructions that extend above the ground surface (i.e., stone foundations, pens, wells, privies, etc.). Archaeological sites dating from the prehistoric era, on the other hand, are less often identified during pedestrian survey because they are buried, and predicting their locations relies more on the analysis and interpretation of environmental factors that would have informed Native American site choices.

With respect to the potential for identifying prehistoric archaeological sites, the Project Site was divided into areas of no/low and/or moderate to high archaeological potential by analyzing the landform types, slope, aspect, soils contained within them, and their distance to water. In general, areas located between 0 and 600 m (0 and 2,000 ft) from a freshwater source and that contain slopes of less than 8 percent and undisturbed well-drained soils possess a moderate to high potential for producing prehistoric archaeological deposits. This is in keeping with broadly based interpretations of prehistoric settlement and subsistence models that are supported by decades of previous archaeological research throughout Connecticut. It is also expected that there may be variability of prehistoric site types found in moderate to high sensitivity zones. For example, large Woodland period village sites and Archaic period seasonal camps may be expected along large river floodplains and near stream/river confluences, while smaller temporary or task specific sites may be expected on level areas with well-drained soils that are situated more than 300 m (1,000 ft) but less than 600 m (2,000 ft) from a water source. Finally, steeply sloping areas, poorly drained soils, or areas of previous disturbance are generally deemed to retain a no/low archaeological sensitivity with respect to their potential to contain prehistoric archaeological sites.

In addition, the potential for a given area to yield evidence of historic period archaeological deposits is based not only on the above-defined landscape features but also on the presence or absence of identified historic period archaeological and architectural resources identified during previous cultural resources surveys, recorded on historic period maps, or captured in aerial images of the region under study. In this case, proposed impact areas that are situated within 100 m (328 ft) of a previously identified historic period archaeological site or a National or State Register of Historic Places district/individually listed property also may be deemed to retain a moderate to high archaeological sensitivity. In contrast, those areas situated over 100 m (328 ft) from any of the above-referenced properties would be considered to retain a no/low historic period archaeological sensitivity.

The combined review of historic maps, aerial images, land deeds, and pedestrian survey indicates that the Project Site contains a variety of landscape types and conditions. The northernmost and north-central portions of the Project Site contain large sand and gravel mining operations. These areas have been heavily disturbed by the mining process, resulting in grade reduction and soil removal to a depth of several meters in some areas. This has effectively eliminated the possibly of identifying intact archaeological deposits in these areas. The northern part of the Project Site also contains an electrical transmission line corridor that extends in a southeast to northwest direction. The Project will be interconnected with this electrical transmission line, which also contains large amounts of prior disturbance and little, if any, sensitivity for archaeological deposits. There is also a north-to-south trending railroad that crosses the Project Site; the land that it traverses also has been disturbed and no longer retains any potential to yield intact cultural deposits (Figure 16).

The central and southern portions of the Project Site are characterized by extensive agricultural fields that have been used historically for shade tobacco and vegetable production. These fields, which are part of a farm currently owned by Edward and Dorothy Markowski, are crisscrossed by a series of dirt access roads, and they have been routinely plowed for hundreds of years. Nevertheless, as been determined through previously completed archaeological research throughout the Connecticut River Valley, agricultural fields have the potential to contain intact archaeological deposits buried beneath the plow zone, especially those of the prehistoric era. Thus, the agricultural fields associated with the Project Site have been assessed as retaining a moderate potential to yield archaeological sites since the uppermost limits of the local soils have been impacted by plowing (Figure 16).

Finally, there are several areas distributed throughout the Project Site that were covered in mixed deciduous forests at the time of survey. They were noted along local streams and on some areas determined to contain moderate to steep topography. It is likely that these areas remain in forest today because they do not contain expansive areas suitable for agricultural production. Most of these areas were considered to retain a no/low potential to yield intact archaeological sites due to the presence of steep slopes and/or wet soils (Figure 16). However, a few smaller forested areas were identified on more gently sloping areas with well drained soils; these areas are places where intact archaeological deposits may remain; thus, they were deemed to possess a moderate archaeological potential.

In sum, the review of historic maps and aerial images, as well as the pedestrian survey, revealed that the Project Site is characterized by a patchwork of various landscape types and contains varying levels of depositional integrity, which range from destroyed in the graveled area to no/low in the steeply sloping areas to moderate in the agricultural fields and wooded portions of the parcel characterized by low slopes and well drained soils. A total of 278.1 acres of the Project Site were deemed to possess a no/low archaeological sensitivity due to previous disturbances related to gravel production, the installation of the existing electrical transmission line, the above-referenced railroad, of steep slopes and wet soils (Figure 16). No additional archaeological examination of these areas is recommended prior to the construction of the proposed solar facility.

The remaining 238.9 acres of land in the Project Site were assessed as having a moderate potential to produce intact archaeological deposits (Figure 16). These areas may produce intact archaeological deposits. It is recommended that the wooded portions of the moderate archaeological sensitivity be subjected to Phase IB cultural resources reconnaissance survey using a subsurface testing regime characterized by the excavation of shovel tests measuring 50 x 50 cm (19.7 x 19.7 in) in size at 15 m (49.2 ft) intervals along survey transects spaced 15 m (49.2 ft) apart. It is further recommended that the agricultural fields also be subjected to Phase IB cultural resources reconnaissance survey through a modified field approach using pedestrian survey augmented by limited shovel testing. It is recommended that pedestrian survey of the agricultural fields be completed by spacing archaeologists 5 m (16.4 ft) apart and having them traverse each field and visually inspect the surface for the presence of artifacts. If artifacts are not recovered from the surface, no additional fieldwork will be completed. In contrast, if artifacts are identified, archaeologists will excavate shovel tests at 15 m (49.2 ft) intervals throughout the area containing surface expressions of cultural material only. This approach has been undertaken on similar projects in the region and it has proven effective for determining whether intact archaeological sites exist within agricultural fields.

Sensitivity of the Proposed Project Site, Built Resources, & Management Recommendations

As mentioned above, the Project Site includes portions of a working tobacco and vegetable farm that is representative of an agricultural complex with residences, tobacco sheds, English style barns, a water tower, and ancillary farm buildings. A review of the Project Site on both aerial images and through pedestrian survey revealed that it is situated in a section of East Windsor that is rural in character and includes a mixture of agricultural and residential properties. The review of historic maps of the region containing the Project Site indicates that it may not have contained any standing structures prior to the turn of the twentieth century, and that it was likely an outlying parcel of land until that point in time (Figures 4 through 6). It is not until a map was drawn in 1931 that the parcel was associated with a particular owner, who was listed simply as “Griffin Farm.” Still, the 1931 map did not record any buildings on the property, though some most likely existed by that time (Figure 7).

Despite the results of the historic map analysis above, the earliest available aerial image for the region, which dates from 1934, clearly shows numerous farm-related structures on the development parcel, including many tobacco sheds and the heart of the farm where the residence, barns, and water tower are located (Figure 8). Thus, it is clear that the parcel was developed for use as a farm at least as early as 85 years ago. Subsequent aerial images, including those from 1941 through 1963, show remarkable stability in the location and use of the earliest historic buildings within Project Site (Figures 9-11). Finally, aerial images dating from 2016 and 2019 shows that while most of the historic buildings remain on the Project Site, several modern additions were made in the form of large barns and what appear to be greenhouse type buildings (Figures 12 and 13).

During the Phase IA review, Heritage plotted all buildings within the Project Site on a 2019 aerial image and labeled each with a distinct symbol that indicated the dates by which they were constructed. These were labeled as buildings from 1934, 1941, and 1963, as well as those that were "Not Historic" (Figure 18). This image shows that there are 41 historic buildings located within or along the borders of the Project Site. These include 32 tobacco sheds, three English barns, three residential structures, a water tower, and two ancillary structures. In addition, there are 19 other buildings in the Project Site. They are marked with an "X" to denote that they are modern constructions (Figure 18). These include 11 greenhouses and five steel-framed sheds found at the center of the complex, as well as three tobacco sheds. The latter appear to date from the first decades of the twenty first century (Photographs 51-53).

Some of the buildings on the Project Site were previously documented as part of the Connecticut Trust's Barn Survey in 2010. It should be noted that the previous survey was not comprehensive, as it was only conducted from streets abutting the Project Site and does not contain all structures located on the property. According to that survey, as well as the pedestrian survey conducted as part of this Phase IA cultural resource assessment survey, the most common type of building found within the Project Site is the tobacco shed. The sheds situated throughout the Project Site are gable roofed structures that contain a gabled vent along the ridge of the building and moveable vertical slat siding (see Photograph 65 for a typical example). During the pedestrian survey, it was noted that many of these buildings rest on granite block foundations. Their purpose was for drying tobacco after the harvest and equipment storage during the remainder of the year.

Other historic buildings noted on or adjacent to the Project Site include English style barns, residences, a water tower, and ancillary buildings. The English style barns, for the most part, are represented by gable roofed buildings with either end of side entrances secured with wooden doors. These buildings are characterized by either cedar shake or vertical board siding, as well as asphalt shingle roofs (Figure 18 and Photos 84, 85, and 87). Of the identified residences on the property, two contain gable roofs that are covered with asphalt shingles and either cedar shake or clapboard style siding. The residence covered in cedar shakes was abandoned at the time of its recordation and is in a significant state of disrepair. The third residence recorded on the property is large house topped with a pyramidal roof that was covered in asphalt shingles. This building has a symmetrical front plan with evenly spaced windows on both of its two stories, as well as a centrally located front door on its relatively unadorned façade. This residence also had what appears to have been a large addition on the rear (Figure 18 and Photos 86, 89, and 91). The above-referenced water tower is of steel construction and is supported by steel lattice legs (Figure 18 and Photo 83). The tower was quite tall and contained numerous cellular communications antennae. The ancillary buildings on the property consist of small to moderate sized one story buildings that appear to have been used as offices or as other support facilities (Figure 18 and Photo 90). The Project sponsor will be avoiding direct impacts to the core of the farm, including, four nearby historic tobacco sheds, the water tower mentioned above, and a few other buildings.

The historical buildings discussed above, which are largely characterized by a high level of integrity for the most part, are part of an agricultural complex characterized by open fields, rows of tobacco sheds dating from the first half of the twentieth century, associated residences, and ancillary agricultural buildings. It is recommended that additional examination and documentation of exteriors and interiors (where possible) of the historic buildings situated on the Project Site be undertaken prior to final design and implementation of the Project so that their National Register of Historic Places eligibility can be determined. Subsequent research should also consider potential direct or indirect effects of the Project on local historic buildings, whether they be situated within or near to the Project Site.

Anderson, Joseph, contr. ed.
1896 *The Town and City of Waterbury, Connecticut, from the Aboriginal Period to the Year Eighteen Hundred and Ninety-Five*. Volume 3. New Haven, Connecticut: The Price & Lee Company.

Baker & Tilden
1869 *Atlas of Hartford and Tolland Counties: With a Map of Connecticut: From Actual Surveys*. Hartford, Connecticut: Baker & Tilden.

Barry, Ann P.
1985 *Connecticut Towns and Their Establishment.* Hartford, Connecticut: Connecticut State Library.

Bendremer, J.
1993 *Late Woodland Settlement and Subsistence in Eastern Connecticut*. Ph.D. Dissertation, Department of Anthropology, University of Connecticut, Storrs, Connecticut.

Bendremer, J. and R. Dewar
1993 The Advent of Maize Horticulture in New England. In *Corn and Culture in the Prehistoric New World.* Ed. by S. Johannessen and C. Hastorf. Westview Press, Boulder.

Bendremer, J., E. Kellogg and T. Largy
1991 A Grass-Lined Storage Pit and Early Maize Horticulture in Central Connecticut. *North American Archaeologist 12(4):325-349.*

CERC
2019 East Windsor, Connecticut, CERC Town Profile 2019. Accessed November 6, 2019. https://s3-us-west-2.amazonaws.com/cerc-pdfs/2019/east-windsor-2019.pdf.

Coe, J.L.
1964 The Formative Cultures of the Carolina Piedmont. *Transactions of the American Philosophical Society*, Vol. 54, Part 5. Philadelphia, Pennsylvania.

Connecticut, State of
1932 *State Register and Manual*. Hartford, Connecticut: State of Connecticut.

Connecticut Environmental Conditions Online (CT ECO)
2019 *Connecticut 2019 Orthophotography*. Storrs, Connecticut: University of Connecticut, Connecticut Environmental Conditions Online. http://www.cteco.uconn.edu/data/flight2019/index.htm.

Crofut, F. S. M.
1937 *Guide to the History and the Historic Sites of Connecticut*. 2 volumes. New Haven, Connecticut: Yale University Press.

Curren, M.L., and D.F. Dincauze

1977 Paleo-Indians and Paleo-Lakes: New Data from the Connecticut Drainage. In *Amerinds and their Paleoenvironments in Northeastern North America.* Annals of the New York Academy of Sciences 288:333-348.

Cutter, William Richard, comp.

1913 *New England Families, Genealogical and Memorial: A Record of the Achievements of Her People in the Making of Commonwealths and the Founding of the Nation.* Volume 2. New York: Lewis Historical Publishing Company.

De Forest, J. W.

1852 *History of the Indians of Connecticut from the Earliest Known Period to 1850.* Wm. Jas. Hamersley, Hartford, Connecticut.

Destler, Chester M.

1973 *Connecticut: The Provisions State*. Connecticut Bicentennial Series V. Chester, Connecticut: Pequot Press.

East Windsor, Town of

2016 *East Windsor: 2016 Plan of Conservation and Development*. Accessed November 6, 2019. https://www.eastwindsor-ct.gov/sites/eastwindsorct/files/uploads/2016_plan_of_conservation_development.pdf.

Dincauze, D.F.

1974 An Introduction to Archaeology in the Greater Boston Area. *Archaeology of Eastern North America* 2(1):39-67.

1976 *The Neville Site: 8000 Years at Amoskeag.* Peabody Museum Monograph No. 4. Cambridge, Massachusetts.

Dowhan, J.J. and R.J. Craig

1976 *Rare and endangered species of Connecticut and Their Habitats*. State Geological Natural History Survey of Connecticut Department of Environmental Protection, Report of Investigations No. 6.

Fairchild Aerial Surveys

1934 *Connecticut Statewide Aerial Photograph Series*. Hartford, Connecticut: Connecticut State Archives.

Feder, K.

1984 *Pots, Plants, and People: The Late Woodland Period of Connecticut*. Bulletin of the Archaeological Society of Connecticut 47:99-112.

Fitting, J.E.

1968 *The Spring Creek Site*. In *Contributions to Michigan Archaeology*, pp. 1-78. Anthropological Papers No. 32. Museum of Anthropology, University of Michigan, Ann Arbor.

Funk, R.E.
1976 *Recent Contributions to Hudson Valley Prehistory.* New York State Museum Memoir 22. Albany.

George, D.
1997 A Long Row to Hoe: The Cultivation of Archaeobotany in Southern New England. *Archaeology of Eastern North America* 25:175 - 190.

George, D. and C. Tryon
1996 *Lithic and Raw Material Procurement and Use at the Late Woodland Period Cooper Site, Lyme, Connecticut.* Paper presented at the joint meeting of the Archaeological Society of Connecticut and the Massachusetts Archaeological Society, Storrs Connecticut

George, D.R., and R. Dewar
1999 Prehistoric Chenopodium in Connecticut: Wild, Weedy, Cultivated, or Domesticated? *Current Northeast Paleoethnobotany*, edited by J. Hart, New York State Museum, Albany, New York.

Gerrard, A.J.
1981 *Soils and Landforms, An Integration of Geomorphology and Pedology*. George Allen & Unwin: London.

Goodwin, Joseph O.
1879 *East Hartford: Its History and Traditions*. Hartford, Connecticut: The Case, Lockwood & Brainard Co.; facsimile ed. East Hartford, Connecticut: The Raymond Library Company, 1975; re-indexed ed. Camden, Maine: Picton Press, 1992.

Gramly, R. Michael, and Robert E. Funk
1990 What is Known and Not Known About the Human Occupation of the Northeastern United States Until 10,000 B. P. *Archaeology of Eastern North America* 18: 5-32.

Griffin, J.B.
1967 Eastern North America Archaeology: A Summary. *Science* 156(3772):175-191.

Guilette, Mary E.
1979 *American Indians in Connecticut: Past to Present*. [Hartford, Connecticut]: State of Connecticut, Department of Environmental Protection, Connecticut Indian Affairs Council.

Hauptman, Laurence M. and James D. Wherry, eds.
1990 *The Pequots in Southern New England: The Fall and Rise of an American Indian Nation*. Norman, Oklahoma: University of Oklahoma Press.

Herzan, John
1997 *Eastern Coastal Slope: Historical and Architectural Overview and Management Guide*. Historic Preservation in Connecticut, Volume V. Hartford, Connecticut: Connecticut Historical Commission.

Jones, B.
1997 The Late Paleo-Indian Hidden Creek Site in Southeastern Connecticut. *Archaeology of Eastern North America* 25:45-80.

Keegan, Kristen Noble, comp.
2012 *Historical Population Data of Connecticut*. Dataset on file, Manchester, Connecticut.

Lavin, L.
1980 Analysis of Ceramic Vessels from the Ben Hollister Site, Glastonbury, Connecticut. *Bulletin of the Archaeological Society of Connecticut* 43:3-46.

1984 Connecticut Prehistory: A Synthesis of Current Archaeological Investigations. *Archaeological Society of Connecticut Bulletin* 47:5-40.

1986 *Pottery Classification and Cultural Models in Southern New England Prehistory*. North American Archaeologist 7(1):1-12.

1987 The Windsor Ceramic Tradition in Southern New England. *North American Archaeologist* 8(1):23-40.

1988a Coastal Adaptations in Southern New England and Southern New York. *Archaeology of Eastern North America*, Vol.16:101-120.

1988b The Morgan Site, Rocky Hill, Connecticut: A Late Woodland Farming Community in the Connecticut River Valley. *Bulletin of the Archaeological Society of Connecticut* 51:7-20.

Lizee, J.
1994a *Prehistoric Ceramic Sequences and Patterning in southern New England: The Windsor Tradition*. Unpublished Ph.D. dissertation, Department of Anthropology, University of Connecticut, Storrs.

1994b *Cross-Mending Northeastern Ceramic Typologies.* Paper presented at the 1994 Annual Meeting of the Northeastern Anthropological Association, Geneseo, New York.

McBride, K.
1978 Archaic Subsistence in the Lower Connecticut River Valley: Evidence from Woodchuck Knoll. *Man in the Northeast* 15 & 16:124-131.

1983 *Prehistory of the Lower Connecticut River Valley.* Ph.D. Dissertation, Department of Anthropology, University of Connecticut, Storrs, Connecticut.

McDonald, Adrian Francis
1936 *The History of Tobacco Production in Connecticut*. Tercentenary Commission of the State of Connecticut Series, No. LII. New Haven, Connecticut: The Tercentenary Commission by Yale University Press.

Moeller, R.
1980 *6-LF-21: A Paleo-Indian Site in Western Connecticut.* American Indian Archaeological Institute, Occasional Papers No. 2.

Oglesby, Scott
2014 I-91. *Connecticut Roads*. Accessed June 20, 2017. http://www.kurumi.com/roads/ct/i91.html.

Pagoulatos, P.
1988 Terminal Archaic Settlement and Subsistence in the Connecticut River Valley. *Man in the Northeast* 35:71-93.

Pfeiffer, J.
1984 The Late and Terminal Archaic Periods in Connecticut Prehistory. *Bulletin of the Bulletin of the Archaeological Society of Connecticut* 47:73-88.

1986 Dill Farm Locus I: Early and Middle Archaic Components in Southern Connecticut. *Bulletin of the Archaeological Society of Connecticut* 49:19-36.

1990 The Late and Terminal Archaic Periods in Connecticut Prehistory: A Model of Continuity. In *Experiments and Observations on the Archaic of the Middle Atlantic Region.* R. Moeller, ed.

Poirier, D.
1987 *Environmental Review Primer for Connecticut's Archaeological Resources.* Connecticut Historical Commission, State Historic Preservation Office, Hartford, Connecticut.

Pope, G.
1952 Excavation at the Charles Tyler Site. *Bulletin of the Archaeological Society of Connecticut* 26:3-29.

1953 The Pottery Types of Connecticut. *Bulletin of the Archaeological Society of New Haven* 27:3-10.

Ritchie, W.A.
1969a *The Archaeology of New York State*. Garden City: Natural History Press.

1969b *The Archaeology of Martha's Vineyard: A Framework for the Prehistory of Southern New England; A study in Coastal Ecology and Adaptation*. Garden City: Natural History Press

1971 *A Typology and Nomenclature for New York State Projectile Points*. New York State Museum Bulletin Number 384, State Education Department. University of the State of New York, Albany, New York.

Ritchie, W.A., and R.E. Funk
1973 *Aboriginal Settlement Patterns in the Northeast*. New York State Museum Memoir 20. The State Education Department, Albany.

Rouse, I.
1947 Ceramic Traditions and sequences in Connecticut. *Bulletin of the Archaeological Society of Connecticut* 21:10-25.

Salwen, B., and A. Ottesen
1972 Radiocarbon Dates for a Windsor Occupation at the Shantok Cove Site. *Man in the Northeast* 3:8-19.

Shelford, V.E.
1963 *The Ecology of North America*. University of Illinois Press.

Smith, C.
1947 An Outline of the Archaeology of Coastal New York. *Bulletin of the Archaeological Society of Connecticut* 21:2-9.

Snow, D.
1980 *The Archaeology of New England.* Academic Press, New York.

Spiess, Mathias
1937 Podunk Indian Sites. *Bulletin of the Archaeological Society of Connecticut* 5:2-6.

Stiles, Henry R.
1891 *The History and Genealogies of Ancient Windsor, Connecticut; Including East Windsor, South Windsor, Bloomfield, Windsor Locks, and Ellington*. Volume I. Hartford, Connecticut: Press of the Case, Lockwood & Brainard Company; reprint edition, Rockport, Maine: Picton Press, 2000.

Tarbox, Increase N.
1886 East Windsor and South Windsor. In *The Memorial History of Hartford County, Connecticut, 1633-1884*, J. Hammond Trumbull, ed., pp. 107-138. Boston: Edward L. Osgood, Publisher.

Turner, G. M., and M. W. Jacobus
1989 *Connecticut Railroads: An Illustrated History*. Hartford, Connecticut: Connecticut Historical Society.

United States Census
1850 *Seventh Census of the United States. Schedule 5 – Products of Industry*. Washington, DC: Bureau of the Census.

1930 *Fifteenth Census of the United States: 1930, Population Schedule*. HeritageQuest Online. Ann Arbor, Michigan: ProQuest LLC.

United States Department of Agriculture (USDA)
1941 *Aerial Photograph Series for Connecticut*. Reston, Virginia: USGS.

1963 *Aerial Photograph Series for Connecticut*. Reston, Virginia: USGS.

Warren, M. and Gillet, G.
1813 *Connecticut From Actual Survey Made in 1811*. Hartford, Connecticut: Hudson & Goodwin.

Wiehn, John and Mark Heiss
2003 *Waterbury, 1890-1930*. Postcard History Series. Portsmouth, New Hampshire: Arcadia Publishing.

Witthoft, J.
1949 An Outline of Pennsylvania Indian History. *Pennsylvania History* 16(3):3-15.

1953 Broad Spearpoints and the Transitional Period Cultures. *Pennsylvania Archaeologist*, 23(1):4-31.

Wood, Frederic J.
1919 *The Turnpikes of New England and Evolution of the Same Through England, Virginia, and Maryland*. Boston: Marshall Jones Company.

Woodford, E. M.
1855 *Smith's Map of Hartford County, Connecticut, From Actual Surveys*. Philadelphia: H. & C. T. Smith.

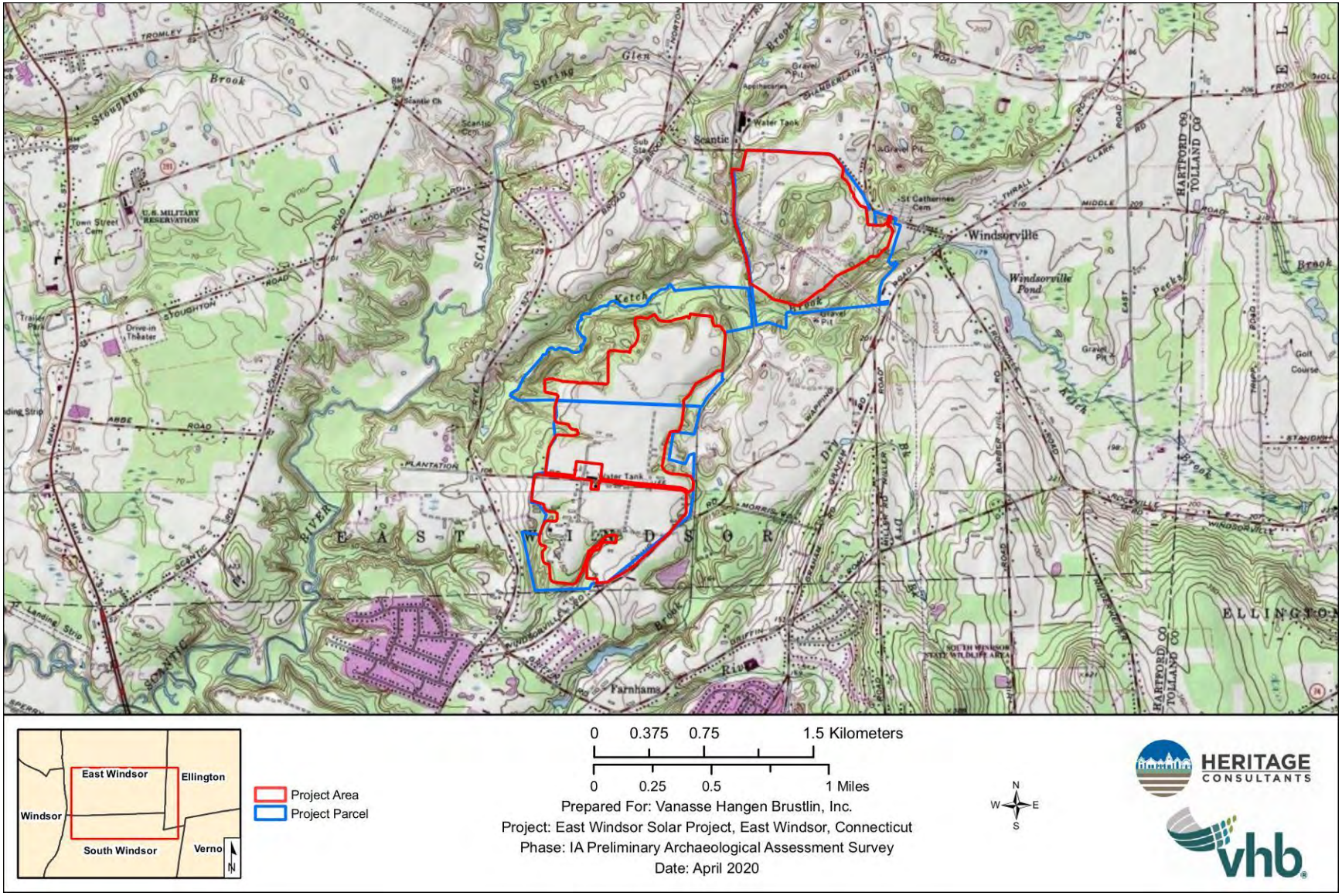


Figure 1. Excerpt from a USGS 7.5' series topographic quadrangle image showing the location of the Project Site in East Windsor, Connecticut.

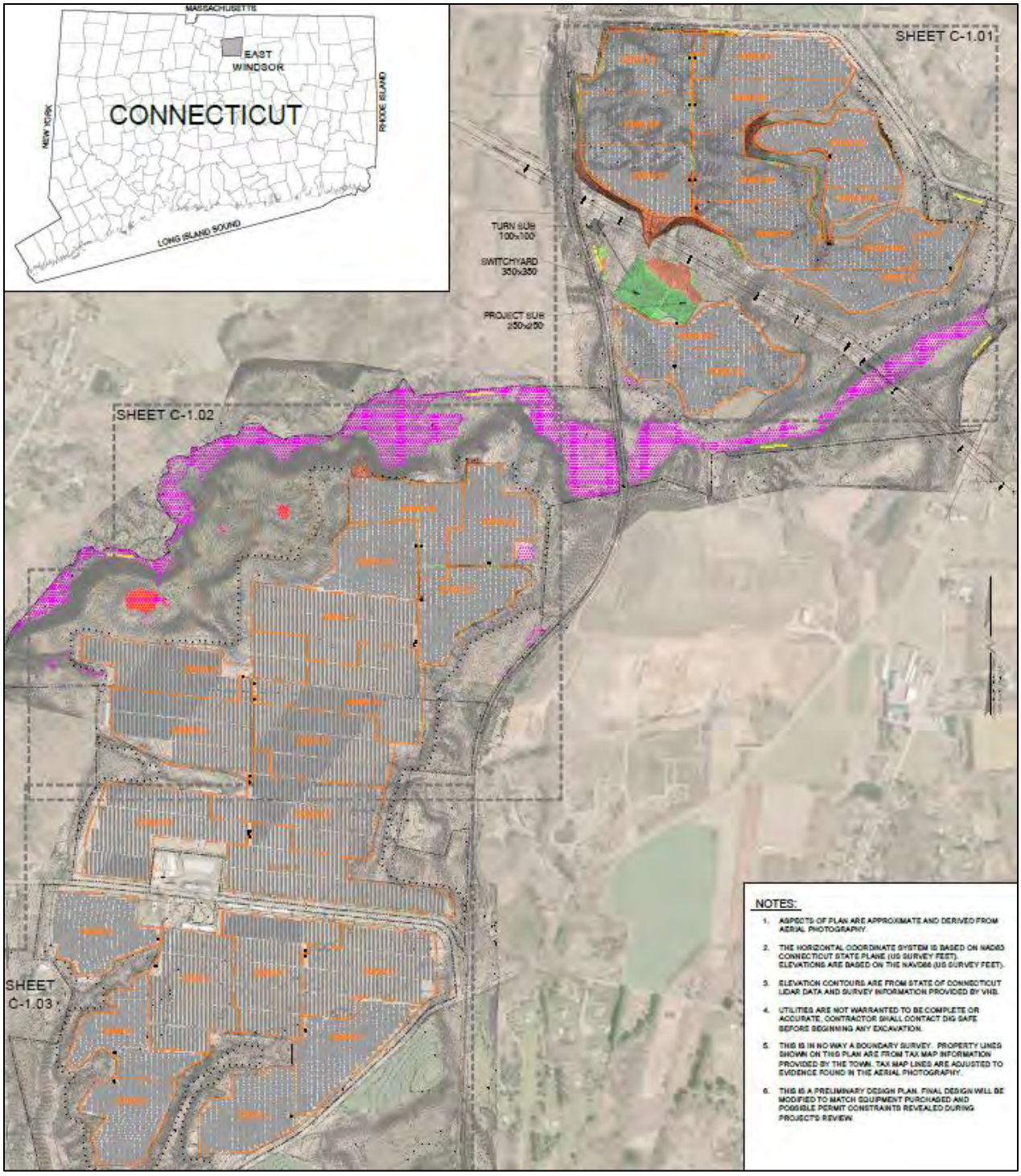


Figure 2. Draft plan of the proposed Gravel Pits Solar facility in East Windsor, Connecticut.

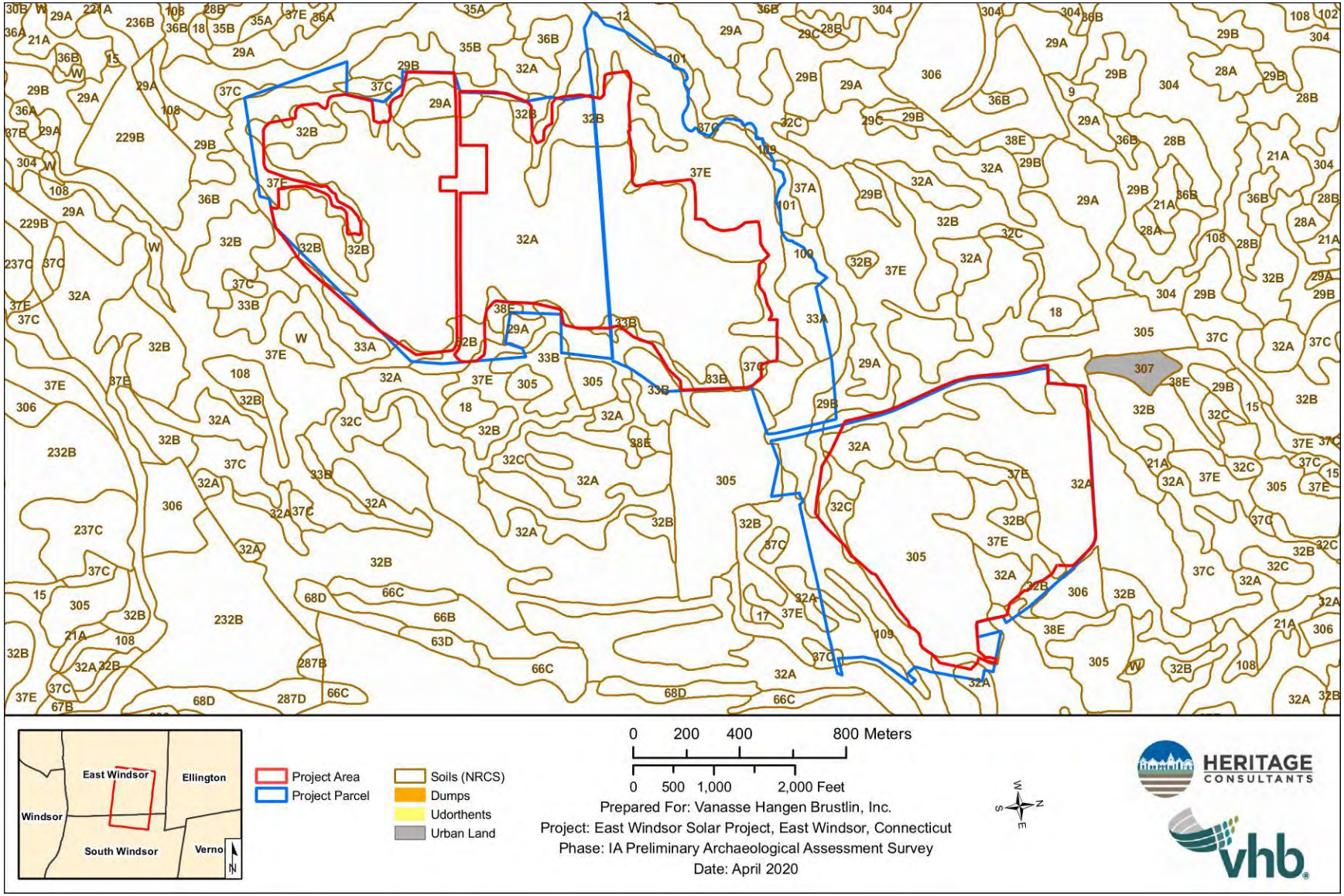


Figure 3. Map of soils located in the vicinity of the Project Site in East Windsor, Connecticut.

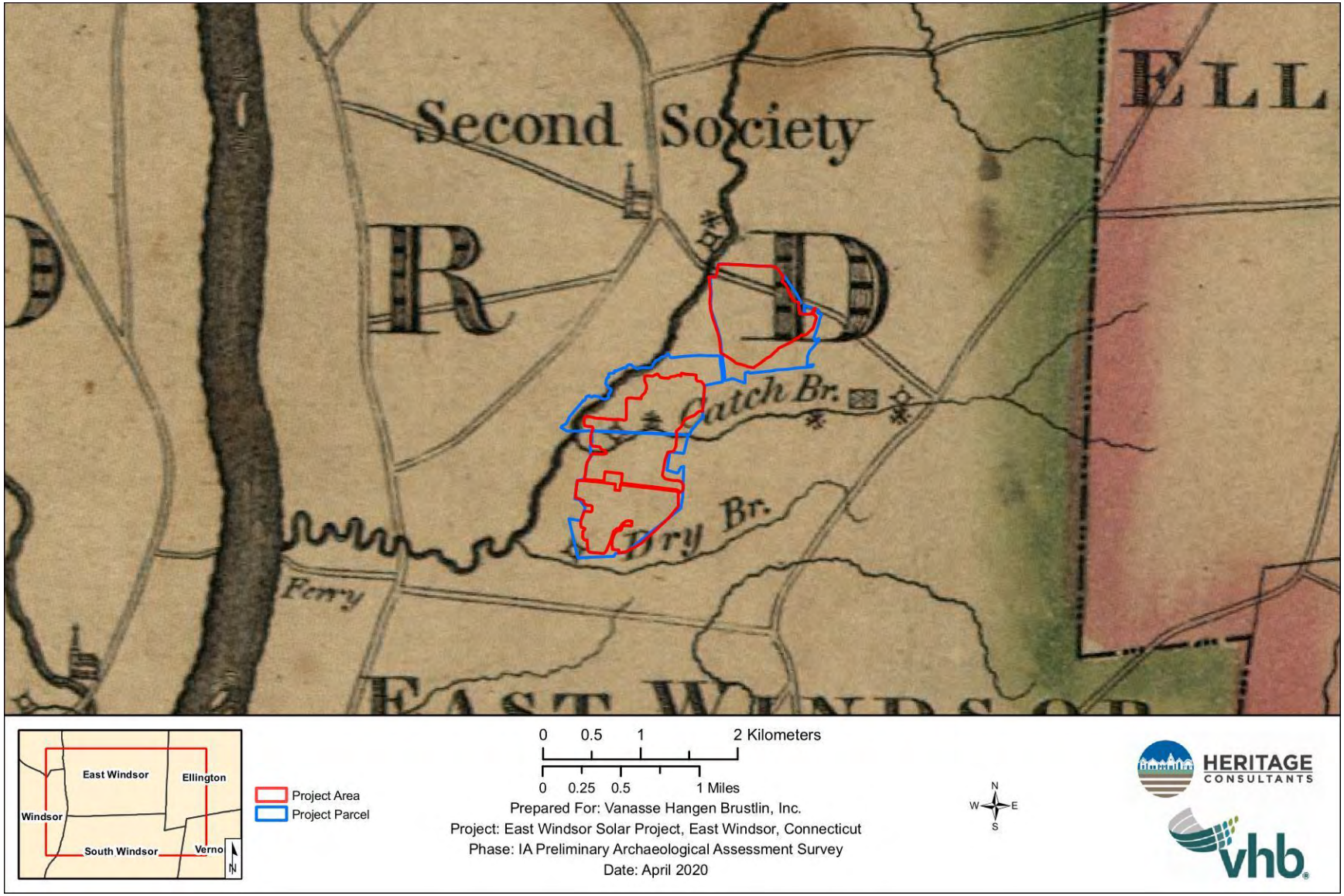


Figure 4. Excerpt from an 1813 historic map showing the location of the Project Site in East Windsor, Connecticut.

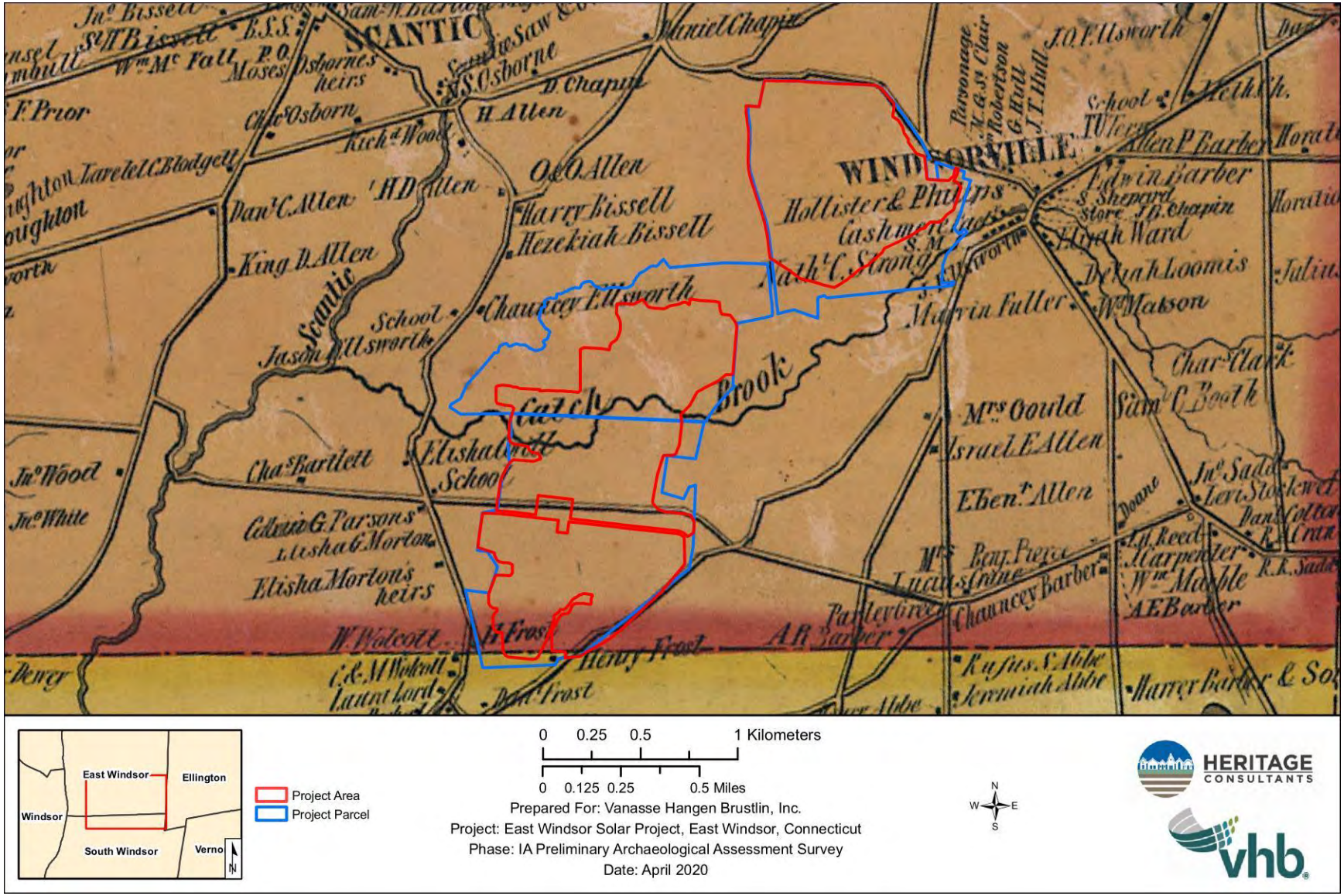


Figure 5. Excerpt from an 1855 historic map showing the location of the Project Site in East Windsor, Connecticut.

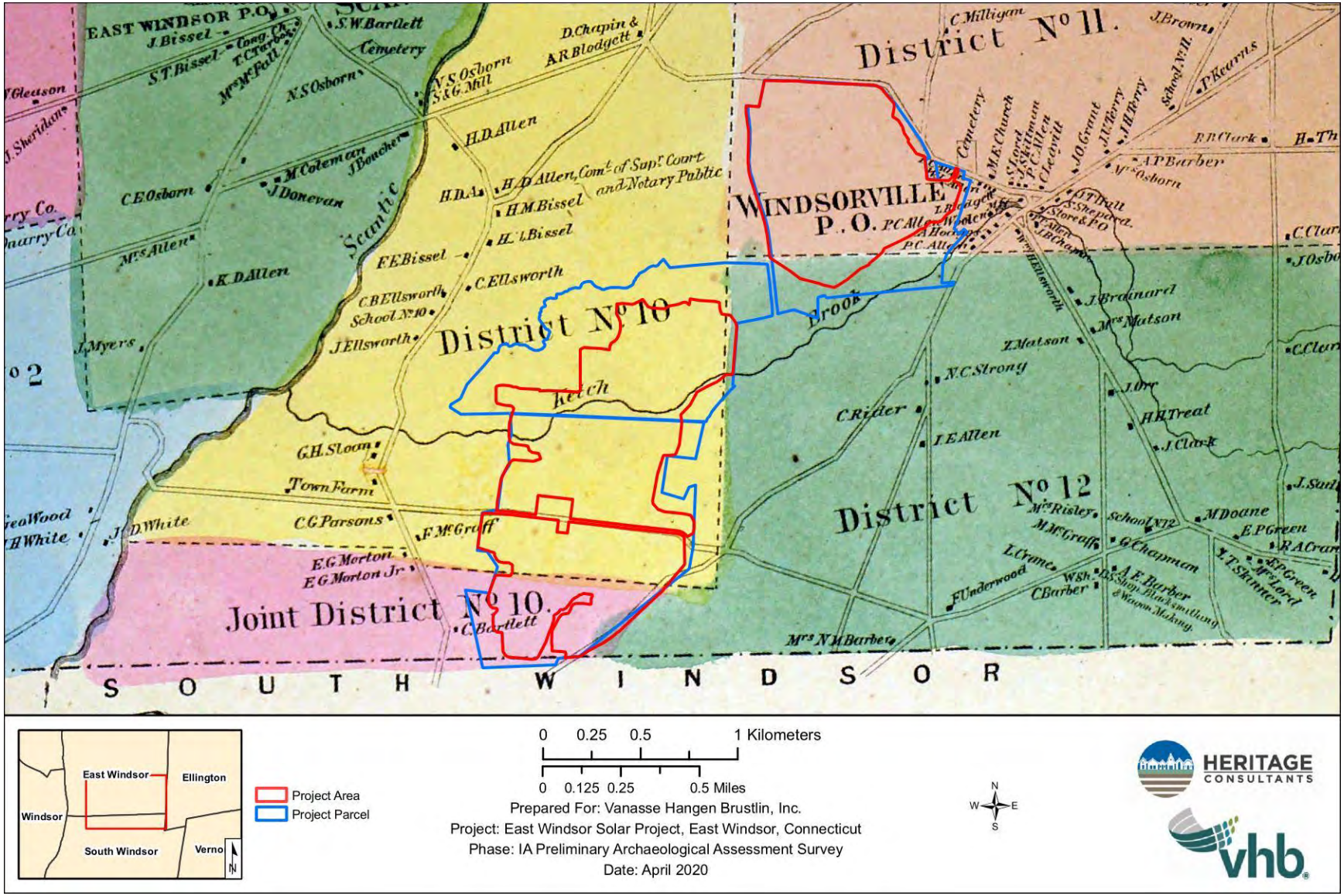


Figure 6. Excerpt from an 1869 historic map showing the location of the Project Site in East Windsor, Connecticut.

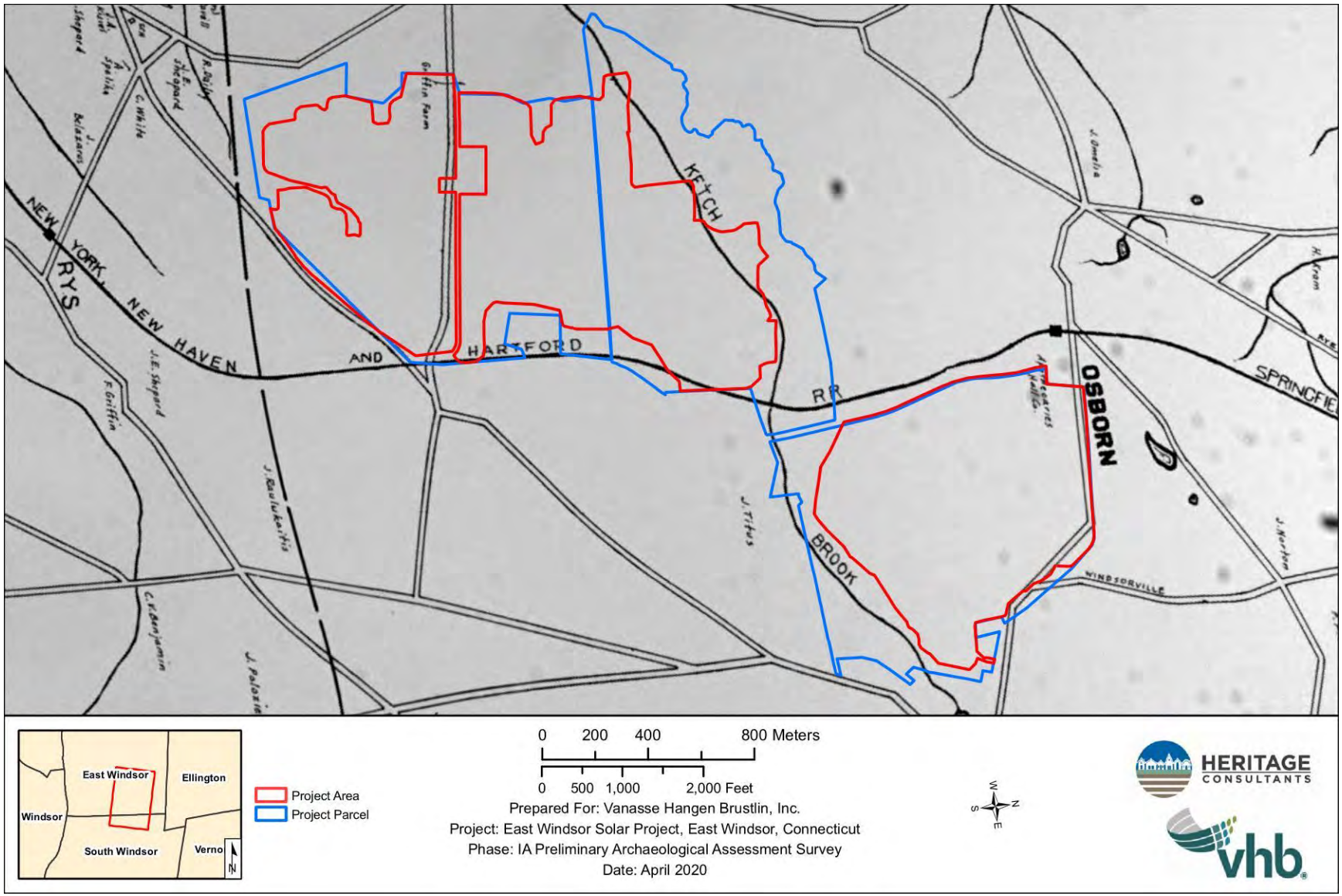


Figure 7. Excerpt from a 1931 historic map showing the location of the Project Site in East Windsor, Connecticut.

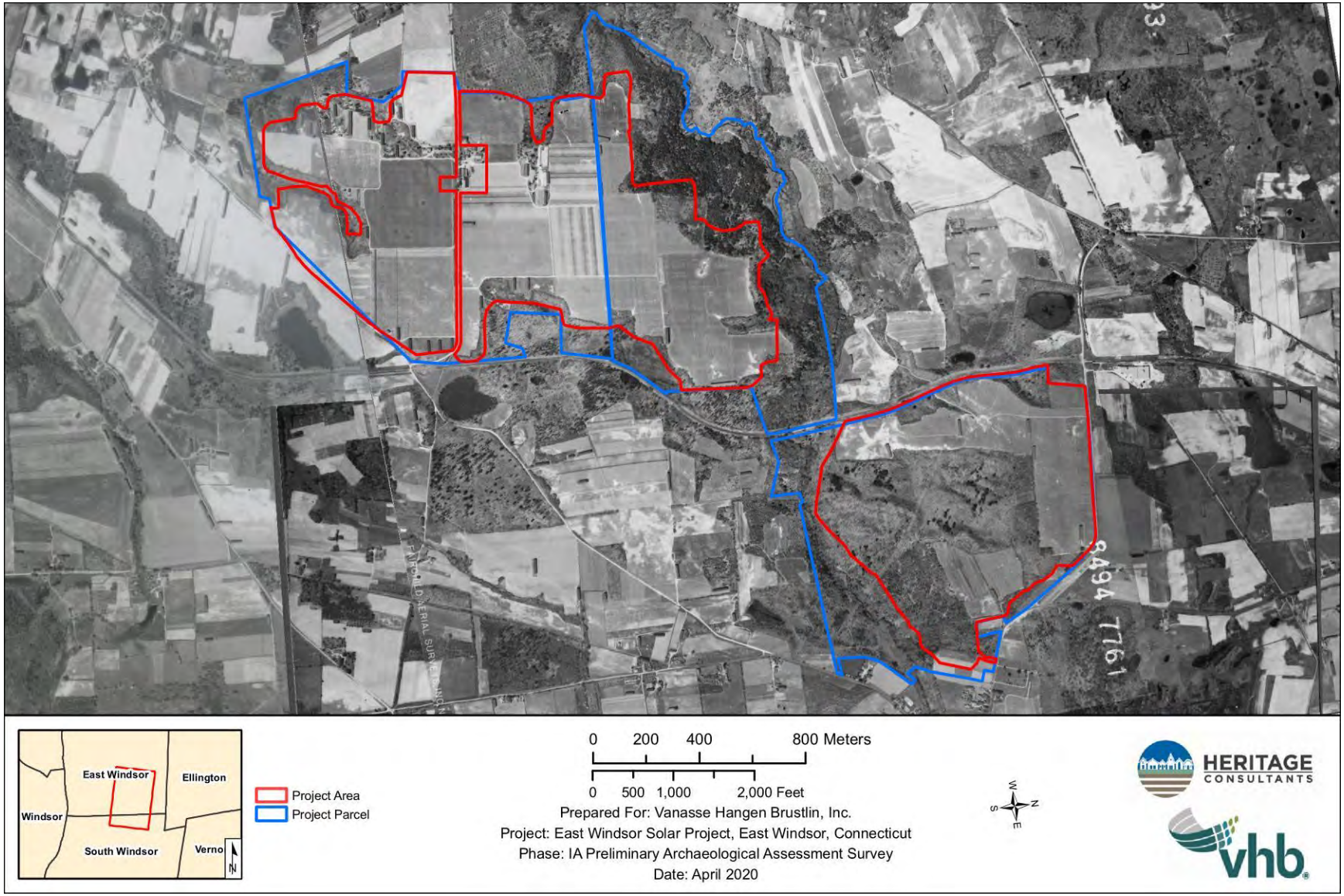


Figure 8. Excerpt from a 1934 aerial photograph showing the location of the Project Site in East Windsor, Connecticut.

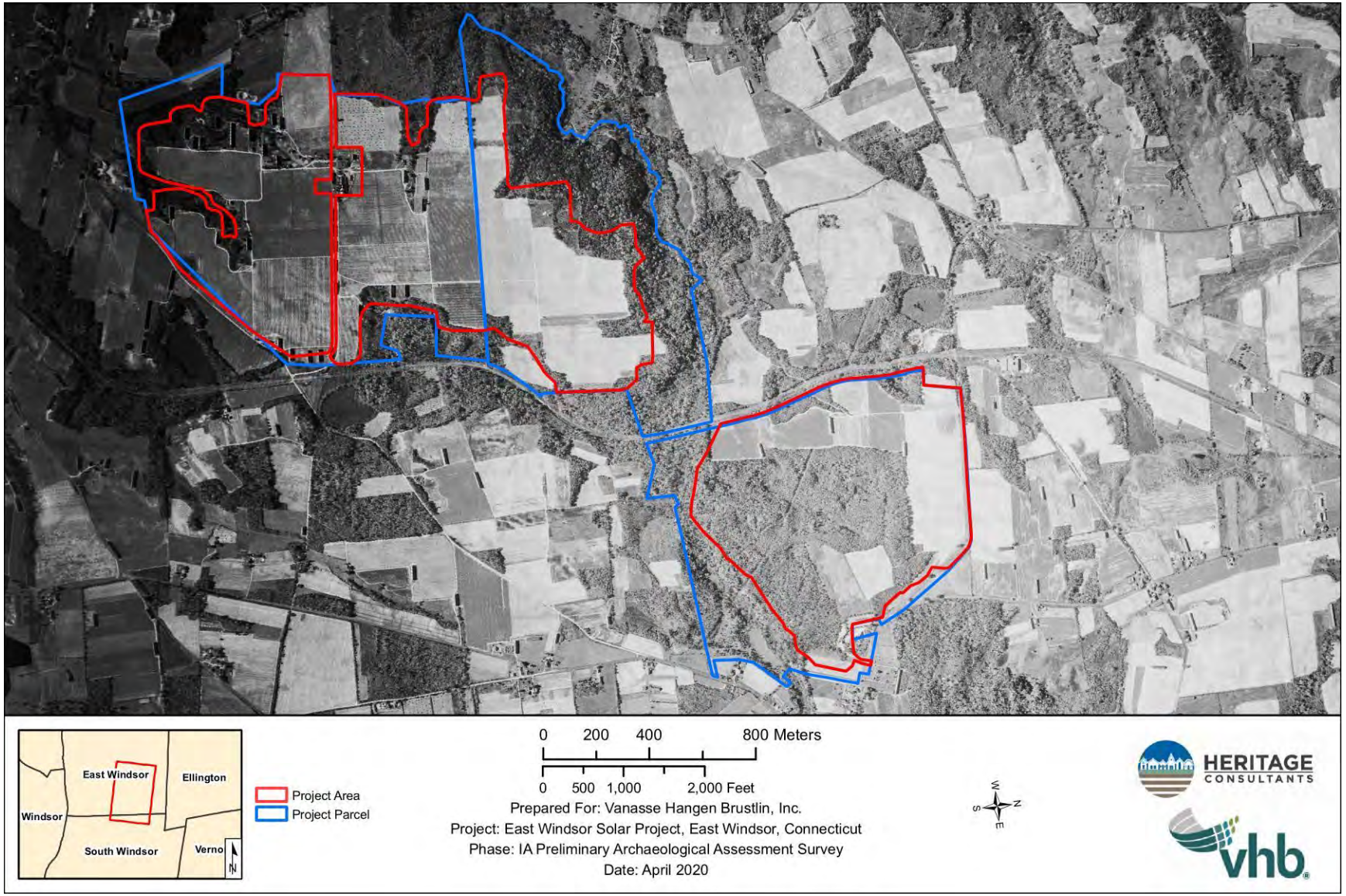


Figure 9. Excerpt from a 1941 aerial photograph showing the location of the Project Site in East Windsor, Connecticut.

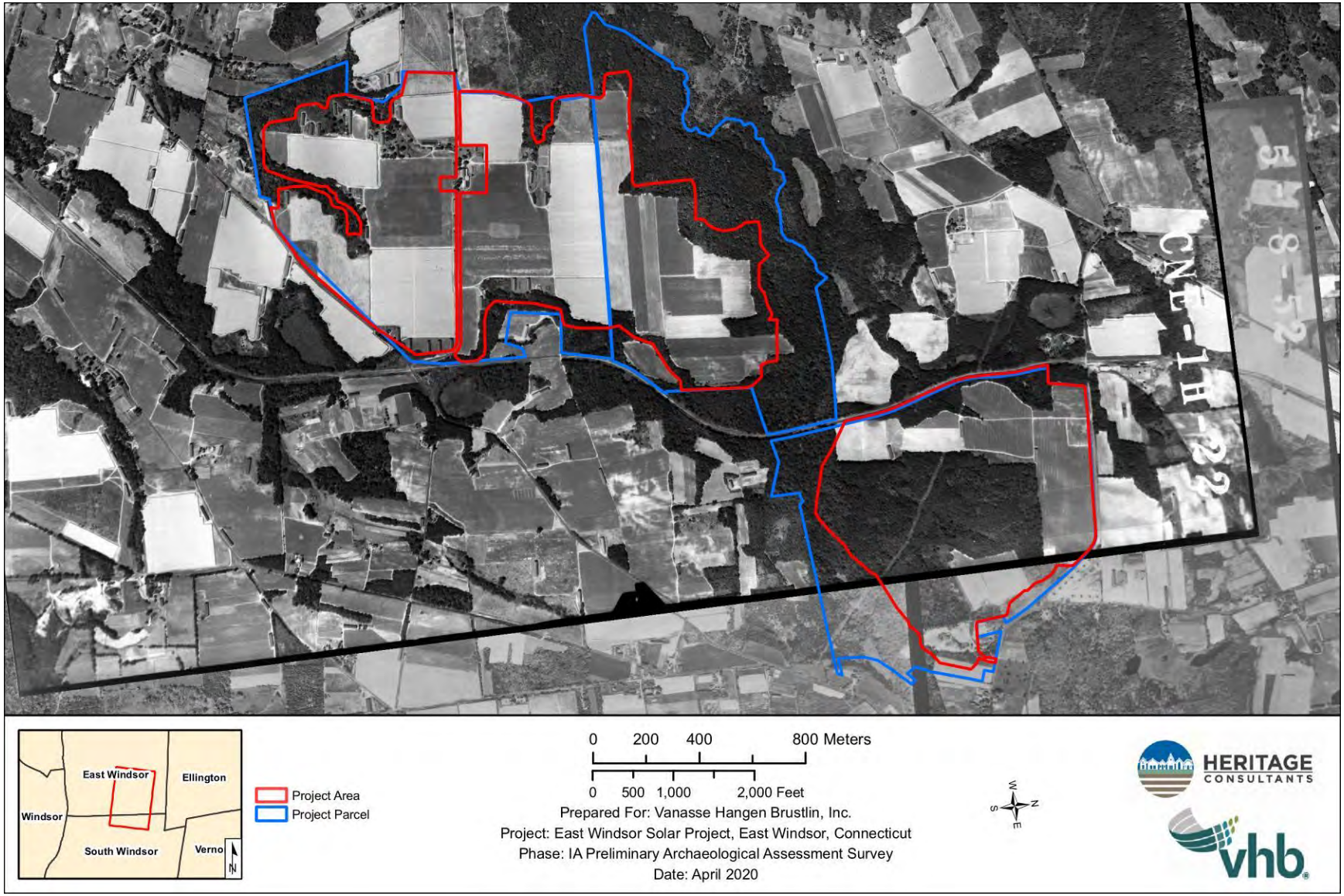


Figure 10. Excerpt from a 1951 aerial photograph showing the location of the Project Site in East Windsor, Connecticut.

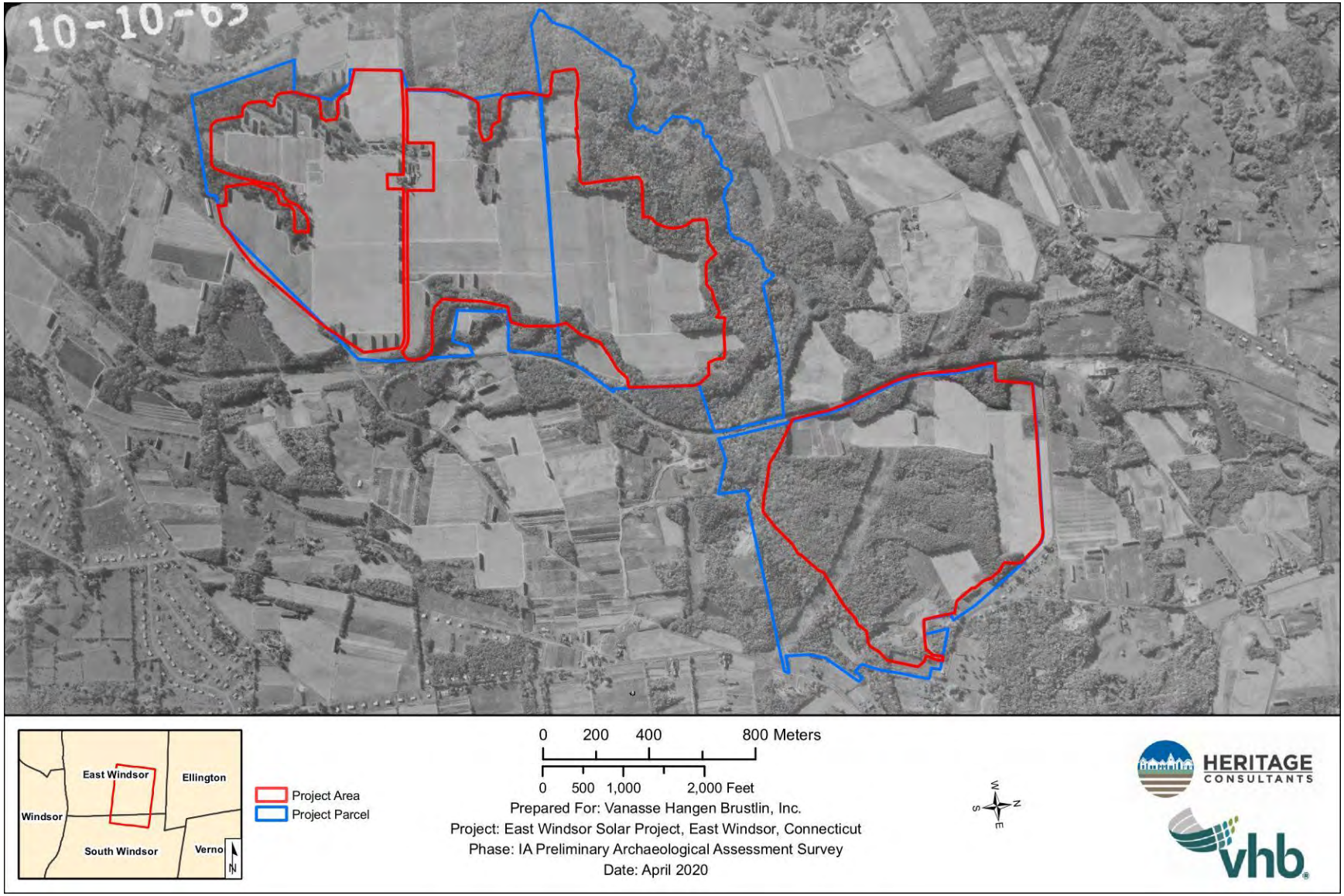


Figure 11. Excerpt from a 1963 aerial photograph showing the location of the Project Site in East Windsor, Connecticut.

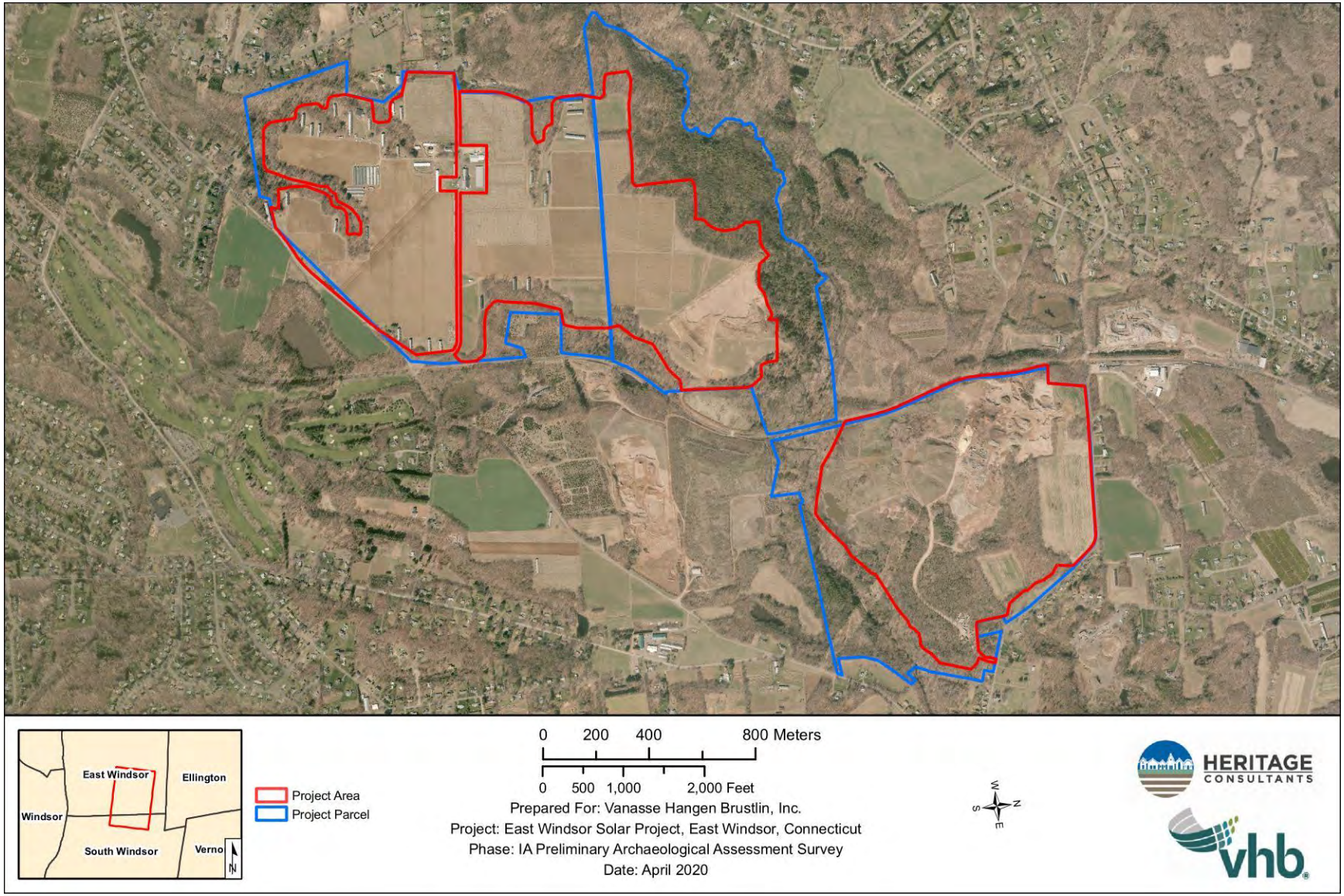


Figure 12. Excerpt from a 2016 aerial photograph showing the location of the Project Site in East Windsor, Connecticut.

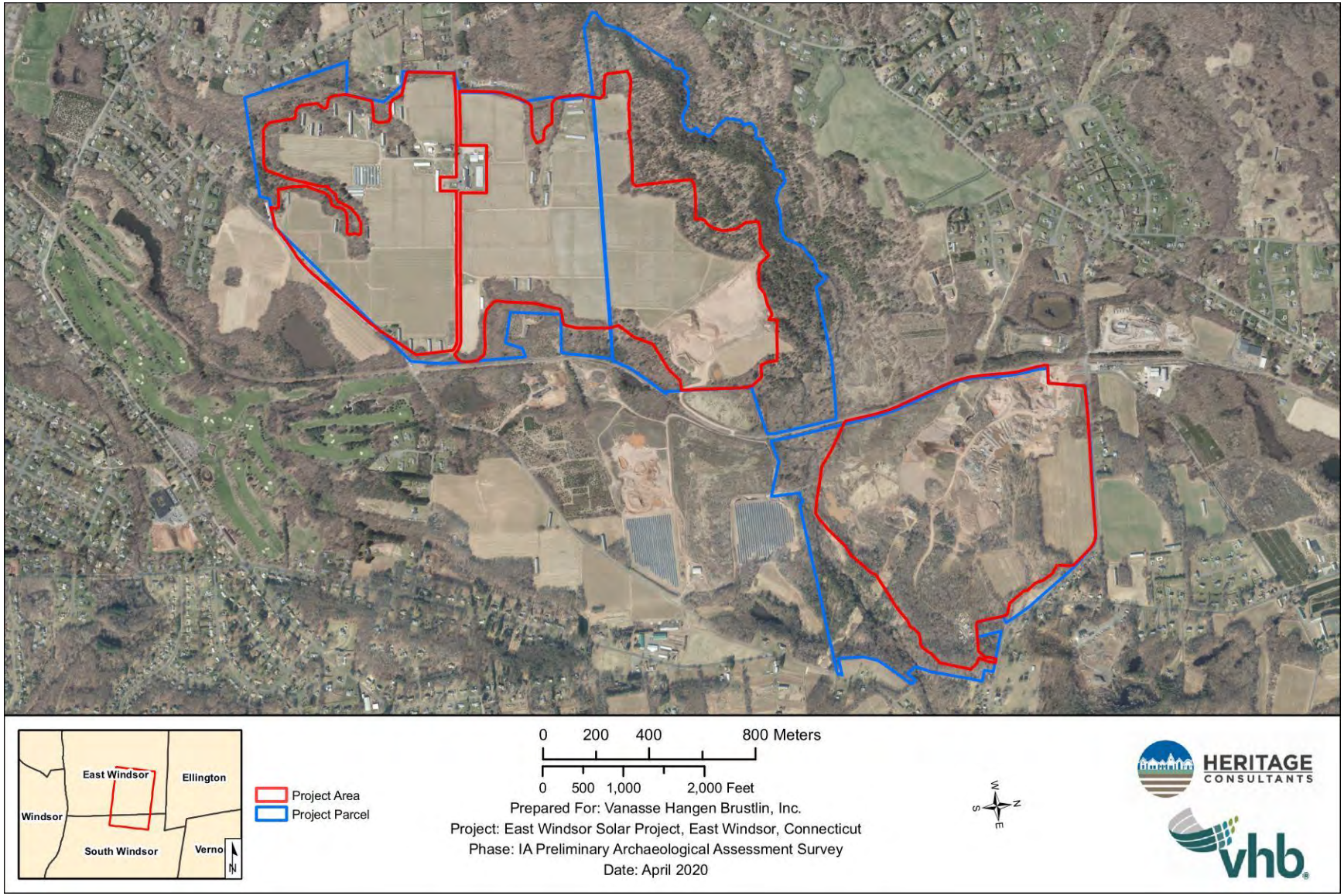


Figure 13. Excerpt from a 2019 aerial photograph showing the location of the Project Site in East Windsor, Connecticut.

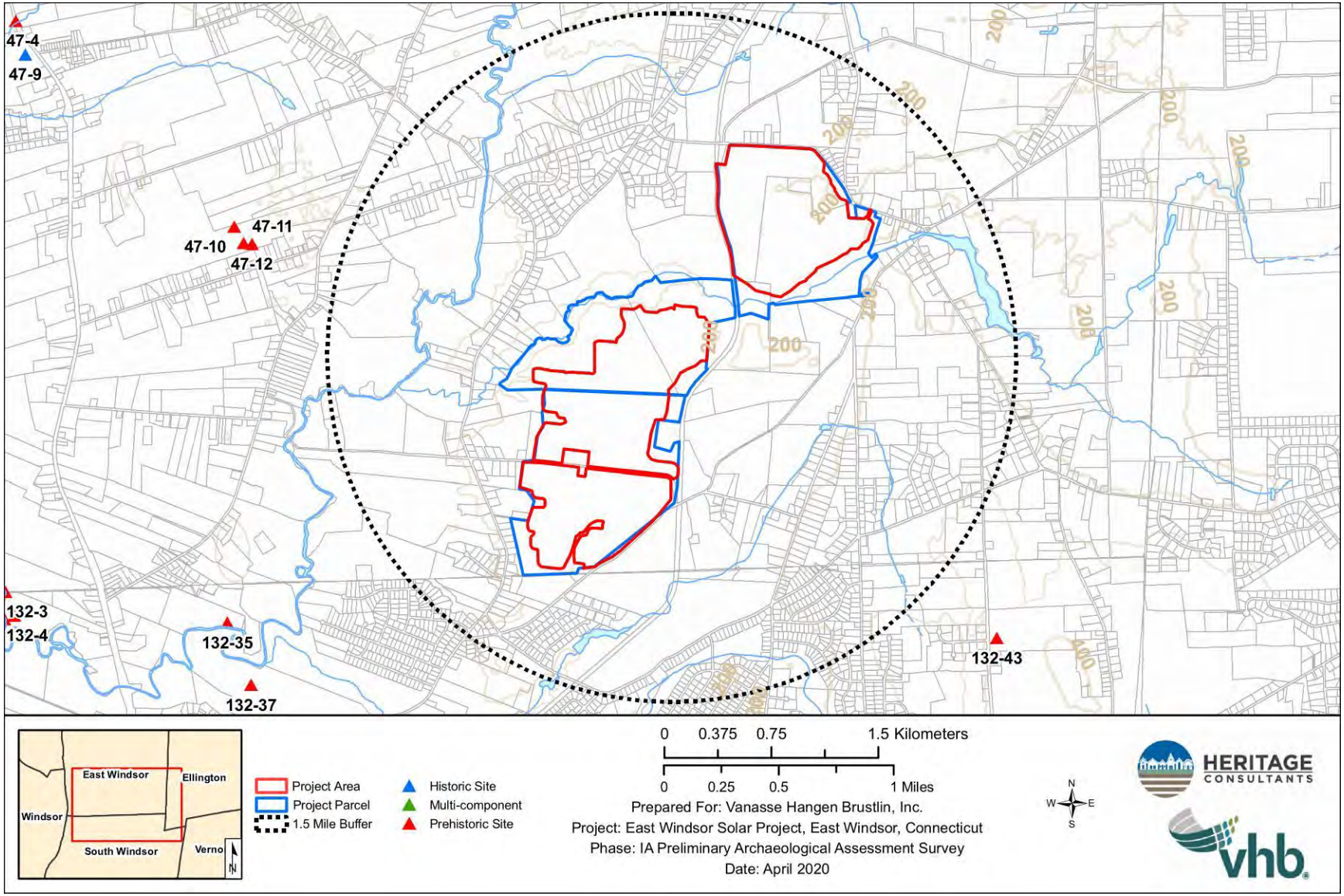


Figure 14. Digital map showing the location of previously identified archaeological sites in the vicinity of the Project Site in East Windsor, Connecticut.

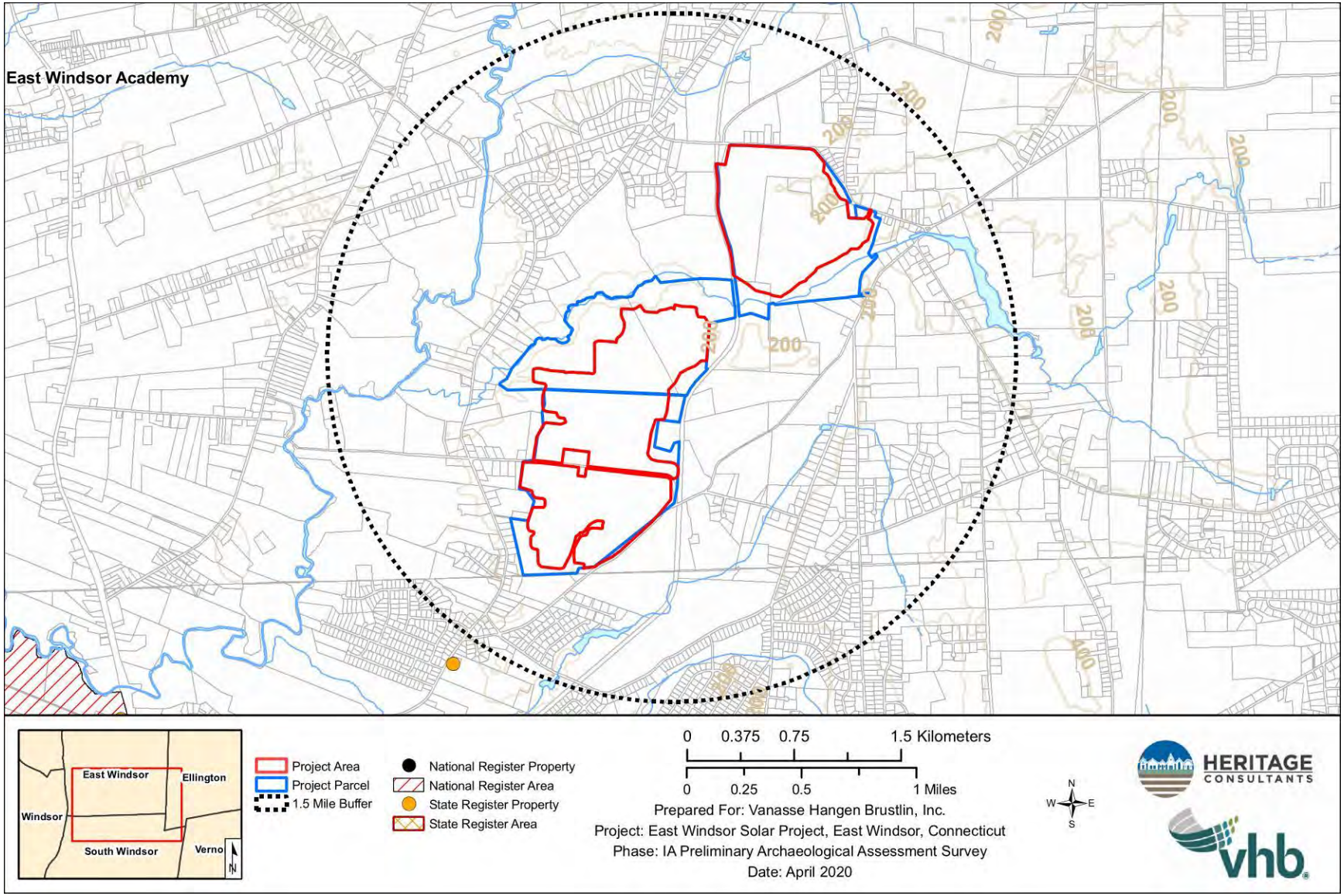


Figure 15. Digital map depicting the locations of previously identified National/State Register of Historic Places properties in the vicinity of the Project Site in East Windsor, Connecticut.

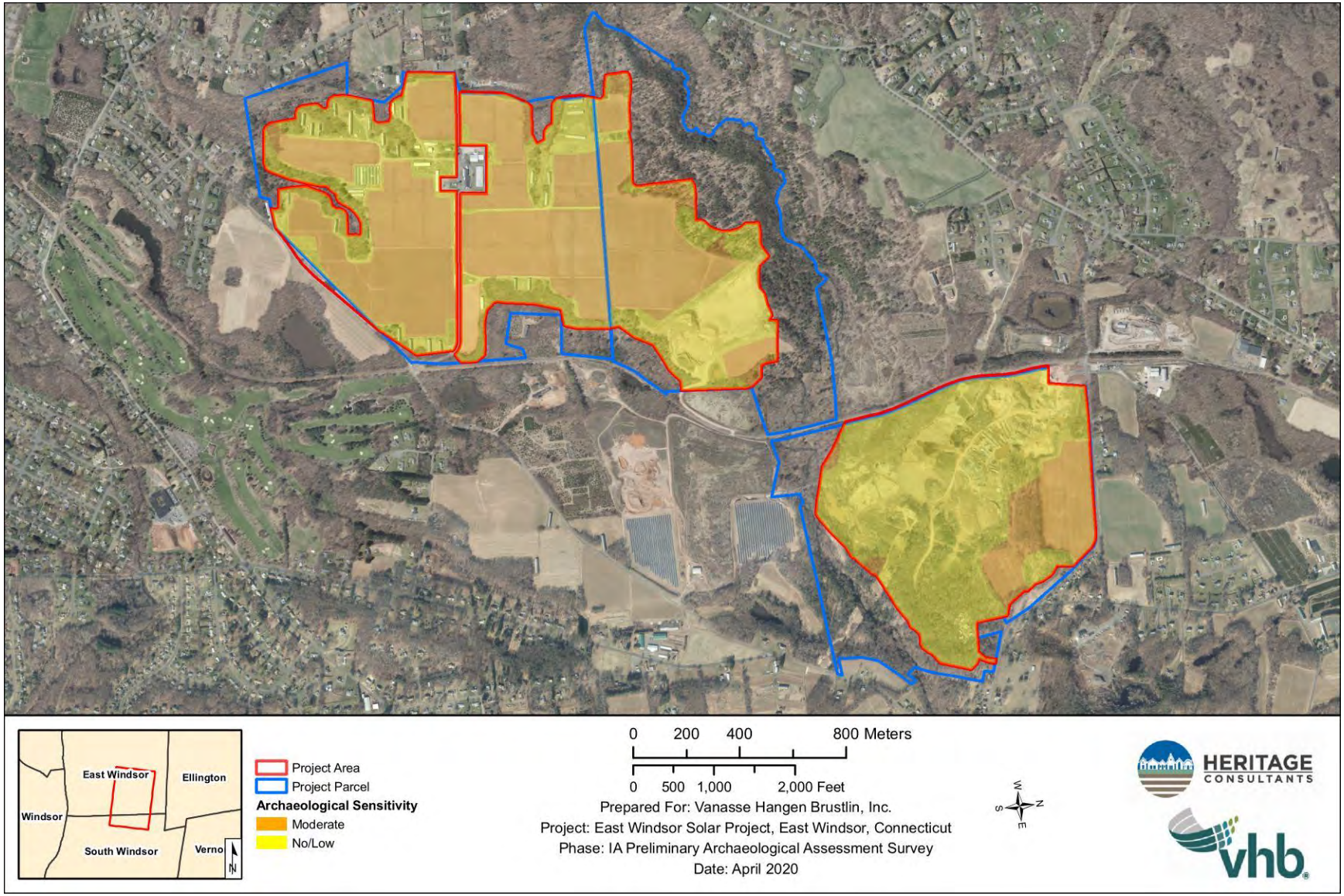


Figure 16. Excerpt from a 2019 aerial image depicting the locations of no/low and moderate archaeologically sensitive zone throughout the Project Site in East Windsor, Connecticut.

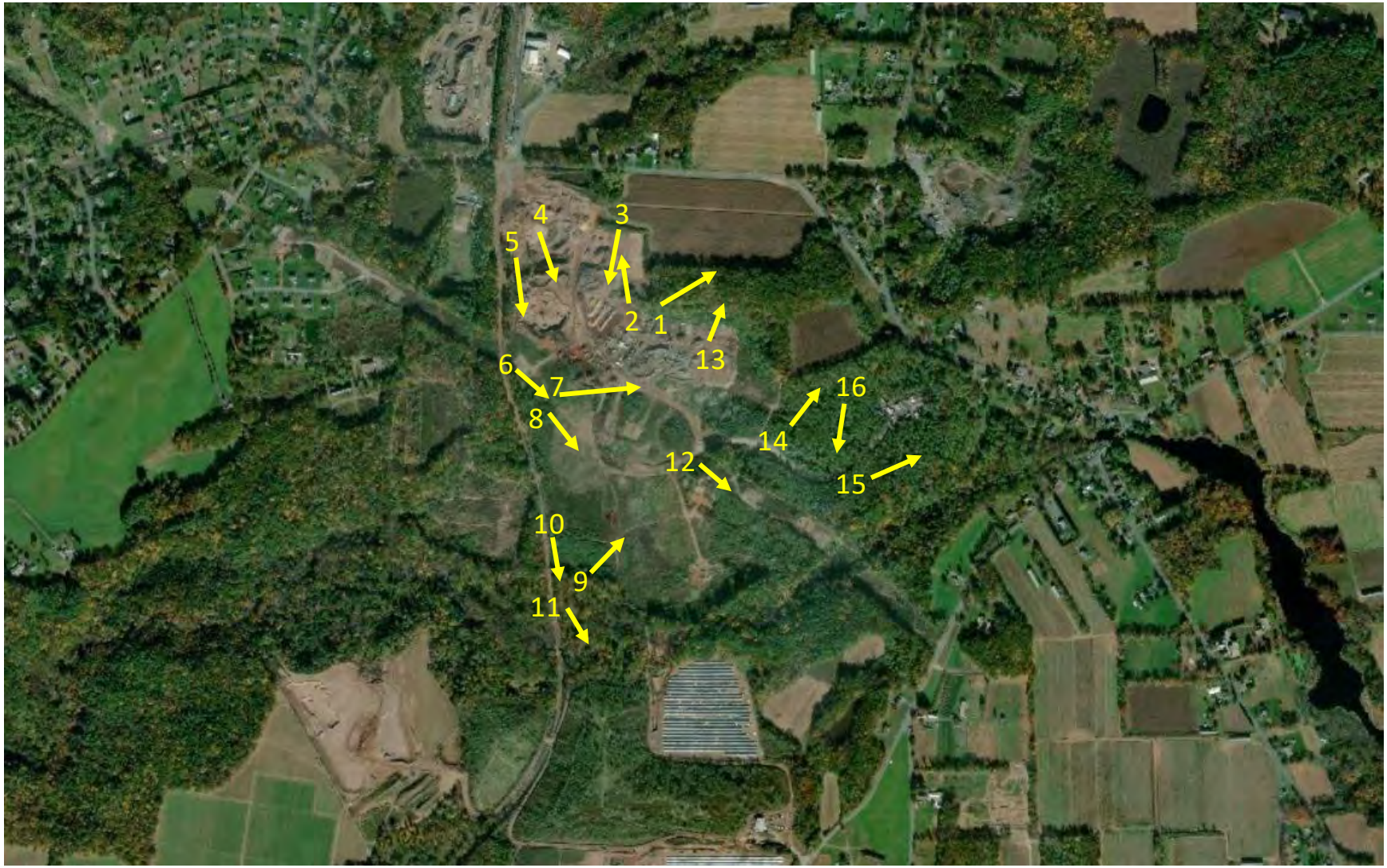


Figure 17; Sheet 1. Excerpt of a recent aerial image depicting photo locations, numbers, and directions within the northern portion of the Project Site in East Windsor, Connecticut.

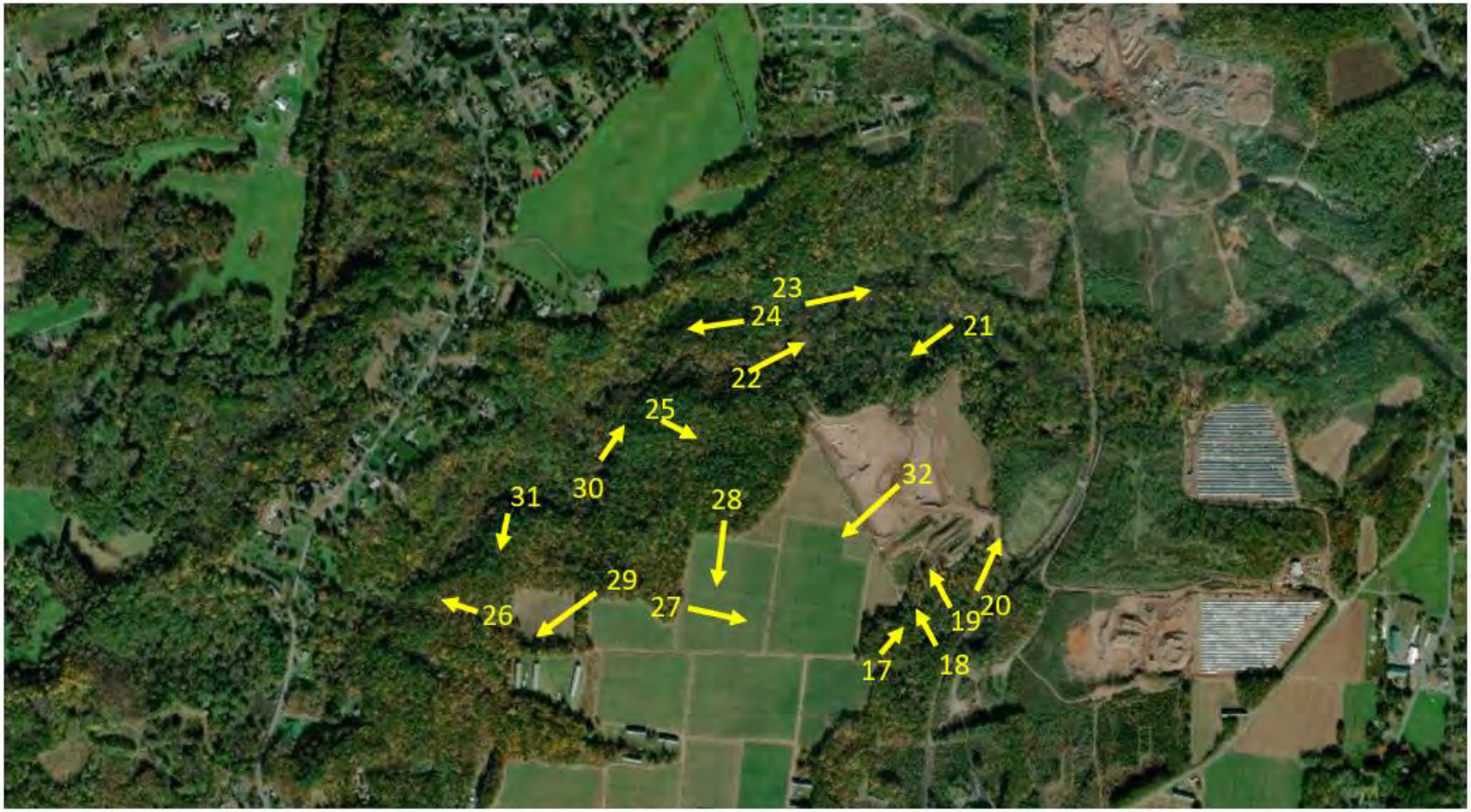


Figure 17; Sheet 2. Excerpt of a recent aerial image depicting photo locations, numbers, and directions within the central portion of the Project Site in East Windsor, Connecticut.

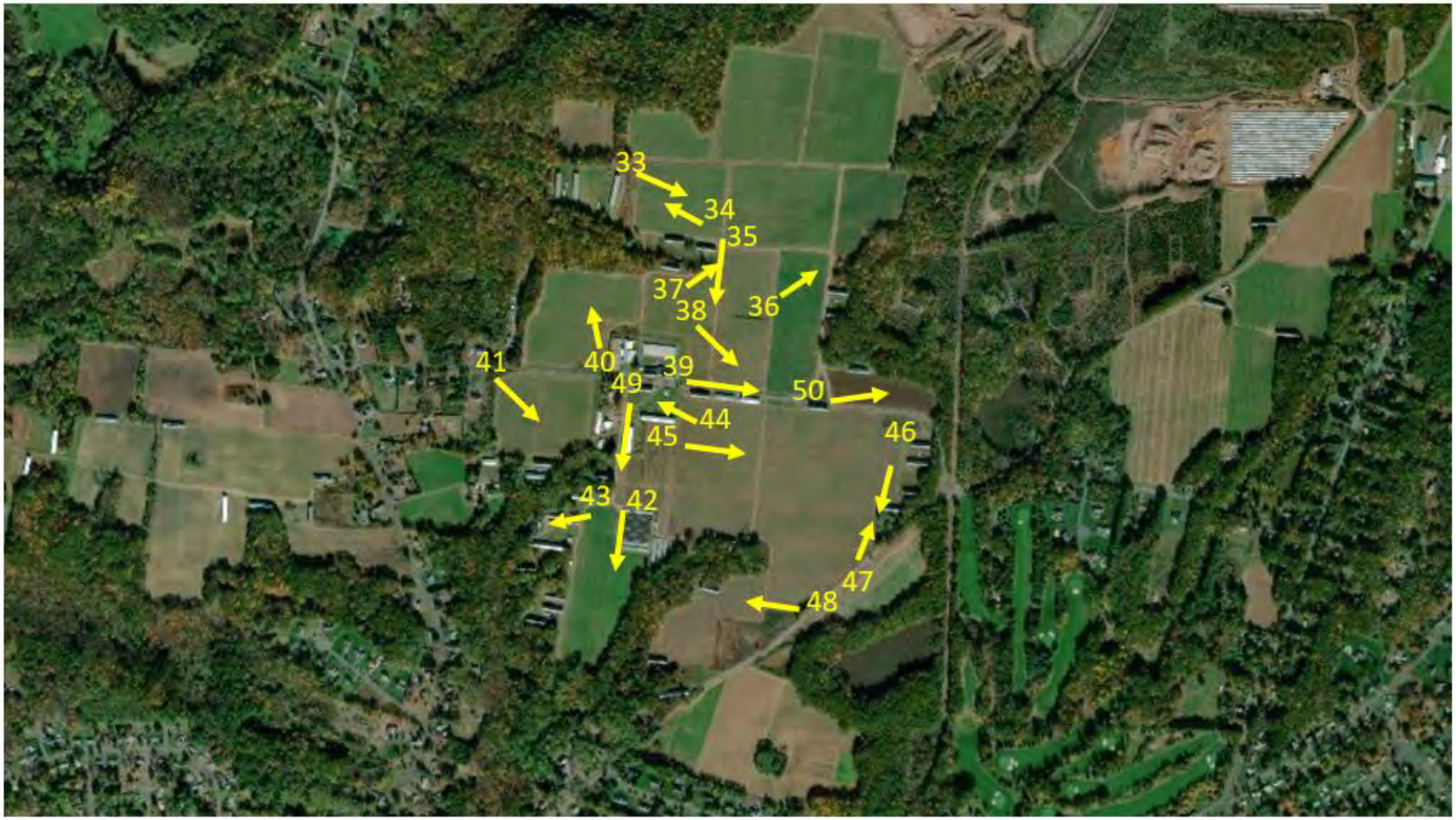


Figure 17; Sheet 3. Excerpt of a recent aerial image depicting photo locations, numbers, and directions within the southern portion of the Project Site in East Windsor, Connecticut.

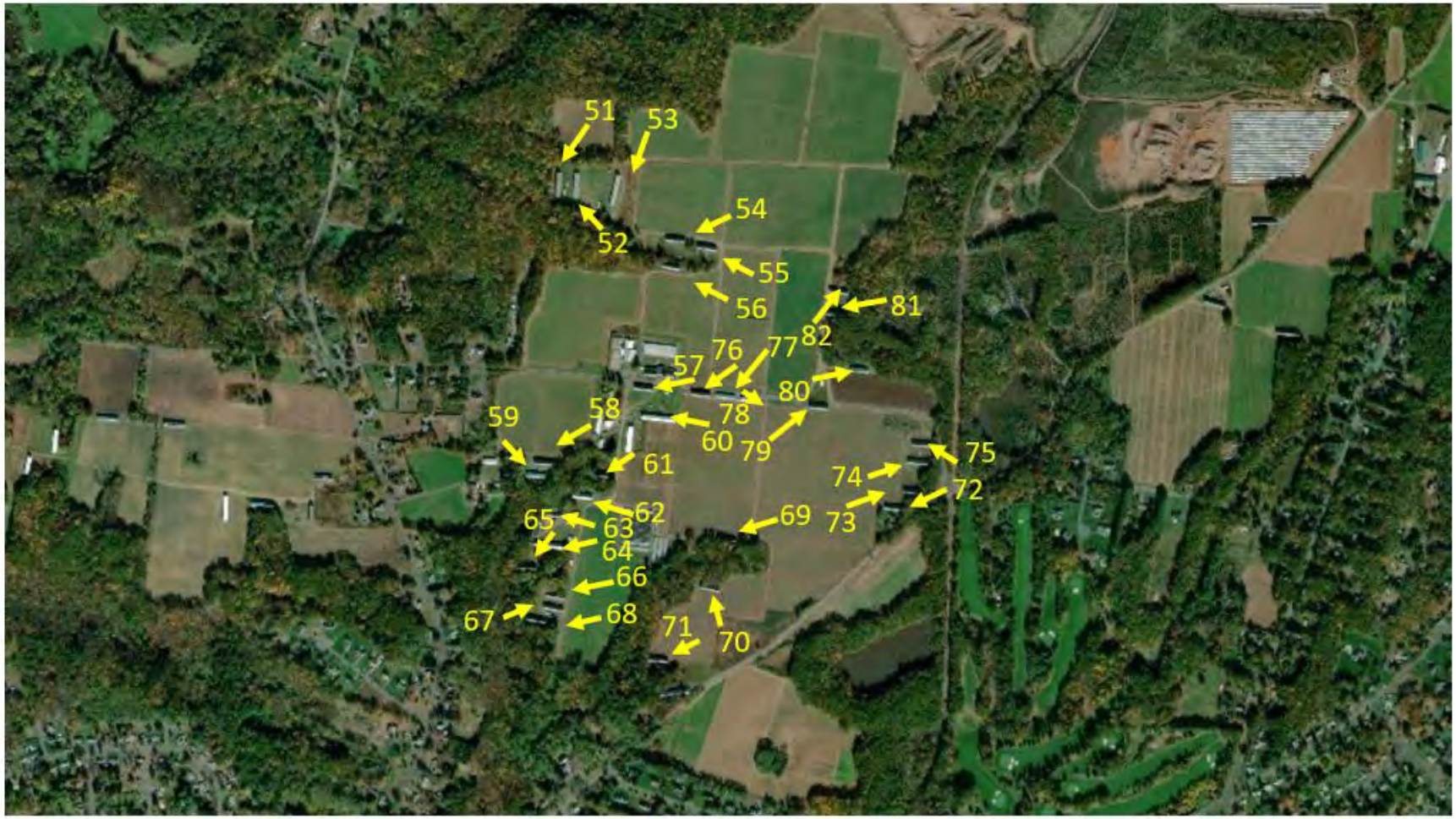


Figure 17; Sheet 4. Excerpt of a recent aerial image depicting photo locations, numbers, and directions of all 32 tobacco sheds within the Project Site in East Windsor, Connecticut.

Figure 17; Sheet 5. Excerpt of a recent aerial image depicting photo locations, numbers, and directions of other historic structures located within the Project Site in East Windsor, Connecticut.

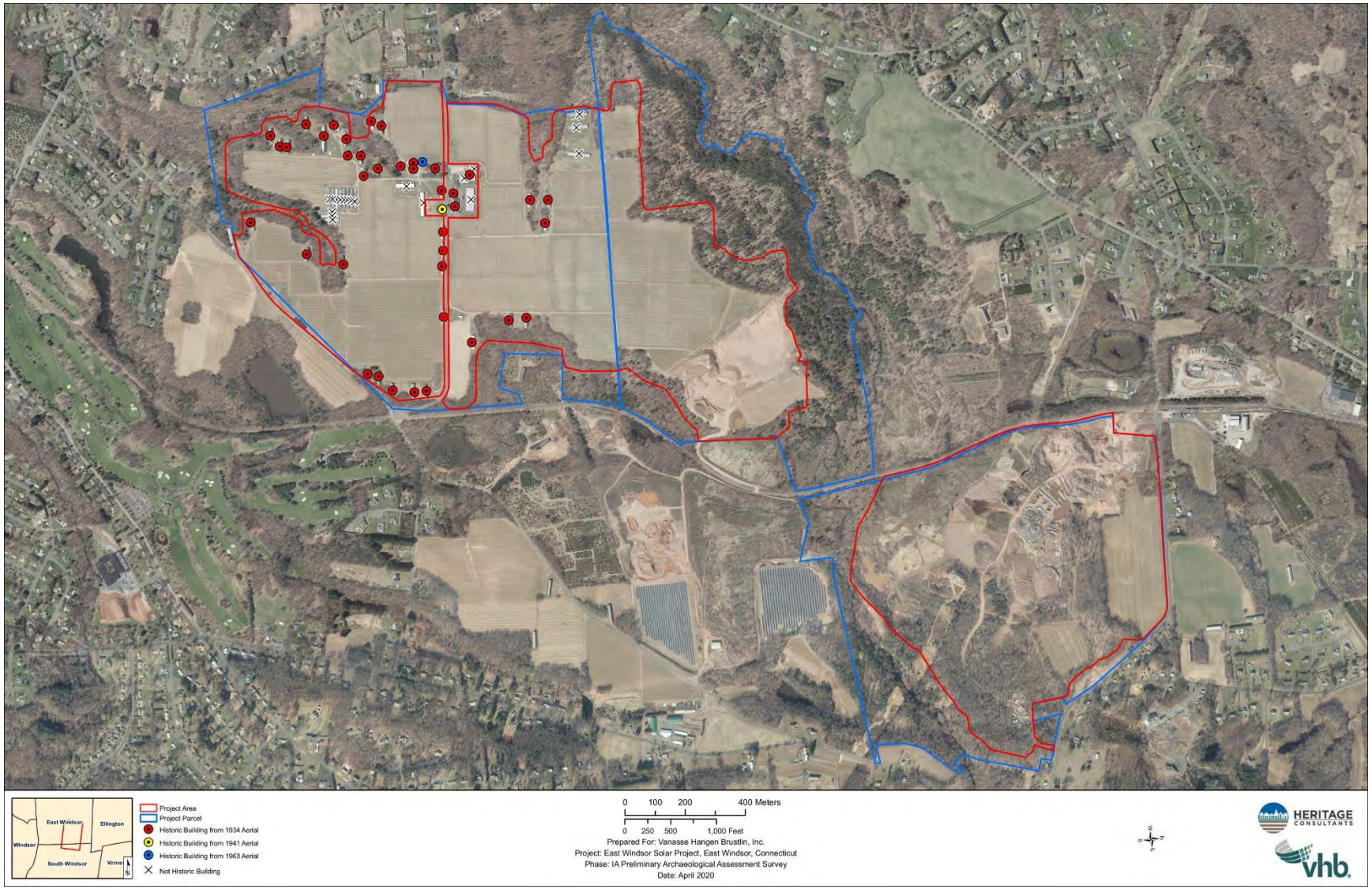


Figure 18. Excerpt of a 2019 aerial image depicting the locations of historic and modern buildings within or immediately adjacent to the Project Site in East Connecticut (note the colored dots represent historic buildings and the "x" marks denote modern

Photo 1. Overview photo of the northern portion of the Project Site facing northeast.

Photo 2. Overview photo of the northern portion of the Project Site facing north.

Photo 3. Overview photo of the northern portion of the Project Site facing south.

Photo 4. Overview photo of the northern portion of the Project Site facing south.

Photo 5. Overview photo of the northern portion of the Project Site facing south.

Photo 6. Overview photo of the northern portion of the Project Site facing southeast.

Photo 7. Overview photo of the northern portion of the Project Site facing southeast.

Photo 8. Overview photo of the northern portion of the Project Site facing southeast.

Photo 9. Overview photo of the northern portion of the Project Site facing northeast.

Photo 10. Overview photo of the northern portion of the Project Site facing south.

Photo 11. Overview photo of the northern portion of the Project Site facing south.

Photo 12. Overview photo of the northern portion of the Project Site facing southeast.

Photo 13. Overview photo of the northern portion of the Project Site facing northeast.

Photo 14. Overview photo of the northern portion of the Project Site facing northeast.

Photo 15. Overview photo of the northern portion of the Project Site facing east.

Photo 16. Overview photo of the northern portion of the Project Site facing south.

Photo 17. Overview photo of the central portion of the Project Site facing northeast.

Photo 18. Overview photo of the central portion of the Project Site facing northwest.

Photo 19. Overview photo of the central portion of the Project Site facing north.

Photo 20. Overview photo of the central portion of the Project Site facing northeast.

Photo 21. Overview photo of the central portion of the Project Site facing southwest.

Photo 22. Overview photo of the central portion of the Project Site facing northeast.

Photo 23. Overview photo of the central portion of the Project Site facing east.

Photo 24. Overview photo of the central portion of the Project Site facing west.

Photo 25. Overview photo of the central portion of the Project Site facing southeast.

Photo 26. Overview photo of the central portion of the Project Site facing west.

Photo 27. Overview photo of the central portion of the Project Site facing east.

Photo 28. Overview photo of the central portion of the Project Site facing south.

Photo 29. Overview photo of the central portion of the Project Site facing southwest.

Photo 30. Overview photo of the central portion of the Project Site facing northeast.

Photo 31. Overview photo of the central portion of the Project Site facing south.

Photo 32. Overview photo of the central portion of the Project Site facing southwest.

Photo 33. Overview photo of the southern portion of the Project Site facing east.

Photo 34. Overview photo of the southern portion of the Project Site facing northwest.

Photo 35. Overview photo of the southern portion of the Project Site facing south.

Photo 36. Overview photo of the southern portion of the Project Site facing northeast.

Photo 37. Overview photo of the southern portion of the Project Site facing northeast.

Photo 38. Overview photo of the southern portion of the Project Site facing southeast.

Photo 39. Overview photo of the southern portion of the Project Site facing east.

Photo 40. Overview photo of the southern portion of the Project Site facing north.

Photo 41. Overview photo of the southern portion of the Project Site facing southeast.

Photo 42. Overview photo of the southern portion of the Project Site facing south.

Photo 43. Overview photo of the southern portion of the Project Site facing west.

Photo 44. Overview photo of the southern portion of the Project Site facing west.

Photo 45. Overview photo of the southern portion of the Project Site facing east.

Photo 46. Overview photo of the southern portion of the Project Site facing south.

Photo 47. Overview photo of the southern portion of the Project Site facing north.

Photo 48. Overview photo of the southern portion of the Project Site facing west.

Photo 49. Overview photo of the southern portion of the Project Site facing south.

Photo 50. Overview photo of the southern portion of the Project Site facing east.

Photo 51. Photo of Tobacco Shed Number 32 facing southwest.

Photo 52. Photo of Tobacco Shed Number 33 facing northwest.

Photo 53. Photo of Tobacco Shed Number 27 facing southwest.

Photo 54. Photo of Tobacco Shed Number 29 facing west.

Photo 55. Photo of Tobacco Shed Number 28 facing west.

Photo 56. Photo of Tobacco Shed Number 25 facing west.

Photo 57. Photo of Tobacco Shed Number 1 facing west.

Photo 58. Photo of Tobacco Shed Number 24 facing southwest.

Photo 59. Photo of Tobacco Shed Number 23 facing southeast.

Photo 60. Photo of Tobacco Shed Number 5 facing west.

Photo 61. Photo of Tobacco Shed Number 22 facing southwest.

Photo 62. Photo of Tobacco Shed Number 21 facing west.

Photo 63. Photo of Tobacco Shed Number 20 facing west.

Photo 64. Photo of Tobacco Shed Number 19 facing west.

Photo 65. Photo of Tobacco Shed Number 18 facing southwest.

Photo 66. Photo of Tobacco Shed Number 17 facing west.

Photo 67. Photo of Tobacco Shed Number 16 facing east.

Photo 68. Photo of Tobacco Shed Number 15 facing west.

Photo 69. Photo of Tobacco Shed Number 12 facing west.

Photo 70. Photo of Tobacco Shed Number 13 facing north.

Photo 71. Photo of Tobacco Shed Number 14 facing west.

Photo 72. Photo of Tobacco Shed Number 11 facing southwest.

Photo 73. Photo of Tobacco Shed Number 10 facing east.

Photo 74. Photo of Tobacco Shed Number 9 facing east.

Photo 75. Photo of Tobacco Shed Number 8 facing northwest.

Photo 76. Photo of Tobacco Shed Number 2 facing southwest.

Photo 77. Photo of Tobacco Shed Number 3 facing southwest.

Photo 78. Photo of Tobacco Shed Number 4 facing southeast.

Photo 79. Photo of Tobacco Shed Number 6 facing northeast.

Photo 80. Photo of Tobacco Shed Number 31 facing east.

Photo 81. Photo of Tobacco Shed Number 30 facing west.

Photo 82. Photo of Tobacco Shed Number 29 facing northeast.

Photo 83. Photo of a water tower in the southern portion of the Project Site facing north (note this tower will not be directly impacted by the Project).

Photo 84. Photo of a historic structure in the southern portion of the Project Site facing northwest.

Photo 85. Photo of a historic structure in the southern portion of the Project Site facing northwest.

Photo 86. Photo of a historic residence in the southern portion of the Project Site facing west.

Photo 87. Photo of a historic structure in the southern portion of the Project Site facing northwest.

Photo 88. Photo of a historic structure in the southern portion of the Project Site facing west.

Photo 89. Photo of a historic structure in the southern portion of the Project Site facing west.

Photo 90. Photo of a historic structure in the southern portion of the Project Site facing west.

Photo 91. Photo of a historic structure in the southern portion of Project Site facing north.

Photo 92. Photo of the location of a historic structure identified on an 1855 map of the Project Site (see Figure 5; note that there are no remains of this structure.

Appendix N
Acoustical Study

ACOUSTICAL STUDY

Gravel Pit Solar

120 MW Solar Photovoltaic Energy Generation Project in East Windsor, Connecticut

PREPARED FOR

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

1166 Avenue of the Americas, 9th Floor
New York, NY 10036

PREPARED BY

100 Great Meadow Road
Suite 200
Wethersfield, Connecticut 06109

May 2020

Table of Contents

Introduction **1**

Project Description 1
Fundamentals of Noise 2
Noise Impact Criteria 4

Acoustical Assessment **5**

Methodology 5
Receptor Locations 6
Existing Conditions 9
Future Conditions 9

Findings **12**

Conclusion of Acoustical Assessment 12
Construction Activities 12

List of Tables

Table No.	Description	Page
Table 1	Common Outdoor and Indoor Sound Levels	3
Table 2	Noise Zone Standards	4
Table 3	Existing Ambient Sound Levels, dB(A)	9
Table 4	Sound Levels at Receptor Locations, dB(A)	10

List of Figures

Figure No.	Description	Page
Figure 1	Monitoring and Receptor Locations	8

1

Introduction

The purpose of this acoustical study is to evaluate the potential noise impacts associated with the construction and operation of the proposed Gravel Pit Solar Project located in East Windsor, Connecticut. This acoustical assessment evaluated the potential sound levels generated by the mechanical equipment, including the inverters, transformers, and single-axis tracking panel rack systems, that will be part of the Project. The sound levels were compared to the Connecticut Department of Energy and Environmental Protection's (CT DEEP) noise control regulations (Regulations of Connecticut State Agencies (RCSA), Title 22a, Section 22a-69-1 to 22a-69-7).

Project Description

The Gravel Pit Solar Project (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 Petitioners) is located on approximately 485 acres and will be sited on eight parcels of land in the Town of East Windsor, Connecticut. The eight parcels of land proposed for the Project are identified by the Town of East Windsor Tax Assessor as 01160500, 01161000, 01424500, 00896507, 01424000, 00196000, 01977500 and 00197500, collectively referred to herein as the Project Site.

Fundamentals of Noise

Noise is defined as unwanted or excessive sound. Sound becomes unwanted when it interferes with normal activities such as sleep, communication, work, or recreation. How people perceive sound depends on several measurable physical characteristics, which include the following:

- **Intensity** – Sound intensity is often equated to loudness.
- **Frequency** – Sounds are comprised of acoustic energy distributed over a variety of frequencies. Acoustic frequencies, commonly referred to as tone or pitch, are typically measured in Hertz. Pure tones have all their energy concentrated in a narrow frequency range.

Sound levels are most often measured on a logarithmic scale of decibels (dB). The decibel scale compresses the audible acoustic pressure levels which can vary from the threshold of hearing (zero dB) to the threshold of pain (120 dB). Because sound levels are measured in dB, the addition of two sound levels is not linear. Adding two equal sound levels creates a 3 dB increase in the overall level. Research indicates the following general relationships between sound level and human perception:

- A 3 dB increase is a doubling of acoustic energy and is the threshold of perceptibility to the average person.
- A 10 dB increase is a tenfold increase in acoustic energy but is perceived as a doubling in loudness to the average person.

The human ear does not perceive sound levels from each frequency as equally loud. To compensate for this phenomenon in perception, a frequency filter known as A weighted [dB(A)] is used to evaluate environmental noise levels. Table 1 presents a list of common outdoor and indoor sound levels.

Table 1. Common Outdoor and Indoor Sound Levels

Outdoor Sound Levels	Sound Pressure (μPa)*		Sound Level dB(A)**	Indoor Sound Levels
	6,324,555	-	110	Rock Band at 5 m
Jet Over Flight at 300 m		-	105	
	2,000,000	-	100	Inside New York Subway Train
Gas Lawn Mower at 1 m		-	95	
	632,456	-	90	Food Blender at 1 m
Diesel Truck at 15 m		-	85	
Noisy Urban Area—Daytime	200,000	-	80	Garbage Disposal at 1 m
		-	75	Shouting at 1 m
Gas Lawn Mower at 30 m	63,246	-	70	Vacuum Cleaner at 3 m
Suburban Commercial Area		-	65	Normal Speech at 1 m
	20,000	-	60	
Quiet Urban Area—Daytime		-	55	Quiet Conversation at 1 m
	6,325	-	50	Dishwasher Next Room
Quiet Urban Area—Nighttime		-	45	
	2,000	-	40	Empty Theater or Library
Quiet Suburb—Nighttime		-	35	
	632	-	30	Quiet Bedroom at Night
Quiet Rural Area—Nighttime		-	25	Empty Concert Hall
Rustling Leaves	200	-	20	
		-	15	Broadcast and Recording Studios
	63	-	10	
		-	5	
Reference Pressure Level	20	-	0	Threshold of Hearing

Source: Highway Noise Fundamentals. Federal Highway Administration, September 1980.

* mPA – MicroPascals, which describe pressure. The pressure level is what sound level monitors measure.

** dB(A) – A weighted decibels, which describe sound pressure logarithmically with respect to 20 mPa (the reference pressure level).

A variety of sound level indicators can be used for environmental noise analysis. These indicators describe the variations in intensity and sequential pattern of the sound levels. The indicators used in this analysis are defined as follows:

- Leq is the A-weighted sound level, which averages the background sound levels with short-term transient sound levels and provides a uniform method for comparing sound levels that vary over time.
- L10 is the A-weighted sound level, which is exceeded for 10 percent of the time during the time period.
- L90 is the A-weighted sound level, which is exceeded for 90 percent of the time during the time period. The L90 is generally considered to be the background sound level. It should be noted that the L90 eliminates the highest 10 percent of the sound levels that occur in the study area.

Noise Impact Criteria

The Connecticut Department of Energy and Environmental Protection (CT DEEP) has developed noise impact criteria that establish sound level thresholds deemed to result in adverse impacts. The acoustic analysis for the Project used these criteria to evaluate whether the Project will generate sound levels that result in adverse impacts.

The CT DEEP's noise control regulations identify the limits of sound that can be emitted from specific premises and what activities are exempt. The noise control regulations (Title 22a, §§ 22a-69-1 to 22a 69-7) are contained in the RCSA. Even though the proposed Project would be considered a Class C (Industrial) emitter by the CT DEEP, the acoustic analysis for the Project assumed the more stringent noise standard for a Class B (Commercial) Emitter Zone and a Class A (Residential) Receptor Noise Zone for the residential receptor locations. A Class C land use is defined as generally industrial where protection against damage to hearing is essential, and the necessity for conversation is limited. The land use for Class B is defined as generally commercial in nature, where human beings converse and such conversations are essential to the intended use of the land. The land use in Class A is defined as generally residential where human beings sleep or areas where serenity and tranquility are essential to the intended use of the land.

The CT DEEP policy states that a source (emitter) located in the various zones shall not emit noise exceeding the levels stated in Table 2 at the adjacent noise zones.

Table 2. Noise Zone Standards

	Receptor Noise Zone			
Emitter Zone	**Class A (Daytime)**	**Class A (Nighttime)**	**Class B**	**Class C**
Class A (Residential)	55	45	55	62
Class B (Commercial)	55	45	62	62
Class C (Industrial)	61	51	66	70

Source: Control of Noise (Title 22a, Section 22a-69-1 to 22a-69-7.4), RCSA, Revised 2015-3-6.

2

Acoustical Assessment

Methodology

This acoustical study evaluated the sound levels from the Project's proposed mechanical equipment. The Project's noise sources consist of 36 electrical inverters used to convert the solar energy to usable electricity, two transformers at the Project (GPS) Switchyard, and 1,133 small actuator motors that move the single-axis panel tracking system to follow the sun. The noise analysis consists of two components: existing ambient sound levels and Project contributions. The existing condition sound levels were determined by conducting sound level measurements at representative property line locations surrounding the Project Site. Refer to Figure 1: Monitoring and Receptor Locations. The Project-generated sound levels were calculated using manufacturer's sound data and the principles of acoustical propagation of sound over distance.

Sound level measurements were conducted to determine the existing ambient sound levels in the vicinity of the Project Site. Measurements were conducted at six locations that were selected as representative of the residential neighborhoods surrounding the Project Site. The measurements were conducted for a 24-hour period to capture typical weekday daytime and nighttime sound levels.

The Project-generated sound levels were calculated for each sensitive receptor location based on manufacturer-provided reference sound level data. The reference sound level data included the following:

- TMEiC Solar Ware Ninja Inverters - 82.5 dBA at 3.3 feet;
- Transformers – 79 dB to 80 dB at 6 feet; and
- NEXTracker's Horizon Single Axis Tracker motor – 69.6 dB at 3.3 feet.

The reference sound level data for the inverters and tracking system motor were obtained from the manufacturer's testing of the equipment. The reference sound levels for the transformers are based on data obtained from the National Electrical Manufacturers Association (NEMA) TR1 publication. These reference sound levels were adjusted to reflect the distances and path to the sensitive receptor locations. The Project-generated sound levels were projected to the receptor locations using the properties of sound propagation for soft ground terrain in the acoustic modeling software CadnaA[1] (Computer Aided Noise Abatement). CadnaA is an internationally accepted sound prediction program that implements the International Standards Organization (ISO) 9613-2 sound propagation standard. This model takes in to account the sound emissions of equipment, the ground cover, and terrain geometry of the project area. The assessment assumed all equipment operating simultaneously during the daytime period. The results were compared to the CT DEEP noise impact criteria for determining compliance.

Receptor Locations

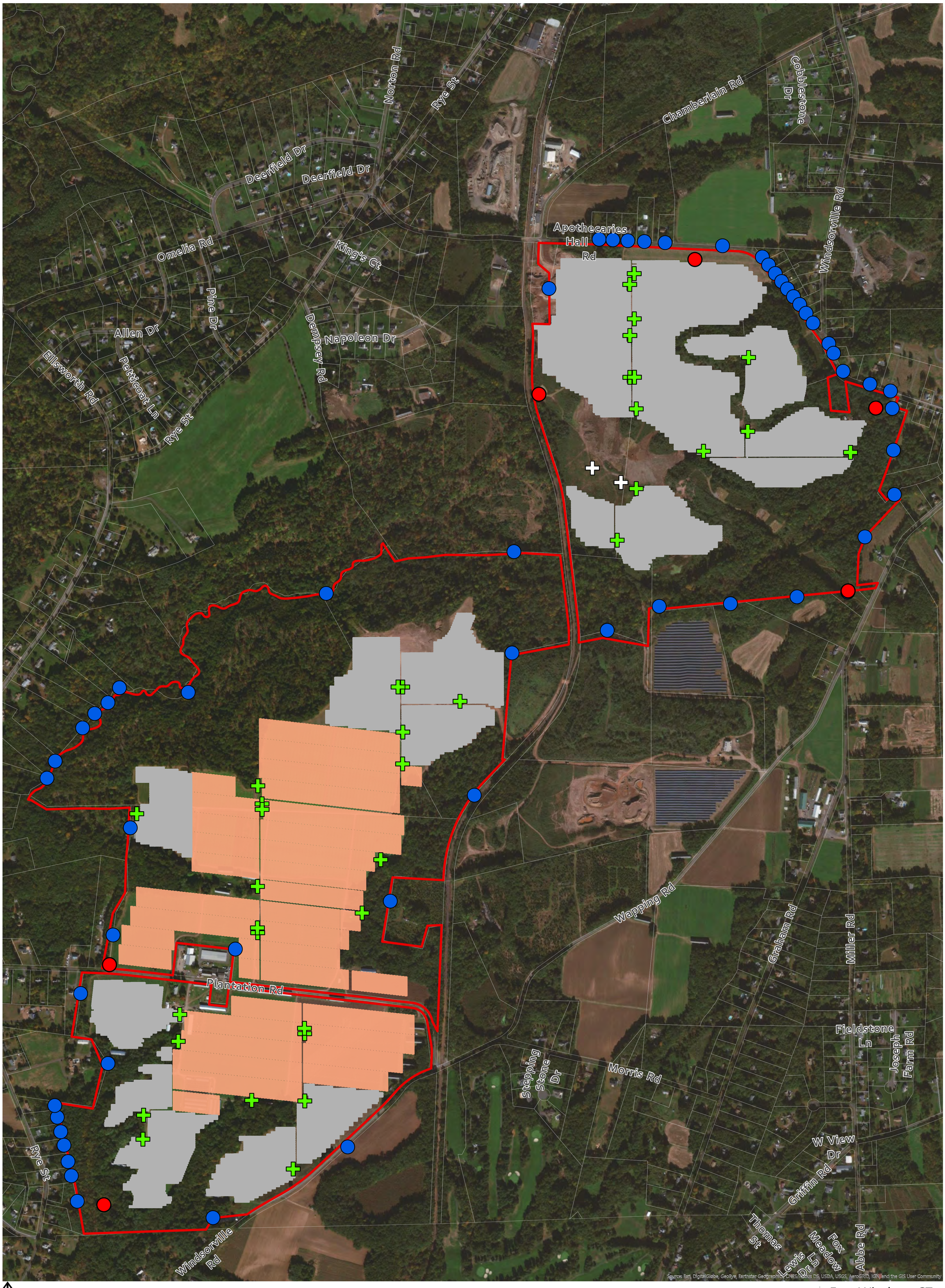
Fifty-six receptor locations were identified in the vicinity of the Project Site. The receptor locations were selected based on their proximity to the Site and their land use. These receptor locations represent the most sensitive locations in the immediate area that may experience changes in sound levels once the Project is in operation. These receptor locations, shown in Figure 1, represent the residential parcels that surround the Project Site and include:

R1 – 363 Rye St
R2 – 359 Rye St
R3 – 357 Rye St
R4 – 353 Rye St
R5 – 351 Rye St
R6 – 349 Rye St
R7 – 345 Rye St
R8 – 341 Rye St
R9 – 20 Plantation Rd
R10 – 25 Plantation Rd
R11 – 295 Rye St
R12 – 281 Rye St
R13 – 271 Rye St
R14 – 265 Rye St
R15 – 263 Rye St
R16 – 259 Rye St
R17 – 257 Rye St
R18 – 247 Rye St
R19 – 169 Rye St
R20 – Rye St
R21 – 30 Apothecaries Hall Rd
R22 – 45 Apothecaries Hall Rd
R23 – 47 Apothecaries Hall Rd
R24 – 51 Apothecaries Hall Rd
R25 – 53 Apothecaries Hall Rd
R26 – 57 Apothecaries Hall Rd
R27 – 141-79 Windsorville Rd
R28 – 85 Apothecaries Hall Rd
R29 – 87 Apothecaries Hall Rd
R30 – 89 Apothecaries Hall Rd

[1] DataKustik GmbH, 2018. Computer Aided Noise Abatement Model.

R31 – 91 Apothecaries Hall Rd
R32 – 93 Apothecaries Hall Rd
R33 – 95 Apothecaries Hall Rd
R34 – 97 Apothecaries Hall Rd
R35 – 99 Apothecaries Hall Rd
R36 – 142 Windsorville Rd
R37 – 145 Windsorville Rd
R38 – 147 Windsorville Rd
R39 – 153 Windsorville Rd
R39A – 159 Windsorville Rd
R40 – 166 Windsorville Rd
R40A – 169 Windsorville Rd
R41 – 176 Windsorville Rd
R42 – 22 Wapping Rd
R43 – 36 Wapping Rd
R44 – 20 Wapping Rd
R45 – 40 Wapping Rd
R46 – 60-134 Wapping Rd
R47 – 80 Wapping Rd
R48 – Rye St
R49 – Rye St
R50 – Rye St
R51 – 140 Wapping Rd
R52 – 223-169 Wapping Rd
R53 – 46 Plantation Rd
R54 – 47 Plantation Rd

Figure 1. Monitoring and Receptor Locations



Gravel Pit Solar | East Windsor, CT

Acoustical Assessment

Existing Conditions

Sound level measurements were conducted to determine existing ambient conditions in the area surrounding the Project Site. The existing sound levels were measured using Type 1 sound analyzers (Larson Davis SoundExpert LxT and 831). Measurements were conducted for a 24-hour period at each monitoring location from approximately 10:00 AM on March 2, 2020 to approximately 10:00 AM on March 3, 2020. During the daytime period, the measured sound level data under existing conditions were composed of noise from the nearby active gravel pit and vehicles on local roadways in the vicinity of the monitoring locations. The existing measured sound level data are presented in Table 3.

Table 3. Existing Ambient Sound Levels, dB(A)

	CT DEEP Residential Zone Noise Standard		Measured L90 Sound Levels	
Monitoring Location[1]	**Daytime[2]**	**Nighttime[3]**	**Daytime**	**Nighttime**
M1 – Windsorville Road	55	45	36-45	32-39
M2 – Wapping Road	55	45	36-46	34-41
M3 – Rye Street	55	45	32-41	35-41
M4 – Plantation Road	55	45	36-43	33-42
M5 – Quarry/Napoleon Drive	55	45	35-41	35-39
M6 – Apothecaries Hall Road North	55	45	34-45	33-39

1 Refer to Figure 1 for monitoring locations.
2 Daytime is from 7:00 AM to 10:00 PM.
3 Nighttime is from 10:00 PM to 7:00 AM.

The L90 sound levels range from 32 dB(A) to 46 dB(A) during the daytime period and from 32 dB(A) to 42 dB(A) during the nighttime period. The result of the monitoring program indicates that the daytime and nighttime sound levels within the study area are currently below the CT DEEP's daytime and nighttime standard of 55 dB(A) and 45 dB(A), respectively.

Future Conditions

VHB evaluated the potential sound level impacts associated with the Project's proposed mechanical equipment at the nearby sensitive receptor locations. This analysis evaluated the potential sound level impacts from the 36 inverters, two transformers, and 1,133 tracking system motors operating simultaneously.

The potential sound level associated with the proposed equipment were determined by comparing existing and future sound levels to the CT DEEP's noise standards. The existing sound levels were based upon sound level measurements. The sound levels were adjusted based upon distance, properties of sound propagation over terrain, and applicable blockage and obstructions.

The results of the acoustical analysis demonstrated that the operation of the proposed equipment will comply with CT DEEP's noise standards at the sensitive

receptor locations. The sound levels attributed to the proposed equipment ranges from approximately 14 dB(A) to 42 dB(A). During the daytime period, the receptor locations will experience overall sound levels (ambient plus project contributions) ranging from approximately 33 dB(A) to 46 dB(A). These sound levels are below CT DEEP's daytime criteria of 55 dB(A). Due to the nature of the Project, the equipment will not be operating during the nighttime period. Table 4 summarizes the sound levels at the receptor locations.

Table 4 Sound Levels at Receptor Locations, dB(A)

Receptor Locations	CT DEEP Noise Standard Daytime*	Project Generated Sound Levels	Overall Sound Levels
R1 – 363 Rye Street	55	27.0	33 - 41
R2 – 359 Rye Street	55	27.7	33 - 41
R3 – 357 Rye Street	55	28.1	33 - 41
R4 – 353 Rye Street	55	28.3	34 - 41
R5 – 351 Rye Street	55	28.3	34 - 41
R6 – 349 Rye Street	55	28.3	34 - 41
R7 – 345 Rye Street	55	28.3	34 - 41
R8 – 341 Rye Street	55	31.6	37 - 43
R9 – 20 Plantation Road	55	30.0	37 - 43
R10 – 25 Plantation Road	55	36.1	39 - 44
R11 – 295 Rye Street	55	40.4	42 - 45
R12 – 281 Rye Street	55	22.1	36 - 43
R13 – 271 Rye Street	55	14.1	36 - 43
R14 – 265 Rye Street	55	18.6	36 - 43
R15 – 263 Rye Street	55	18.3	36 - 43
R16 – 259 Rye Street	55	17.5	36 - 43
R17 – 257 Rye Street	55	22.2	36 - 43
R18 – 247 Rye Street	55	20.5	36 - 43
R19 – 169 Rye Street	55	20.6	36 - 43
R20 – Rye Street	55	27.5	36 - 42
R21 – 30 Apothecaries Hall Road	55	28.7	36 - 42
R22 – 45 Apothecaries Hall Road	55	30.6	36 - 46
R23 – 47 Apothecaries Hall Road	55	32.0	36 - 46
R24 – 51 Apothecaries Hall Road	55	33.3	37 - 46
R25 – 53 Apothecaries Hall Road	55	33.2	37 - 46
R26 – 57 Apothecaries Hall Road	55	31.3	36 - 46
R27 – 141-79 Windsorville Road	55	27.2	35 - 45
R28 – 85 Apothecaries Hall Road	55	25.9	35 - 45
R29 – 87 Apothecaries Hall Road	55	26.0	35 - 45
R30 – 89 Apothecaries Hall Road	55	26.1	35 - 45

Receptor Locations	CT DEEP Noise Standard Daytime*	Project Generated Sound Levels	Overall Sound Levels
R31 – 91 Apothecaries Hall Road	55	26.1	35 - 45
R32 – 93 Apothecaries Hall Road	55	26.2	35 - 45
R33 – 95 Apothecaries Hall Road	55	26.3	35 - 45
R34 – 97 Apothecaries Hall Road	55	26.3	35 - 45
R35 – 99 Apothecaries Hall Road	55	26.4	36 - 45
R36 – 142 Windsorville Road	55	26.3	36 - 45
R37 – 145 Windsorville Road	55	26.2	36 - 45
R38 – 147 Windsorville Road	55	26.5	36 - 45
R39 – 153 Windsorville Road	55	26.7	36 - 45
R39A – 159 Windsorville Road	55	26.3	36 - 45
R40 – 166 Windsorville Road	55	26.5	36 - 45
R40A – 169 Windsorville Road	55	25.6	36 - 45
R41 – 176 Windsorville Road	55	28.9	37 - 45
R42 – 22 Wapping Road	55	23.3	36 - 45
R43 – 36 Wapping Road	55	24.9	36 - 46
R44 – 20 Wapping Road	55	23.3	36 - 46
R45 – 40 Wapping Road	55	23.8	36 - 46
R46 – 60-134 Wapping Road	55	25.7	36 - 46
R47 – 80 Wapping Road	55	27.1	36 - 46
R48 – Rye Street	55	27.2	36 - 46
R49 – Rye Street	55	29.0	37 - 46
R50 – Rye Street	55	31.1	37 - 43
R51 – 140 Wapping Road	55	36.4	39 - 44
R52 – 223-169 Wapping Road	55	31.9	37 - 46
R53 – 46 Plantation Road	55	28.7	34 - 41
R54 – 47 Plantation Road **	62	42.2	43 - 46

* Noise standard for Class B emitter and Class A receptor.

** Noise standard for Class B emitter and Class B receptor for commercial use location.

3

Findings

Conclusion of Acoustical Assessment

In this acoustical analysis, VHB evaluated the sound levels associated with the Project's mechanical equipment which includes 36 inverters, two transformers, and 1,133 tracking system motors. This analysis determined that the properties abutting the Project Site currently experience sound levels below CT DEEP's daytime noise standards.

Due to the low noise equipment and siting of the proposed equipment central to the Project Site, the sound levels associated with the Project's mechanical equipment are expected to comply with CT DEEP's noise standards and have no adverse noise impacts at nearby sensitive receptor locations.

Construction Activities

Construction activities, including the intermittent use of heavy machinery, may result in temporary increases in nearby sound levels at the proposed Project. The Project is expected to generate typical sound levels from construction activities, including truck movements, heavy equipment operations, and general construction activities. Heavy machinery, such as front-end loaders, graders, bull dozers, and backhoes, would be used intermittently throughout the proposed Project's construction.

Section 22a-69-1.8(g) of the CT DEEP's noise control regulation states that noise associated with construction activities are exempt from the regulation. However, even though construction noise is exempt from the regulation, construction activities such as site excavation/grading and installation of the solar panel systems would typically be limited to normal daytime working hours. Construction activities beyond normal daytime work hours would be minimized to the extent practicable.

If noise concerns arise during construction, the proponent will evaluate and implement appropriate noise abatement measures to reduce or minimize noise from the construction activities. The GPS Project plans to coordinate closely with the Town during construction. Construction vehicles and equipment would be required to maintain their original engine noise control equipment. Specific mitigation measures may include, but not limited to, the following:

- Implement appropriate traffic management techniques during the construction period to minimize roadway traffic noise impact;
- Implement procedures for proper operation and maintenance, and prohibition of excessive idling of construction equipment engines;
- Adjust construction activity timing to reduce impact of noise at certain times of day.

Appendix O
Carbon Debt Analysis

Memorandum

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

Date: May 15, 2020

Project #: 42569.00

From: Susan Moberg PWS, CFM

Re: Gravel Pit Solar Project, East Windsor CT
Carbon Debt Analysis

VHB performed a Carbon Debt Analysis for the proposed Gravel Pit Solar Project (the Project) in East Windsor, Connecticut. The Project is proposed on eight parcels of land totaling approximately 726 acres adjacent to Apothecaries Hall Road, Wapping Road, and Plantation Road (the Project Site). The Project proposes to develop approximately 485 acres as a solar photovoltaic (PV) system. The purpose of this analysis is to determine when the Project will have a net improvement in greenhouse gas (GHG) emissions compared to the loss of 124.0 acres of forested areas. This analysis also accounts for emissions considerations of 229.0 acres of cropland conversion and the emissions associated with upstream activities of the solar PV system.

Methodology and Assumptions

This analysis primarily relied upon United States (U.S.) Environmental Protection Agency (EPA)-derived conversion factors. These included the amount of carbon sequestered in one year by one acre of average U.S. forest (0.77 metric tons [MT] CO_2), the carbon stock in one acre of average U.S. forest (85 MT CO_2), and the carbon stock in one acre of cropland, plus the soil carbon stock and emissions from drained organic soils (22.76 MT CO_2).[1]

To estimate emissions avoided by converting 229.0 acres of land from active agriculture (i.e., primarily shade tobacco, with smaller rotations of corn [feed] and other vegetables) to either gravel/compacted roads or cool-season grasses, this analysis used emissions estimates specific to Hartford County provided by Michigan State University's U.S. Cropland Greenhouse Gas Calculator.[2] This tool accounts for emissions associated with farming activities such as soil tillage, fuel consumption, and fertilizer use. Soybean crop was used as a proxy for all agricultural production at the Project Site so as not to overestimate the benefits of avoiding such activities. Soybean crop has the lowest overall emissions per acre per year among all available inputs within the tool (i.e., corn, wheat, soybean, switchgrass, silage, and oats). For reference, estimated GHG emissions per year for soybean production is 0.15 MT CO_2eq per acre compared to 0.40 MT CO_2eq per acre for corn production.

---

1 EPA. (2019). "Greenhouse Gases Equivalencies Calculator - Calculations and References." Retrieved 12 May 2020, from https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references
2 Michigan State University. (2020). "US Cropland Greenhouse Gas Calculator." Retrieved 12 May 2020, from http://surf.kbs.msu.edu/county/CT/Hartford

100 Great Meadow Road
Suite 200
Wethersfield, CT 06109-2377
P 860.807.4300

To calculate GHG emissions associated with upstream activities of the Project's system components, this analysis utilized a study from the National Renewable Energy Laboratory (NREL) that estimated total life cycle emissions of solar PV systems to be approximately 40 g CO_2eq per kilowatt-hour (kWh), with upstream activities accounting for up to 70 percent of these emissions (28 g CO_2eq per kWh).[3] Upstream activities of solar PV systems include:

- Raw materials extraction;
- Materials production;
- Module manufacture;
- System/plant component manufacture; and
- Installation/plant construction.

Estimated emissions generated, avoided, or sequestered were extended over a 30-year period, which is the assumed lifetime of the Project. This period is consistent with the NREL study on the life-cycle of solar PV systems.

Findings

The carbon debt of the Project is estimated to be 230,104.8 MT CO_2eq over a period of 30 years. This figure includes:

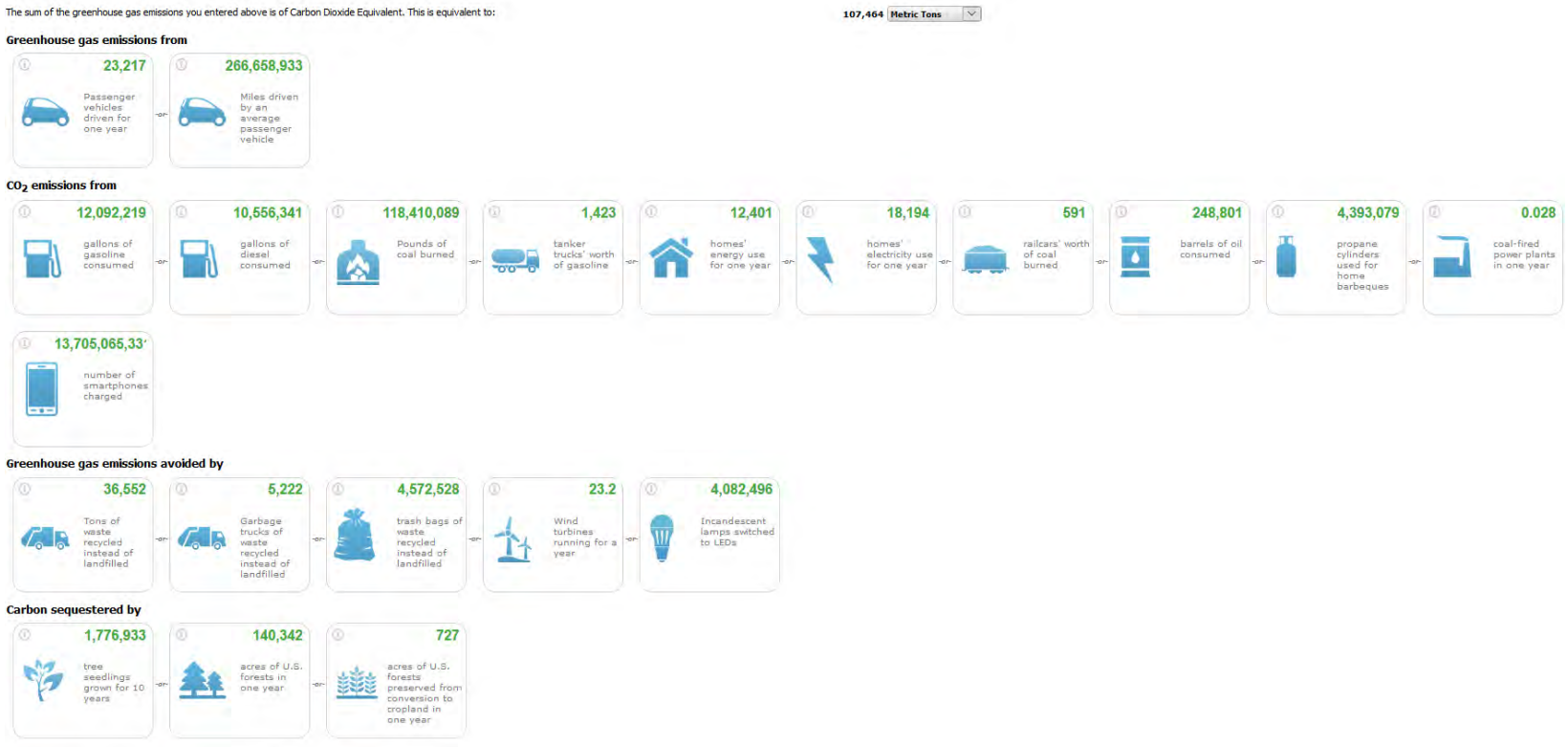
- Tree removal (30-year sequestration loss): 2,864.4 MT CO_2;
- Tree removal (one-time release of carbon stock): 10,538.1 MT CO_2;
- Cropland conversion (30-year emission avoidance): ((1,030.5) MT CO_2eq;
- Cropland conversion (one-time release of carbon stock): 5,212.7 MT CO_2; and
- Upstream activities of solar PV system: 212,520.0 MT CO_2eq.

The Project is expected to produce 253,000 megawatt hours of electricity in its first year of operation. Using non-baseload output emission rates provided by the EPA specific to the Project's eGrid region (NPCC New England),[4] the estimated annual emissions avoided by the Project is anticipated to be 107,463.6 MT CO_2eq. **Attachment A** provides GHG emissions equivalencies for this estimate. For example, the Project's estimated annual emissions avoidance is equivalent to GHG emissions from 23,217 passenger vehicles driven for one year and CO_2 emissions from 12,401 homes' energy use for one year.[5]

Anticipating a carbon debt of 230,104.8 MT CO_2eq and annual production benefits of 107,463.6 MT CO_2eq, it would take the Project 2.1 years (or 25.7 months) to have a net improvement in GHG emissions.

[3] NREL. (2013). *Life Cycle Greenhouse Gas Emissions from Solar Photovoltaics.* Retrieved 12 May 2020, from https://www.nrel.gov/docs/fy13osti/56487.pdf
[4] EPA. (2018). *eGrid Summary Tables 2018*. Retrieved 12 May 2020, from https://www.epa.gov/sites/production/files/2020-01/documents/egrid2018_summary_tables.pdf
[5] EPA. (2020). "Greenhouse Gas Equivalencies Calculator." Retrieved 12 May 2020, from https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

Attachment A



Source: EPA, 2020

Appendix P
Operations & Maintenance Plan

GRAVEL PIT SOLAR

Operations and Maintenance Plan

May 2020

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

Table of Contents

1. Introduction 3
1.1. Project Contact Information 3
2. Project Description 3
3. Maintenance and Monitoring 4
3.1. Site Access and Lighting 4
3.2. Equipment and Grounds Maintenance 4
3.3. Monitoring 5
3.4. Environmental Compliance 5
3.5. Long Term Stormwater Management Plan 5
4. Emergency Response 6

Tables

Table 1. Project Contact Information
Table 2. Scheduled Maintenance Activities
Table 3. Town of East Windsor Emergency Contacts

Revision No.	Date	Comments
0		

1. Introduction

As the owner of the Gravel Pit Solar project (Project), Gravel Pit Solar, LLC, Gravel Pit Solar II, LLC, Gravel Pit Solar III, LLC, and Gravel Pit Solar IV, LLC (collectively, Gravel Pit Solar) are affiliates of DESRI Renewables, LLC and are Delaware limited liability companies. Gravel Pit Solar is responsible for maintaining and servicing the solar electric system and related ancillary facilities (roads, fence, etc.) during the operation and maintenance (O&M) phase of the Project. This O&M Plan describes the Project components, maintenance and monitoring procedures, and emergency response measures, requirements of the Project.

1.1. Project Contact Information

Gravel Pit Solar will engage qualified firms for the construction and operation of the Project. Table 1 provides Project contact information.

Table 1. Project Contact Information

Owner	DESRI Renewable Investments, LLC Christopher Thuman Associate, Asset Management 1166 6th Ave, 9th Fl. New York, NY 10036 212-478-0549
O&M Service Provider	TBD

2. Project Description

Once constructed, the Project will consist of the ground-mounted solar panel array, inverters, transformers, switchgear, electrical cable collection system, and interconnection with the Project (GPS) Switchyard and Transmission Owner (Eversource) Switchyard facilities. The Project also includes access roads, security and aesthetic fencing, and stormwater management areas.

The area within the security fence is a Secure Facility, accessible by authorized personnel only. Access

to these locations should be arranged by contacting the Owner or O&M Service Provider identified in Table 1.

3. Maintenance and Monitoring

Gravel Pit Solar will obtain the services of a dedicated O&M service provider for maintenance and monitoring of the Project. Operations at the site will be minimal.

3.1. Site Access and Lighting

The solar array, inverters, and transformers will be enclosed by a fence with at least three gated entrances; one off of Windsorville Road for access to the northern array, and two gated entrances off of Plantation Road for access to the southern arrays. The gates will have a universal key lock (e.g. Knox lock) for emergency service providers. The access roads and the row spacing will provide sufficient access throughout the site for emergency responders.

Signs along the perimeter fence would be limited to displaying the installation name, address and emergency contact information, and trespassing/warning/danger signs to ensure the safety of individuals who may come in contact with the installation. The facility may be lit in accordance with electrical safety and building codes and to minimize Project visibility.

3.2. Equipment and Grounds Maintenance

All Project equipment will be inspected and maintained as directed by the manufacturer's requirements. Grounds maintenance activities will be scheduled to ensure site access and function of the stormwater management areas (see summary of scheduled maintenance activities in Table 2). Specific maintenance requirements for stormwater management areas are included in the Long-Term Stormwater Management Plan in Section 3.5.

Table 2. Scheduled Maintenance Activities

Task	Frequency
On-site visual inspection	1 x per year or per manufacturer requirements
Mechanical and electrical inspection	1 x per year
Panel cleaning	1 x per year
Grass cutting and weeding	1 x per year between April and October
Snow removal	As needed between October and April
Perimeter fence inspection	1 x per year
Stormwater management area inspection	In accordance with Section 3.5

No harmful chemicals will be used during the cleaning of the solar panels. Cleaning will be done with water and a soft-bristled broom, if needed. Note that the solar panel system does not need to be turned off during cleaning. Snow will be plowed off the access roads to the electrical equipment pads following snow events, as needed.

3.3. Monitoring

The O&M service provider will provide continuous 24/7 remote monitoring of the system performance, including a live telephone support line for corrective action and a single point of contact for system maintenance and repair related issues.

3.4. Environmental Compliance

The O&M service provider will be contractually obligated to comply with this O&M Plan, as well as the conditions of all permits and regulatory approvals.

3.5. Long Term Stormwater Management Plan

The O&M service provider shall inspect all on-site vegetated areas at least once per year, removing any accumulated sediment or debris, as needed. Although not a structural component of the drainage system, the maintenance of vegetated areas will affect the functioning of the long-term stormwater management. This includes the health/density of vegetative cover and activities such as the application and disposal of lawn and garden care products, disposal of leaves, and yard trimmings.

Any bare areas shall be re-seeded promptly, and appropriate erosion control measures shall be installed when native soil is exposed or when erosion channels are forming. Alternative mixtures of grass species shall be planted in the event of unsuccessful establishment. Vegetated areas are to be mowed approximately once per year to prevent the establishment of woody species.

4. Emergency Response

Gravel Pit Solar and the O&M services provider will coordinate with the Town of East Windsor police and fire departments regarding access to the facility and emergency shutoff switches. Emergency response trainings will occur with the Town of East Windsor emergency service providers at least once soon after commercial operation, and more frequently thereafter if requested by the Town. A draft Emergency Management Plan has been prepared and is included as Exhibit R. Table 3 provides an emergency contact list for the Town of East Windsor.

Each of the entrance gates will have a universal key lock (e.g. Knox lock) for emergency responders. Emergency shut-off switches will be clearly labeled. Communication with emergency service providers is available in the area via cell phone coverage.

Table 3. Town of East Windsor Emergency Contacts

Emergencies	Dial 911
Police Department	Edward J. DeMarco, Jr., Chief of Police 25 School Street East Windsor, CT 06088 Routine phone calls: (860) 292-8240 Emergency: 911
Fire District	Thomas Arcari, Chief Gerald Bancroft, Assistant Chief 125 Main Street Broad Brook, CT 06016 Business Phone: (860) 623-5940 Emergency: 911

Appendix Q
FAA Notice of Proposed Construction

Federal Aviation Administration

« OE/AAA

Project Submission Success
Project Name: GRAVE-000579003-20

Project GRAVE-000579003-20 has been submitted successfully to the FAA.

Your filing is assigned Aeronautical Study Number (ASN):

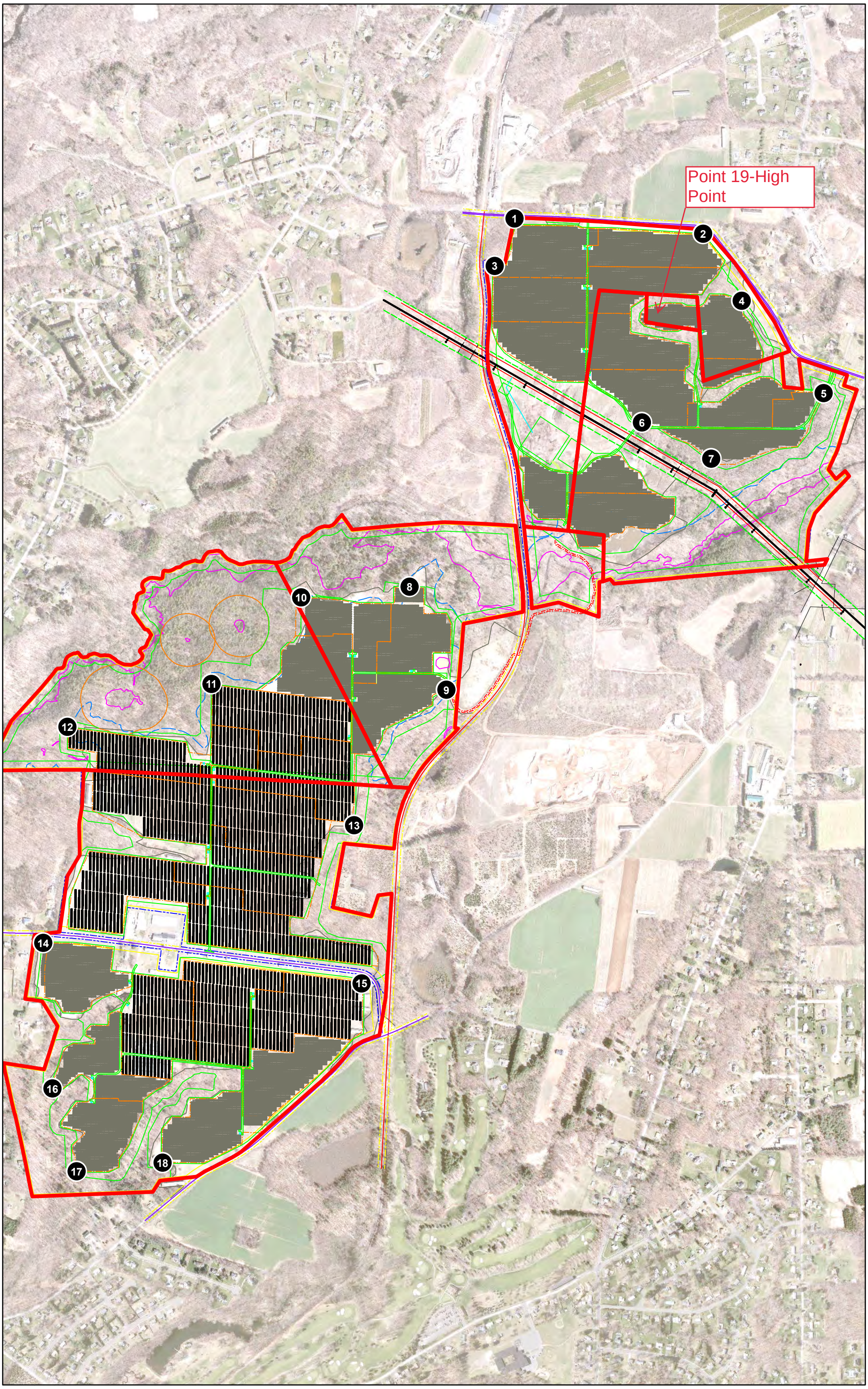
2020-ANE-2781-OE
2020-ANE-2782-OE
2020-ANE-2783-OE
2020-ANE-2784-OE
2020-ANE-2785-OE
2020-ANE-2786-OE
2020-ANE-2787-OE
2020-ANE-2788-OE
2020-ANE-2789-OE
2020-ANE-2790-OE
2020-ANE-2791-OE
2020-ANE-2792-OE
2020-ANE-2793-OE
2020-ANE-2794-OE
2020-ANE-2795-OE
2020-ANE-2796-OE
2020-ANE-2797-OE
2020-ANE-2798-OE
2020-ANE-2799-OE

Please refer to the assigned ASN on all future inquiries regarding this filing.

Please return to the system at a later date for status updates.

It is the responsibility of each e-filer to exercise due diligence to determine if coordination of the proposed construction or alteration is necessary with their state aviation department. Please use the link below to contact your state aviation department to determine their requirements:
State Aviation Contacts

To ensure e-mail notifications are delivered to your inbox please add noreply@faa.gov to your address book. Notifications sent from this address are system generated FAA e-mails and replies to this address will NOT be read or forwarded for review. Each system generated e-mail will contain specific FAA contact information in the text of the message.


Point 19-High Point
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 1

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 1
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 53 ' 45.66 " N
* **Longitude:** 72 ° 33 ' 8.39 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 169 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 2

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 2
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 53 ' 44.32 " N
* **Longitude:** 72 ° 32 ' 43.25 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 183 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Additional Location(s)

Add New Location(s)

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 3

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 3
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 53 ' 40.92 " N
* **Longitude:** 72 ° 33 ' 10.98 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 146 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 4

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 4
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 53 ' 37.71 " N
* **Longitude:** 72 ° 32 ' 38.01 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 196 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
**** For notice of alteration or existing provide the current AGL height of the existing structure.***
Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
**** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.***

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
**** Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System***
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 5

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 5
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 53 ' 28.59 " N
* **Longitude:** 72 ° 32 ' 26.97 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 189 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 6

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 6
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 53 ' 25.49 " N
* **Longitude:** 72 ° 32 ' 51.14 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 147 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 7

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 7
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 53 ' 21.96 " N
* **Longitude:** 72 ° 32 ' 41.85 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 156 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
*** For notice of alteration or existing provide the current AGL height of the existing structure.***
Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
*** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.***

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
*** Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System***
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 8

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 8
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 53 ' 8.92 " N
* **Longitude:** 72 ° 33 ' 21.88 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 170 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
*** For notice of alteration or existing provide the current AGL height of the existing structure.***
Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
*** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.***

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
*** Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System***
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 9

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 9
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 52 ' 58.7 " N
* **Longitude:** 72 ° 33 ' 16.82 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 172 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 10

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 10
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 53 ' 7.74 " N
* **Longitude:** 72 ° 33 ' 36.28 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 179 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 11

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 11
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 52 ' 59.04 " N
* **Longitude:** 72 ° 33 ' 48.13 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 171 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
**** For notice of alteration or existing provide the current AGL height of the existing structure.***
Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
**** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.***

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
**** Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System***
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 12

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 12
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 52 ' 54.62 " N
* **Longitude:** 72 ° 34 ' 7.23 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 138 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
*** For notice of alteration or existing provide the current AGL height of the existing structure.***
Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
*** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.***

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
*** Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System***
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 13

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 13
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 52 ' 45.12 " N
* **Longitude:** 72 ° 33 ' 28.93 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 167 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 14

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 14
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 52 ' 33.09 " N
* **Longitude:** 72 ° 34 ' 10.14 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 161 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 15

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 15
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 52 ' 29.39 " N
* **Longitude:** 72 ° 33 ' 27.69 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 165 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 16

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 16
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 52 ' 18.62 " N
* **Longitude:** 72 ° 34 ' 8.73 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 145 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
**** For notice of alteration or existing provide the current AGL height of the existing structure.***
Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
**** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.***

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
**** Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System***
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 17

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 17
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 52 ' 10.41 " N
* **Longitude:** 72 ° 34 ' 5.4 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 143 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
For notice of alteration or existing provide the current AGL height of the existing structure. Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 18

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 18
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 52 ' 11.36 " N
* **Longitude:** 72 ° 33 ' 53.94 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 146 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
**** For notice of alteration or existing provide the current AGL height of the existing structure.***
Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
**** For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.***

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
**** Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System***
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Federal Aviation Administration

« OE/AAA

Notice of Proposed Construction or Alteration - Off Airport

Add a New Case (Off Airport) - Desk Reference Guide V_2018.2.1

Add a New Case (Off Airport) for Wind Turbines - Met Towers (with WT Farm) - WT-Barge Crane - Desk Reference Guide V_2018.2.1

Project Name: GRAVE-000579003-20 **Sponsor:** Gravel Pit Solar, LLC

Details for Case : GP Solar Point 19 - High Point

Show Project Summary

Case Status

Status: Active

Documents: None

Project Documents:
05/08/2020 Gravel Pit Solar ... Delete for Project
05/08/2020 GP Solar Multiple...

Construction / Alteration Information

* **Notice Of:** Construction
* **Duration:** Permanent
if Temporary : Months: Days:
Work Schedule - Start: 07/01/2021 (mm/dd/yyyy)
Work Schedule - End: 12/31/2022 (mm/dd/yyyy)

For temporary cranes-Does the permanent structure require separate notice to the FAA?
To find out, use the Notice Criteria Tool. If separate notice is required, please ensure it is filed.
If it is not filed, please state the reason in the Description of Proposal.

State Filing:

Structure Summary

* **Structure Type:** Solar Panel
* **Structure Name:** GP Solar Point 19 - High Point
NOTAM Number:
FCC Number:
Prior ASN: - - - OE Validate Prior

Structure Details

* **Latitude:** 41 ° 53 ' 35.77 " N
* **Longitude:** 72 ° 32 ' 43.99 " W
* **Horizontal Datum:** NAD83
* **Site Elevation (SE):** 227 (nearest foot) PASSED
* **Structure Height (AGL):** 16 (nearest foot)
* **Current Height (AGL):** (nearest foot)
For notice of alteration or existing provide the current AGL height of the existing structure.
Include details in the Description of Proposal

Minimum Operating Height (AGL): (nearest foot)
For aeronautical study of a crane or construction equipment the maximum height should be listed above as the Structure Height (AGL). Additionally, provide the minimum operating height to avoid delays if impacts are identified that require negotiation to a reduced height. If the Structure Height and minimum operating height are the same enter the same value in both fields.

* **Requested Marking/Lighting:** None
Other :
Aircraft Detection Lighting System(ADLS): Yes
Only check this box if you are proposing the installation and use of an Aircraft Detection Lighting System
* **Current Marking/Lighting:** N/A Proposed Structure
Other :
* **Nearest City:** Windsor
* **Nearest State:** Connecticut
* **Description of Location:** The project is located approximately 3.7NM NW of Windsor, CT.
On the Project Summary page upload any certified survey.
* **Description of Proposal:** The project is the construction of a large solar array.

Additional Location(s)

Add New Location(s)

Proposed Frequency Bands

Select any combination of the applicable frequencies/powers identified in the Colo Void Clause Coalition, Antenna System Co-Location, Voluntary Best Practices, effective 21 Nov 2007, to be evaluated by the FAA with your filing. If not within one of the frequency bands listed below, manually input your proposed frequency(ies) and power using the Add Specific Frequency link.

Add Specific Frequency

Low Freq	High Freq	Freq Unit	ERP	ERP Unit
6	7	GHz	55	dBW
6	7	GHz	42	dBW
10	11.7	GHz	55	dBW
10	11.7	GHz	42	dBW
17.7	19.7	GHz	55	dBW
17.7	19.7	GHz	42	dBW
21.2	23.6	GHz	55	dBW
21.2	23.6	GHz	42	dBW
614	698	MHz	1000	W
614	698	MHz	2000	W
698	806	MHz	1000	W
806	901	MHz	500	W
806	824	MHz	500	W
824	849	MHz	500	W
851	866	MHz	500	W
869	894	MHz	500	W
896	901	MHz	500	W
901	902	MHz	7	W
929	932	MHz	3500	W
930	931	MHz	3500	W
931	932	MHz	3500	W
932	932.5	MHz	17	dBW
935	940	MHz	1000	W
940	941	MHz	3500	W
1670	1675	MHz	500	W
1710	1755	MHz	500	W
1850	1910	MHz	1640	W
1850	1990	MHz	1640	W
1930	1990	MHz	1640	W
1990	2025	MHz	500	W
2110	2200	MHz	500	W
2305	2360	MHz	2000	W
2305	2310	MHz	2000	W
2345	2360	MHz	2000	W
2496	2690	MHz	500	W

Appendix R
GPS Emergency Management and Evacuation Plan

Emergency Management Plan

Gravel Pit Solar

DRAFT

East Windsor,

Connecticut

TABLE OF CONTENTS

1.0 INTRODUCTION
- 1.1 Additional Safety Documents for Review 5
- 1.2 Additional Information (Use as needed) 5

2.0 PURPOSE OF THIS DOCUMENT
- 2.1 Emergency Management Plan (EMP) "Key Functions" 6
- 2.2 Additional Information (Use as needed) 6

3.0 PROJECT MANAGEMENT AND STAFF ORGANIZATION
- 3.1a Solar Site 7
- 3.1b Corporate Contact Information 7
- 3.1 Owner/Developer Key Personnel – Table 2 8
- 3.2 Emergency Contacts – Table 3 9

4.0 PERSONNEL ROLES AND ORGANIZATIONAL RESPONSIBILITES
- 4.1 Management Team 10
- 4.2 Developer Personnel/Owners Representative 10
- 4.3 Builders, Renewable Energy & Safety Personnel 11
- 4.4 Additional Information (Use as needed) 11

5.0 GENERAL SITE SAFETY REQUIREMENTS
- 5.1 General Site Requirements Applicable to Subcontractors and SRE Personnel 12
- 5.2 Site Security/Visitors 12
- 5.3 Spill Prevention 12
- 5.4 Accident Reporting 12
- 5.5 Safety Audits 14
- 5.6 Tailgate/Toolbox Training 14
- 5.7 Noise 15
- 5.8 Sanitation and Potable Drinking Water 15
- 5.9 First Aid Training and First Aid Kits 15
- 5.10 Fire Protection Requirements/Plan 15
- 5.11 Excavations and Trenching 17
- 5.12 Fall Protection 17
- 5.13 Confined Spaces Entry 17
- 5.14 Housekeeping 16
- 5.15 Electrical 18
- 5.16 Forklifts 18
- 5.17 Tools 18
- 5.18 Lockout/Tagout 19
- 5.19 Personal Protective Equipment 19
- 5.20 Hot Work 20

DRAFT

5.21 List of Any Known Contaminates or Toxic Environmental Issues 20

TABLE OF CONTENTS continued

6.0 CONTINGENCY AND EMERGENCY RESPONSE PROCEDURES

6.1 Site Evacuation Plan and Assembly Areas 20
6.2 Response to Release of Hazardous Materials/Wastes 21
6.3 Fire 21
6.4 Explosions 21
6.5 Accidents 22
6.6 Vehicle Accidents 22
6.7 Equipment Failure or Power Outage 22
6.8 Natural Disaster/Earthquake 22
6.9 Exposure Assessment 22
6.10 Liaison, Notification Requirement for Incidents, Accidents and Injuries 23
6.11 Additional Information (Use as needed) 23

7.0 MEDICAL MANAGEMENT

7.1 Medical Support Facilities 24
7.2 Additional Information (Use as needed) 24

DRAFT

Document Revision History			
REV #	Section Revised	Revision Date	Author

DRAFT

1.0 INTRODUCTION

This Emergency Management Plan has been prepared exclusively to accommodate all phases of the operation and maintenance activities associated with the Solar Power Plant listed below:

Job-site Address: 42 Plantation Road

East Windsor, Connecticut 06016

Hartford County

Coordinates to the north gate
Latitude: 41.891985

Longitude: -72.540486

Coordinates to the south gate
Latitude: 41.875749

Longitude: -72.563597

Office or Mailing Address

Contact Gravel Pit Solar, Inc.
Street 1166 Avenue of the Americas, 9th Floor
City, State: New York, 10036

1.1 Relevant Safety or Environmental Documents for Review

The following codes, standards & policy reference documents are available for review upon request from the Gravel Pit Solar Division Office.

1. Name of Document: ANSI-NETA MTS 2015 - Electrical Power Distribution Equipment and Systems

Location: Gravel Pit Solar Division Office – available upon request

2. Name of Document: ANSI/NFPA 70E, Applicable NEC, OSHA 29CFR 1901 and 1910.269 Electric Power Generation, Transmission, & Distribution

Location: Gravel Pit Solar Division Office – available upon request

DRAFT

3. Name of Document: Injury, Illness and Prevention Program (IIPP) Location: Gravel Pit Solar Division Office – available upon request

DRAFT

2.0 PURPOSE OF THIS DOCUMENT

2.1 The Emergency Management Plan (EMP) serves four "Key" functions:

- The EMP identifies key personnel in the Gravel Pit Solar Project organization.
- The EMP is the primary health and safety resource tailored specifically for the operations and maintenance project activities and sets forth the minimum work practice standards for all work including any Contractors, Subcontractors, vendors and visitors who may be on the Project Site during major solar plant repairs, solar plant system testing or Gravel Pit Solar tasks including, but-not-limited-to, requirements for: incident reporting, accident investigation and medical management, public safety, Contractor safety, transportation, waste management, equipment management, site security, emergency response and site evacuation, environmental conditions, construction safety, agency relations, sanitation, decontamination, hazard awareness and training.
- The EMP sets forth the minimum environmental, health and safety standards that contractors and subcontractors will incorporate into their company or individual H&SP's or JHA's.
- The EMP highlights the minimum environmental, health and safety standards Gravel Pit Solar Contractors will incorporate into their individual JHA's and day-to- day Gravel Pit Solar activities. This EMP is in addition to the Gravel Pit Solar IIPP documents and all Safety and Risk Management policies set forth by the company. It is important to note that ALL Gravel Pit Solar Field Technicians are OSHA 30 certified. The Gravel Pit Solar staff have extensive supplementary task specific safety training in addition to the to the contractor training that is required before they are assigned to a Gravel Pit Solar Project.

2.2 Additional Information (reserved)

DRAFT

3.0 PROJECT MANAGEMENT AND STAFF ORGANIZATION

3.1(a) Table 1

Solar Site Key Personnel

Primary Contact:

Secondary Contact - Gravel Pit Solar Senior Field Technician	
Name:	Office:
	Mobile:
	Fax:
Tertiary Contact - Field Technician	
Name:	Office:
	Mobile:
	Fax:
Gravel Pit Solar Field Operations Manager	
Name:	Office:
	Mobile:
	Fax:

3.1(b) Corporate Contact Information

Emergency Management Plan and Division/Regional Safety Manager	
Primary:	Mobile:
Secondary:	Mobile:
Location:	
Gravel Pit Solar Inc. - Division Manager	
Name:	Office:
Location:	Mobile:
	Fax:
Gravel Pit Solar Inc. – Additional contacts	
Labor Relations:	
Employee Assistance Program:	
O&M Contractor Safety Hotline:	
Workers' Comp – Contractor Employees:	
Gallagher Bassett Services, Inc. (Claims Administrator):	

DRAFT

Hazardous Material Handling:	
Gravel Pit Solar Compliance:	

3.2 Table 2
Owner/Developer Key Personnel

Project Owner Name
NAME: **COMPANY**: **ADDRESS**: **PRIMARY NUMBER**: **SECONDARY NUMBER:**
Project Developer
NAME: **COMPANY**: **ADDRESS**: **PRIMARY NUMBER**: **SECONDARY NUMBER:**

3.3 Table 3 – Emergency Contacts and Governmental Agencies

Water Pollution Control Authority
ADDRESS: 192 South Water Street, PO Box 359 **PHONE:** 860-292-8264
OSHA
ADDRESS: Building 135 High Street, Suite 361, Hartford, CT 06103 **PHONE:** 860-240-3152
State of Emergency Services
Emergency Management: 860-658-1973 **Weather Warning Center:** https://www.weather.gov/ **Hazardous Material Spills**: 860-424-3338
Fish & Game, Environmental Division

DRAFT

NAME: Department of Energy and Environmental Protection, Wildlife Division **ADDRESS:** 79 Elm Street, Hartford, CT 06106 **PHONE:** 860-424-3000
Emergency Contacts
POLICE DEPT **ADDRESS:** 25 School Street, East Windsor, CT 06088 **PHONE:** 860-292-8240
FIRE DEPT **ADDRESS:** 125 Main Street, Broad Brook, CT 06016 **PHONE**: 860-623-5940
STATE POLICE (use Police Department for emergencies) **ADDRESS:** Central District HQ 269 Maxim Road Hartford, CT 06114 **PHONE:** TEL: (860) 706-5656. Major Crime Unit (860) 706-5632.
Primary & Secondary Local Hospital or Urgent Care Clinic - please see pg. 24, section 7.0
Poison Control PHONE: 800-222-1222
State Environmental Agency: 860-424-3000
National Response Center (NRC): 800-424-8802

DRAFT

4.0 PERSONNEL ROLES AND ORGANIZATIONAL RESPONSIBILITIES

4.1 Management Team

The Management Team for this Gravel Pit Solar Project includes: Gravel Pit Solar Division Manager, Gravel Pit Solar Operations and Maintenance (O&M) Manager, and the Owner's Representative.

All inquiries and decisions regarding this Gravel Pit Solar Project should be addressed to Gravel Pit Solar Division Manager or to Gravel Pit Solar – Gravel Pit Solar Manager who will act as liaison to the Management Team.

Management Team Members, by name, for this Gravel Pit Solar Project include:

Gravel Pit Solar Division Manager:
Gravel Pit Solar Field Operations Manager:
Owner's Representative:

4.2 Owner's Representative & Developer Personnel

Owner's Representative:
Developer's Representative:

4.3 Gravel Pit Solar

4.3.1 Gravel Pit Solar Field Division Manager

The Gravel Pit Solar Division Manager is charged with the overall responsibility for the successful implementation of field operations and maintenance. The Gravel Pit Solar Division Manager responsibilities include, but are-not-limited-to:

- Prepare and organize project activities on-site.
- Review and approve the site-specific H&SP.
- Provide operational needs, supplies, etc.
- Coordinate cost controls.
- Prepare and organize project activities on-site.
- Review and approve the site-specific H&SP.
- Provide operational needs, supplies, etc.
- Coordinate cost controls.

DRAFT

4.3.2 Gravel Pit Solar – Lead Field Technician

The Gravel Pit Solar Lead Technician coordinates Gravel Pit Solar Field Technicians, vendors and contractor(s) and subcontractor(s) activities on the site. The Gravel Pit Solar Lead Technician's responsibilities include but are-not- limited-to:

- Prepare and organize project activities on-site.
- Supervise vendors and subcontractors for compliance with job scope and quality.
- Supervise field operations and implement safety procedures.
- Enforce implementation of EMP and established health and safety practices.

4.3.3 Emergency Management Plan (EMP)

The EMP is responsible for assuring compliance with the EMP. Specifically, duties of the EMP include but are-not-limited-to:

- Establishes site safety controls.
- Develops the EMP.
- Safety liaison with vendors and subcontractors on the site.
- Point person for health and safety questions.
- Monitors Gravel Pit Solar personnel, vendor and subcontractor compliance.
- Oversees security compliance for the Gravel Pit Solar Project.

4.4 Additional Information (use as needed)

DRAFT

5.0 GENERAL SITE SAFETY REQUIREMENTS

5.1 Site Requirements

- As required by the state in which the work is being performed, each subcontractor shall develop their company Injury, Illness and Prevention Program (IIPP) and shall provide written documentation to the Site Gravel Pit Solar Field Technician verifying existence of program.
- Each contractor and subcontractor shall provide a copy of their Hazard Communication Program to the Site Gravel Pit Solar Field Technician at onset of activities at the site.
- Each subcontractor is required to provide one contractor per crew and per shift that holds current standard first aid training that covers both first aid and CPR.
- Any hazardous material products brought onto the Project Site will be cleared with the Gravel Pit Solar Lead Technician or EMP. The Gravel Pit Solar Lead Technician is responsible for collecting each materials Material Safety Data Sheets (MSDS) as it enters the site. Each contractor(s) and subcontractor(s) will be responsible for submitting a list of MSDS on the job. Gravel Pit Solar shall post a composite MSDS list on the central job board in the on-site Gravel Pit Solar office or the Site Safety Binder.
- All personnel will be required to follow the Gravel Pit Solar Two Person Rule as outlined in the policy.

5.2 Site Security/Visitors & Vendors

All visitors to the Gravel Pit Solar Project site shall enter and exit through the security gate(s) and must be signed in and out by authorized personnel.

5.3 Spill Prevention

The following general requirements for any hazardous substances stored or used at this facility.

General Requirements:

- Ensure all hazardous substances are properly labeled and tightly sealed.
- Maintain and review Safety Data Sheet for hazardous materials.
- Store, dispense, and/or use hazardous substances in a way that prevents releases.
- Provide secondary containment when storing hazardous substances in bulk quantities (~55 g).
- Maintain good housekeeping practices for all chemical materials at the

DRAFT

facility.

5.4 Accident Reporting

All accidents will be reported to the site's Lead Technician, the Gravel Pit Solar Field Operations Manager or the EMP as soon as possible after it occurs. A complete follow-up written accident investigation report will be submitted to the Site O&M Field Technician, Gravel Pit Solar Field Operations Manager or EMP within 24 hours Accident investigations will be handled by each Subcontractor using its own internal reporting system. A copy of this report will be submitted to the Site Gravel Pit Solar Superintendent, Gravel Pit Solar Manager or EMP, as described above.

Accident investigations involving hazardous materials or wastes will be handled jointly by Subcontractor and the Site Gravel Pit Solar Field Technician, Gravel Pit Solar Field Operations Manager or EMP. This is to assure the cause of the accident is determined and proper precautions are implemented for other similar activities. The corrective action expected must be relayed to other Contractors and Subcontractors.

5.5 Safety Audits / Inspections

Each Contractor(s) and Subcontractor(s) are expected to conduct reasonable and customary self- audits of their operations and promote safe work practices.

Each Subcontractor will be required to submit a copy of the job site safety inspection or job hazard analysis upon request. The inspection forms shall be turned into the O&M Field Technician.

Gravel Pit Solar Field Technician Standard – A full site walk will be conducted during the O&M and Off phase; all systems are to be reviewed based on the Gravel Pit Solar commissioning check list. A Job Hazard Analysis is to be conducted before any task new begins, or there is a change in a specific component, element with season changes. All JHA documents are to be filed in the Site Field Technician's JHA Book and are to remain in the Gravel Pit Solar job vehicle at all times.

5.6 Tailgate/Toolbox Training

DRAFT

Each Subcontractor, Module Washer and Landscaper is expected to attend Gravel Pit Solar Site Safety Meeting or/and conduct their own Weekly Site Safety Meetings for their contractors. A copy of the meeting records, which enumerates the content of the meeting along with the attendance roster, shall be turned into the Site Gravel Pit Solar Field Technician.

Gravel Pit Solar Field Technician Standard – Gravel Pit Solar conducts bimonthly Gravel Pit Solar meetings during which time Gravel Pit Solar safety updates, safety conditions at each site, PPE and safety issues are reviewed. Gravel Pit Solar conducts a mandatory annual all-staff Gravel Pit Solar Team Safety Training Review each year. ALL Gravel Pit Solar Field Technicians must be OSHA 30 certified. Many Gravel Pit Solar staff have extensive supplementary safety training and Construction Safety training that is required before they are assigned to the Gravel Pit Solar job site.

5.7 Noise

Noise exposures may be expected when working near or operating machinery and equipment (e.g., graders, backhoes and generators).

If noise levels cannot be controlled, the Gravel Pit Solar Field Technician shall be notified, and the work may be temporarily suspended until suitable controls can be implemented.

Personnel will be required to wear approved hearing protection to maintain exposures below 85 dBA.

5.8 Sanitation Stations and Drinking Water

The site's Lead Field Technician or responsible Technician will be responsible for providing sanitation stations during module washing, landscaping and major repairs requiring a significant number of staff on site for more than one day.

Each individual Subcontractor is responsible for providing potable drinking water for their workers as required by State and Federal OSHA Heat Stress Standards.

Gravel Pit Solar Field Technician Standard - A minimum of 64 ounces of

DRAFT

drinking water in the work vehicles at all times. During High Heat Warnings a minimum of 2 gallons per worker must be on site at all times.

5.9 First Aid Training and Kits

Each Subcontractor is required to provide a minimum of one first aid/CPR trained supervisor and first aid kit/supplies that meet State and Federal OSHA Standards.

A central first aid kit will be designated at the on-site Gravel Pit Solar office or located inside the site storage Conex containers or ***SCADA cabinet*** to facilitate on-site emergency response. Off-site medical emergency facilities will be posted inside the door of the ***SCADA cabinet.*** Subcontractors are required to advise their contractor(s) of the name, address and telephone number of the designated medical facility and the location (***SCADA cabinet***) of this information on the Project Site.

Gravel Pit Solar Field Technician Standard – All Gravel Pit Solar personnel are required to have a first- aid kit in their work vehicles and a second first-aid kit is to remain in the ***SCADA cabinet***.

5.10 Fire Protection Plan

Fire extinguishers shall be inspected at the start of the Project and not less than once per month thereafter. Each Contractor or Subcontractor is required to have at least one 10-lb. ABC fire extinguisher properly tagged with a current inspection. A current inspection indicates servicing and/or inspection within the past 12 months. The following table enumerates the minimum fire protection necessary per item and activity. These minimum standards are required for every Subcontractor working on the Project.

Table 4

Cranes, forklifts, aerial devices, loaders, backhoes, etc.	10: BC	1 per piece of equipment
Work generating sparks or open flames	10: ABC	1 per operation
Temporary heating	4A: 40BC	1 per piece of equipment

DRAFT

devices		
Fueling areas	Dry chemical or carbon dioxide 20 ABC	2 per station
Floors	10: ABC	2 per floor <3,000 ft2 or every 100 ft of

Stored oxygen and acetylene shall be stored separately, a minimum of 20 feet or separated by a wall not less than 5 feet in height. Cylinders will be stored with caps on tight.

Should a Gravel Pit Solar Project include burning and/or welding, all burning, and welding operations will provide a fire watch person, burning blankets and a fire extinguisher to protect adjacent areas.

Gravel Pit Solar Field Technician Standard - All Gravel Pit Solar personnel are required to have one 2.0-lb. ABC fire extinguisher in their work vehicle and a second2.0-lb. ABC fire extinguisher hung on the wall just inside the door to the SCADA cabinet. Fire extinguisher gages should be checked monthly and replaced as needed.

5.10 *Excavation and Trenching* (Not applicable for Gravel Pit Solar activities, included for *Subcontractor activities required for Solar Plant major repairs)*

A competent trained person will be responsible for supervising excavations, drilling, and trenching. Type A, B, C soils will be checked daily by a certified person to determine the minimum type and level of protection necessary. Soil inspections shall be checked and documented daily by a certified person for the duration of the soil excavation. Objects shall not be stored within 2 feet of the edge of all excavations.

5.11 Fall Protection (*Not applicable for Gravel Pit Solar activities, included for Subcontractor activities required for Solar Plant major repairs)*

All contractors shall wear a full body harness and double shock-absorbing lanyard system anytime a worker is required to disconnect and reconnect to travel

DRAFT

around an obstacle. At no time will a worker be totally "unhooked".

Fall protection shall be provided on all fixed elevated surfaces above 6 feet for all trades. The 6-foot fall protection rule does not pertain to ladders and scaffolding as long as they are used within OSHA standards.

Subcontractors that work from temporary elevated surface heights of 6 feet or more will be required to provide a written fall protection plan. Said plan shall be submitted and approved prior to Subcontractor starting any work with a fall risk.

5.12 Confined Space Entry Requirements (Not applicable for Gravel Pit Solar activities, included for Subcontractor activities required for Solar Plant major repairs)

Confined space work requiring an entry permit shall be performed only under the supervision of a competent trained person. Only trained and authorized Contractors shall be allowed to enter the confined space. A Confined Space Entry Permit is available from the Contractor. Subcontractors may also use any equivalent permit.

5.13 Housekeeping

Regular housekeeping is a part of this job safety plan with special emphasis on keeping pathways and walkways clean and free of debris.

Gravel Pit Solar Field Technician Standard - All pathways and walkways must be clear and free of debris. SCADA cabinet and Conex containers, doorways, and interiors should be kept clean and free of debris.

5.13 Electrical

Please see Section 5.17 for Lockout/Tagout Procedures (LOTO)

All temporary power sources will be provided with Ground Fault Circuit Interrupters (GFCI), and all cords, plugs and receptacles shall be checked for damage daily. Testing of the ground and labeling of the cords will be performed as needed or at least monthly. Remove any damaged equipment from use and tag out of service until repaired.

Tools and equipment shall be routinely inspected for frayed cords, loose wires and plugs and should be tested before use.

Gravel Pit Solar Field Technician Standard - In addition to the policy and procedures list above, also refer to the attached SOP for Control of Hazardous

DRAFT

Energy and Gravel Pit Solar Power Generation System Testing Procedures and always conduct a JHA. These attachments further outline safe electrical work on solar plant systems and site-specific equipment procedures as well as the appropriate PPE for each task.

5.14 Forklifts

No modifications or additions that affect the capacity or safe operations of the equipment shall be made without the manufacture's written approval. Only trained and certified personnel shall be permitted to operate forklifts. All forklifts must be inspected daily before operations begin.

If a load is lifted by two or more trucks working in unison, the proportion of the total load carried by any one truck shall not exceed its capacity.

Gravel Pit Solar Field Technician Standard – All the standards and regulations listed above apply to any forklift operations.

5.15 Tools

Impact tools, such as drift pins, wedges and chisels shall be kept free of mushroomed heads. The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight in the tool and be replaced immediately if defective or damaged.

DRAFT

5.16 Lockout / Tag out Procedures (LOTO)

Before any modifications, maintenance, or repairs are done on equipment, tools, or power panels, the energy source shall be disconnected or turned off (turn valve, pull fuse, switch breaker) and locked out or blocked out with a padlock, chain or both to ensure energy source is locked off.
Place a tag at the disconnect point, identifying who you are, who you work for, and why you locked it off. Never move or remove another person's tag.
Be sure to release residual energy (i.e. lead line grounding circuits).
Test equipment or energy source to ensure it will not run. Turn on equipment or test circuits to ensure it is disconnected.
Restore energy safely when you are finished with your repairs. Remove lock and tag.

Gravel Pit Solar Field Technician Standards – All standards and regulations listed above apply. See attached Lockout/Tagout Procedure document.

5.17 Personal Protective Equipment (PPE)

The minimum PPE required includes hard hats, sturdy work boots, shirt sleeves (no tank tops), long pants, and safety glasses Z87 are to be worn at all times.
Goggles, and/or face shields shall be worn as necessary for eye protection.

Respiratory protection shall be worn, as necessary, to prevent breathing harmful concentrations of paint, welding fumes, concrete and sheet rock dust, vapors, etc.

Gravel Pit Solar Field Technician Standards - In addition to hard hats, work boots non-steel toe and safety glass Z87 list above, additional task specific PPE requirements are as follows: Class 00 - 1000 Volt Rated Electric Work Gloves, 1000 Volt Rated Face Shields, Level 4/40 Cal Arc Flash Suits, Class 1/12 CAL Arc Flash Suits, class 4 - 12000 Volt rated electrical gloves.

DRAFT

5.18 Hot Work

Subcontractors performing Hot Work such as welding, cutting, brazing, soldering, and grinding are exposed to the risk of fires from ignition of flammable or combustible materials in the space, and from leaks of flammable gas into the space, from Hot Work equipment.

All Hot Work performed by any person will require a JHA and written pa review and approval by the Gravel Pit Solar Field Technician prior to the start of the job.

A Hot Work permit will be required for any work activity performed in an *enclosed* environment, including but not limited to inside a cabinet or a confined space, that generates sparks, open flames or creates in any way a potential fire hazard.

See Section 6.3 for required fire safety precautions during Hot Work.

6.0 CONTINGENCY AND EMERGENCY RESPONSE PROCEDURES

6.1 Site Evacuation Plan / Assembly Area

Site evacuation procedures are required as part of an emergency response plan. Upon the plant/site handover to the Gravel Pit Solar staff, every job site will be evaluated for a safe corridor for escape and assembly. Most site assembly areas will be located outside of the main access gate. Examples of emergencies requiring a site evacuation include:
Equipment fire or explosion.
Explosion from underground pocket of flammable/combustible gases.
Inclement weather.
Toxic gas/vapor release from subsurface pocket of gases or containers.
Cave-in from excavated trenching.

During any construction work, evacuation routes are established upwind and a cross from the direction of wind flow as determined by either a windsock or other visual means of determining air movement. In the event of an evacuation signal, every worker is required to cease operations, note the wind pattern and move in a cross and upwind direction to the designated assembly point.

See the attached Emergency Assembly Map for this site-specific assembly point.

6.2 Response to Release of Hazardous Materials / Wastes

Gravel Pit Solar sites are equipped with spill kits to handle the containment and clean- up of minor spills. For spills over 25 gallons,

DRAFT

technicians should attempt to stop the leak (if possible), and contain the spill then contact a Lead Field technician immediately. The Lead Field Technician shall evaluate the extent of the spill and determine if the local Spill Remediation Contractor needs to be called in for clean-up. Notifications to the National Response Center (NRC) and State Environmental agency might be required as outlined in the site's Spill Prevention and Response Plan. Any notification to a government agency requires follow-up notification to the owner and Gravel Pit Solar's Compliance Department.

6.3 Fire – See Section 5.9 Fire Protection Plan for Fire Extinguisher Requirements

Alert and immediately evacuate personnel away from the immediate area. Notify Site Gravel Pit Solar field Technician, Gravel Pit Solar Field Operations Manager or EMP regarding any size fire that occurs on the Project Site. **If necessary, Gravel Pit Solar Staff or Management will notify the Fire Department by calling 911 and/or the local Fire Department.**

For small fires, a fire that can be controlled with one 2.5 lb. fire extinguisher, contain and extinguish the fire as quickly as possible. For larger fires, immediately evacuate the affected area and gather in the designated assembly area outside of gate access locations.

6.4 Explosions

Following an explosion, immediately survey the affected area for injured workers. If the area is safe to enter, move the injured to a safe distance. Injured workers will be transported to the nearest emergency medical facility.

Once injured workers have been moved, immediately evacuate the affected area and gather in the designated assembly area outside of the gate access location. If a fire develops, follow emergency procedures for fire control and evacuation, as described above.

DRAFT

6.5 Accidents

All accidents/incidents shall be reported to the Gravel Pit Solar Lead Field Technician, Gravel Pit Solar Field Operations Manager or the EMP immediately for investigation and follow- up. An incident written incident report shall be submitted to the Site Gravel Pit Solar Field Technician and EMP within 24 hours. For accidents involving personal injury, immediately apply appropriate first aid and transport the injured party to the designated medical facility. Never allow the injured contractor to transport them. The Site Gravel Pit Solar Field Technician (OSHA30 trained) will summons emergency medical response for injuries requiring emergency medical assistance and ambulance transport.

6.6 Vehicle Accidents

Stop the vehicle as soon as safely possible. Assess the damage to the vehicle and collateral damage to equipment other objects. If injuries are sustained, follow the accident procedures above. Report all vehicle accidents to the Site Gravel Pit Solar Field Technician Gravel Pit Solar Field Operations Manager or EMP immediately.
The attached Vehicle Accident Report must be filled out and submitted to the Site Gravel Pit Solar Field Technician and EMP.

6.7 Equipment Failure or Power Outage

Turn off equipment or power. Assess damage and notify the Site Gravel Pit Solar Field Technician or Gravel Pit Solar Field Operations Manager. Wait for further instructions from Site Gravel Pit Solar Field Technician, Gravel Pit Solar Field Operations Manager.

6.8 Natural Disaster/Earthquake Checklist

1. Shut down all operations/equipment in a safe effective manner
2. Check all personnel for injury and follow appropriate procedures
3. Inspect all fuel/oil/wastewater tankage and/or containment structures for signs of leakage or damage
4. Inspect all operational units for proper operations made, and manually check to insure all automatic and alarmed features are working properly
5. Inspect all piping, values, and fixed pumping units for damage
6. Re-inspect electrical circuits and power supplies for damage

DRAFT

7. Report to assembly point and wait further instructions

6.9 Exposure Assessment

Subcontractors will become familiar with the potential hazards on the job, as described in this EMP. They will train, manage and provide appropriate measures to protect their contractors. Each Subcontractor shall provide appropriate tools, (i.e., PPE, equipment, environmental exposure monitors) to assess and assure that its contractors are working in a safe area and manner.\ Liaison, Notification Requirement for Incidents, Accidents and Injuries

Should any of the events listed above occur, the Gravel Pit Solar Field Technician, Gravel Pit Solar Field Operations Manager, and the EMP shall be contacted immediately. The EMP will assist Subcontractors in the issuance and preparation of a written report to the Gravel Pit Solar Field Operations Manager within 24 hours.

Gravel Pit Solar, Inc. Management and the EMP will determine the appropriate reporting and notification procedures involving notification and follow up to local authorities.

6.10 Additional Information (Use as needed)

DRAFT

7.0 MEDICAL MANAGEMENT PLAN

7.1 Medical Support Facilities

The closest emergency medical facilities shall be identified and posted on the job site. The following medical support personnel have been contacted and informed of this ongoing Gravel Pit Solar project. The contacts and corresponding telephone numbers of local clinics and hospitals are provided below.

Primary & Secondary Local Hospital or Urgent Care Clinic
PRIMARY ADDRESS: St. Francis Hospital and Medical Center 114 Woodland Street, Hartford, CT 06105 **PHONE**: 860-714-4000 **SECONDARY ADDRESS**: Concentra Urgent Care, 1080 Day Hill Rd, Windsor, CT 06095 **SECONDARY PHONE**: 860-298-8442

Please see attached map showing the transportation route to the closest clinic or hospital.

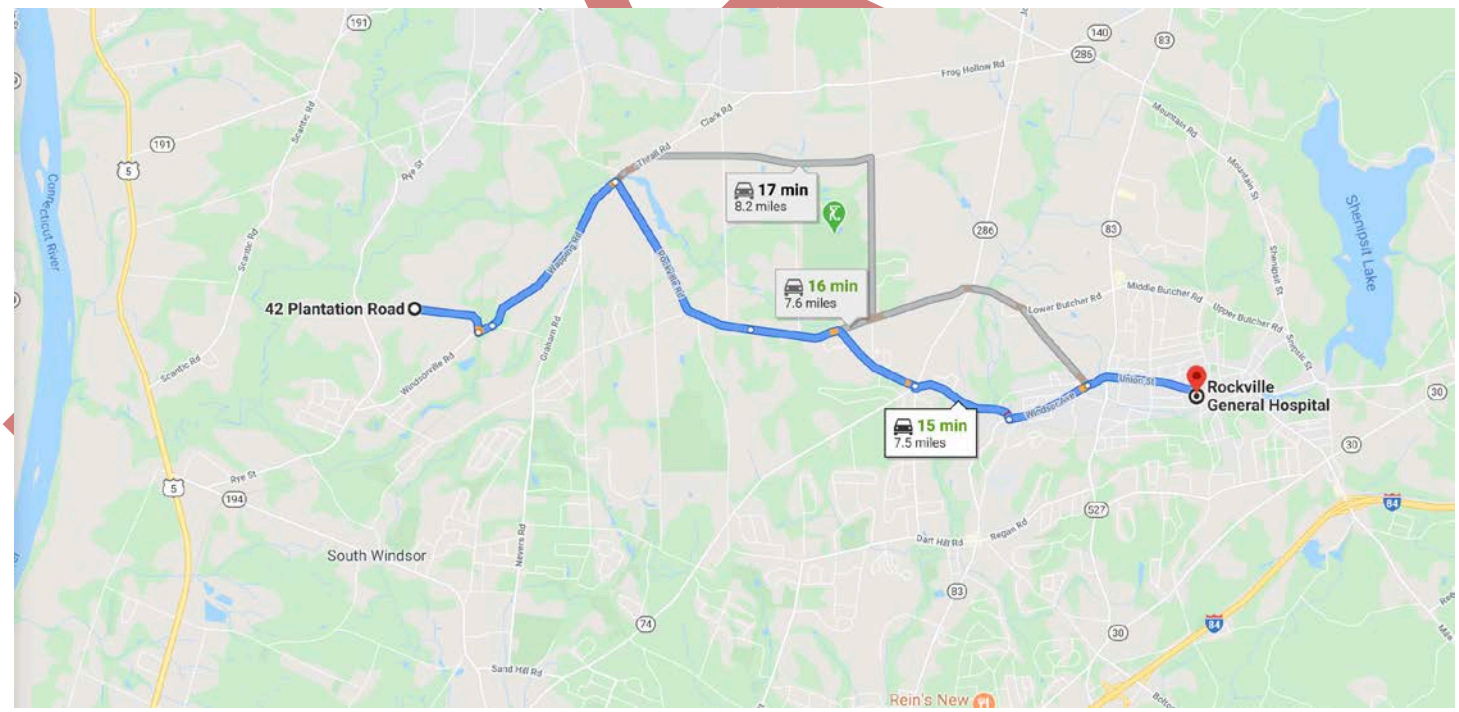
7.2 Additional Information (Use as needed)

DRAFT

Closest Hospital

Rockville General Hospital

31 Union Street,
Vernon, CT 06066
(860) 872-0501



DRAFT

Closest Urgent Care

SECONDARY

CONCENTRA URGENT CARE

1080 Day Hill Road,

Windsor, CT 06095

(860) 298-8442

DRAFT

EMERGENCY ASSEMBLY AREA

AND SITE MAP

TO BE ADDED

DRAFT

ALL TASKS LISTED BELOW REQUIRE PPE RATED FOR THE TASKS AT HAND. ALL PPE SHOUD BE SIZED FROM THE REQUIRED ARC FLASH LABELS. ALL PPE IS TO BE CHECKED PRIOR TO EVERY USE AND IS THE RESPONSIBILITY OF THE INDIVIDUAL WEARING SUCH PPE.

SOME EQUIPMENT ARC FLASH RATINGS EXCEED RATED PPE, WHEN THIS HAPPENS OPERATIONS MUST BE COMPLETED DE-ENERGIZED.

STOP WORK IF ANY ABNORMAL CONDITION ARISES

General		
Where the heat index is above 95 degrees two people are required		
Where the work is on a rooftop two people are required		
Where the work is on a carport two people are required		
Equipment type	**One person**	**Two people**
POI (substation, switchgear, recloser)		
	Visual inspection from outside the fence	All POI inspections require two people
		All site trips require two people
		Any work at the POI area, or inside the fence
Pad Mount transformer		
	Inspect exterior for leaks	IR scanning cable terminations
	If Gauges are external, can inspect gauges	Interior inspections
	Inspect exterior paint condition and touch up	DGA's if internal after isolation
	DGA's if external	Verify electrical circuits of SCADA inputs
	Inspect exterior paint condition and touch up	Operate breakers outside of normal conditions, for any repairs or breaker trips
	Open swing door to visually inspect seals and breaker status	Internal inspections and IR scans
	Operate breakers under normal operating conditions only if PPE Exceeds ARC Flash hazard shown on ARC flash label. If no label exists requires de-energizing of any other energy source.	To perform any repairs
AC Panel or skid control power panels		
	Inspect exterior paint condition and touch up	Internal inspections and IR scans
	Operate breakers under normal operating conditions with dead front in place, only if PPE Exceeds ARC Flash hazard shown on ARC flash label. If no label exists requires de-energizing of any other energy source.	Troubleshooting and resetting tripped breakers
		Any repairs to AC panels or control power transformers
Inverter		
	Inspect exterior paint condition and touch up	Opening any cabinet doors where voltage is present
	External inspections for damage	Preforming inverter PM
	Fault resetting from control panels	Internal inspections and repairs
	Reading HMI screen for inverter data	Fuse replacements
	Pulling event logs	Ground fault troubleshooting
	Resetting from control panel only (without breaker operation or opening of inverter cabinets)	
Recombiner		
	WITH VOLTAGE PRESENT (Daytime)	**WITH VOLTAGE PRESENT (Daytime)**
	Inspect exterior paint condition and touch up	Opening any bolted cabinet doors
	Operate breakers under normal operating conditions only if PPE Exceeds ARC Flash hazard shown on ARC flash label. If no label exists requires de-energizing of all field combiners prior to recombiner operation.	Internal inspections and IR scans
		Operate breakers outside of normal conditions, for any repairs or breaker trips
	WITH NO VOLTAGE PRESENT	**WITH NO VOLTAGE PRESENT (Nighttime)**

DRAFT

	(Nighttime)	
	Internal inspections and repairs	
	Troubleshooting	
	Preform PM	
Combiner box		
	WITH VOLTAGE PRESENT (Daytime)	**WITH VOLTAGE PRESENT (Daytime)**
	Inspect exterior paint condition and touch up	Opening any cabinet doors
	With doors shut and latched operate disconnect handle	Performing IR scans
		Internal inspections and repairs
		Fuse replacements
		Ground fault troubleshooting
		String testing
	WITH NO VOLTAGE PRESENT (Nighttime)	**WITH NO VOLTAGE PRESENT (Nighttime)**
	Opening any cabinet doors	
	Internal inspections and repairs	
	Fuse replacements	
	Ground fault troubleshooting	

DRAFT

ALL TASKS LISTED BELOW REQUIRE PPE RATED FOR THE TASKS AT HAND. ALL PPE SHOUD BE SIZED FROM THE REQUIRED ARC FLASH LABELS. ALL PPE IS TO BE CHECKED PRIOR TO EVERY USE AND IS THE RESPONSIBILITY OF THE INDIVIDUAL WEARING SUCH PPE.

SOME EQUIPMENT ARC FLASH RATINGS EXCEED RATED PPE, WHEN THIS HAPPENS OPERATIONS MUST BE COMPLETED DE-ENERGIZED. STOP WORK IF ANY ABNORMAL CONDITION ARISES

General		
Where the heat index is above 95 degrees two people are required		
Where the work is on a rooftop two people are required		
Where the work is on a carport two people are required		
Equipment type	**One person**	**Two people**
	Shield removal	
String wires		
	WITH VOLTAGE PRESENT (Daytime)	**WITH VOLTAGE PRESENT (Daytime)**
	Visual inspections	After isolation string wire, fuse, and connector repairs
	Current readings without circuit interruption	Major zip tie replacement or on strings over 600V
	Minor zip tie replacement on strings under 600V	
	WITH NO VOLTAGE PRESENT (Nighttime)	**WITH NO VOLTAGE PRESENT (Nighttime)**
	String wire, fuse, and connector repairs	
	String wire management and zip tie repairs	
Racking		
	Preform all racking PM without exposure to any damaged modules or unmanaged strings	Excessive damage or where damage exists on modules and strings
Trackers		
	Perform tracker PM	All controller repairs over 110V
	Tracker repairs except motor controller repairs over 110V	Ground fault locating
	Open tracker controller over 110V for visual inspections only	
Modules		
	WITH VOLTAGE PRESENT (Daytime)	**WITH VOLTAGE PRESENT (Daytime)**
	Visual inspections	Isolating modules from the array
	IR scans and PM	Testing modules connected to the array
	Handling individual modules not connected to the array	Carrying modules over 50 Lbs.
	Test individual modules not connected to the array	
	WITH NO VOLTAGE PRESENT (Nighttime) Isolating modules from the array	**WITH NO VOLTAGE PRESENT (Nighttime)**
MET Station		
	Perform all PM	
	Replacement of sensors	
	Troubleshooting and repairs	
	Programming	
SCADA within substations		
	VISUAL INSPECTION PERMIT REQUIRED	**HV PERMIT REQUIRED**
	Visual inspections	Troubleshooting and repairs
	Logging into network	Replacement of sensors
		Preform all PM
		Power cycling
		Working on UPS System
	VIRTUAL PERMIT REQUIRED	
	Programming	
DAS outside of substations		
	Perform all PM	
	Replacement of components	
	Troubleshooting and repairs	
	Logging into network	
	Power cycling	
	VIRTUAL PERMIT REQUIRED	
	Programming	
Site		
	Driving and inspections of site and fencing	Inspection and IR of any junction boxes
	Cleaning up trash and debris	Digging near conductors

DRAFT

	Weed control none mechanical	Weed control mechanical
	Fence and security system repairs	
	Site PM	

DRAFT

Appendix S
Decommissioning Plan

GRAVEL PIT SOLAR

Decommissioning Plan

May 2020

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

Table of Contents

1 Introduction 1
2 Current and Proposed Conditions 2
2.1 Current Conditions 2
2.2 Proposed Conditions 2
2.3 Photovoltaic Modules 3
2.4 Panel Installation, Array Assembly, and Racking 3
2.5 Electrical Collection, Inverters, Transformers, and Telecommunications 3
2.6 Project Interconnection 3
3 Decommissioning Procedure 4
3.1 Removal Process 4
3.2 Removal of Electrical Equipment, PV Modules, and Infrastructure 4
3.3 Reuse, Recycling, and Disposal 4
3.4 Soil Decompaction 4
3.5 Soil Compaction Testing and Remedial Action 5
3.6 Soil Testing After Decommissioning 5
4 Site Reclamation and Decommissioning Budget 6
4.1 Information Sources for this Review 6
4.2 Wage Determination 6
4.3 Decommissioning Scope 6
4.4 Decommissioning Budget 7
Attachment A - Decommissioning Budget Summary 8

1 Introduction

This Decommissioning Plan has been developed for the Gravel Pit Solar Project, a 120 MW AC photovoltaic solar energy facility (the "Project" or "Facility"). The Project will be sited on a subset of eight parcels of land in East Windsor, Connecticut with access provided from Plantation Road and Windsorville Road (the "Site"). The Site is generally bounded by Windsorville Road on the south, Wapping Road on the east, Apothecaries Hall Road on the north, and Ketch Brook on the west. Most of the Project development will be on gravel and mining pits and tobacco fields, but approximately 118 acres of forest are planned to be cleared. There are wetlands associated with the brook, the previous earthwork performed at the abutting railroad and landfill properties, and other parts of the Site.

This Decommissioning Plan has been prepared to fulfill the requirements of Section 16-50k and Section 4-176(a) of the Connecticut General Statutes (CGS) and Section 16-50j-38 *et seq*. of the Regulations of Connecticut State Agencies (RCSA), the Applicant hereby petitions the Connecticut Siting Council.

This Decommissioning Plan consists of three sections, the first section describes the current Site conditions and proposed improvements. The second section describes the decommissioning process, including agricultural soil treatments. The third section is a site reclamation budget and financial assessment for decommissioning the Project in the Site.

2 Current and Proposed Conditions

2.1 Current Conditions

The Project is situated in the watersheds of the Ketch Brook, which runs through the Site. Stormwater runoff from the northern gravel pit of the Project Area is generally contained on-site and discharged to groundwater. Untreated stormwater runoff from the southern gravel pit generally flows overland to the wetland systems of Ketch Brook. Lastly, the agricultural fields portions of the Project Area are generally at a higher elevation than surrounding areas and drain to a variety of discharge areas including kettle holes, wide valleys, and pocket wetland systems.

The Site is primarily managed as active mining and tobacco farming operations or as forested area with little existing impervious surface, beyond the farming buildings (greenhouses, tobacco sheds) and unimproved packed dirt farm roads. The soils within the Site are mostly derived from outwash and have high internal permeability rates. Under existing conditions precipitation can infiltrate into the ground or flow overland as runoff.

In agricultural fields, the rate and volume of runoff are influenced by conditions in the soil and by the cover on the soil. Runoff rates would be highest when the soil is frozen or thoroughly saturated and there is little vegetative cover or stubble in the fields protecting the soil surface. Storm events during such periods would lead to accelerated soil erosion rates with the higher levels of suspended solids in stormwater runoff. In addition to fine soil separates, runoff from agricultural fields may contain higher levels of plant nutrients and other pollutants associated with crop management.

In forested areas, the tree canopy intercepts precipitation and the litter layer protects the mineral soil surface from the forces of rain drop impact. Forested parts of the Site with near level or gentle slopes favor infiltration. Runoff from forested areas is generally considered to be of higher quality as there is little opportunity for soil erosion and sediment transport in runoff.

2.2 Proposed Conditions

The Project will consist of ground-based solar racking structures (including fixed and single-axis tracker racking), solar modules, combiner boxes, power conditioning systems (i.e., inverters), and other balance of plant equipment. The Project will also have access roads, perimeter security fences, stormwater prevention and control features.

Under proposed conditions, Site grading has been designed to maintain as much of the existing topography and drainage patterns as practicable to preserve the Site's existing hydrologic characteristics. Stormwater best management practices (BMPs) will be implemented throughout the Site to utilize natural processes of infiltrating rainfall and filtering runoff as close to its source as possible. The plan also avoids impact to ecologically sensitive areas and preserves existing vegetation cover to the maximum extent practicable. The Project avoids the creation of any new significant effective impervious areas.

Under proposed conditions, most of the stormwater runoff generated within the Project will continue to flow overland and remain on-site. Vegetated buffer strips and kettle holes that are existing within the Site will be utilized to the extent practicable to promote natural infiltration into the well-drained soils. A portion of the temporary sediment traps and basins will be converted to permanent water quality basins, and the

ground cover change from tilled soil to grass and low plantings will reduce the curve number in terms of maintain pre- and post- peak rates and volumes of runoff.

Most work in the vicinity of wetland will maintain a minimum 150-foot buffer, concurrent with the Town of East Windsor regulation.

2.3 Photovoltaic Modules

The PV modules will be mounted on fixed racks or single-axis tracker racks and connected to inverter-transformer stations. The modules will be covered by a tempered glass pane or otherwise sealed for long-term outdoor durability. PV modules will be dark colored, highly absorptive, and minimally reflective.

2.4 Panel Installation, Array Assembly, and Racking

Structures supporting the PV modules will consist of steel piers, which would be driven into the soil. A mix of single-axis tracker and fixed-tilt metal racking systems will be installed, to which the modules will be mounted.

2.5 Electrical Collection, Inverters, Transformers, and Telecommunications

Panels would be electrically connected into panel strings using wiring attached to the panel racking system. Panel strings would be electrically connected to one another via underground wiring installed from the panel strings to combiner boxes located throughout the PV arrays. Cabling would be installed to convey the direct current (DC) electricity from the combiner boxes to inverters. The inverters convert the DC electricity to alternating current (AC) electricity. The output voltage of the inverters would be stepped up to the collection system voltage via transformers located at the inverters. Electrical cables would be installed from the transformers to the separate Project Collector Substation and to the Transmission Owner Switchyard, accordingly. Telecommunications will also be installed throughout the site as underground and aboveground cabling.

2.6 Project Interconnection

The Project (GPS) Switchyard will connect the Project to the Transmission Owner (Eversource) Switchyard. Both the GPS Switchyard and the Eversource Switchyard will be built in the north-central portion of the Project Site, adjacent to the existing transmission line ROWs. Accommodations for decommissioning of the Project's switch gear are included in the Site Reclamation Plan.

3 Decommissioning Procedure

3.1 Removal Process

Effectively, the reclamation of the Project proceeds in reverse order of the installation and will comply with the applicable sections of the Project's Development and Management Plan as approved by the CSC.

1. The PV facility will be disconnected from the utility power grid.
2. PV modules will be disconnected, collected, and either shipped to another project, salvaged, or sent to a collection program.
3. PV module racking system will be removed and recycled offsite.
4. Fencing will be removed and will be recycled offsite.
5. Soil conditions will be restored in compliance with the Development and Management Plan, and as summarized herein.

3.2 Removal of Electrical Equipment, PV Modules, and Infrastructure

All modules will be disconnected, removed from the racks, packaged and transported to a designated location for resale, recycling, or disposal. The connecting cables and the combiner boxes will be de-energized, disconnected, and removed, to a depth of three feet where applicable.

Any demolition debris that is not salvageable will be transported to an approved disposal area. Other salvageable equipment and/or material will be removed for the site for resale, scrap value/recycling or disposal.

Decommissioning will require dismantling and removal of the electrical equipment, including inverters, transformers and the switch gear electrical equipment.

3.3 Reuse, Recycling, and Disposal

Removal and disposal of plant components will comply with the Connecticut Department of Energy and Environmental Protection's recommendations for best practices. To the maximum extent feasible, salvageable components and equipment will be sold for reuse or recycled. It is anticipated that solar modules, inverters, and transformers may be refurbished for reuse, and that steel, concrete, glass, copper, semiconductor, and other core components will be recycled, when possible, for raw materials value.

Disposal facilities will be selected based on proximity to the Project Site, so that transport distance is minimized. At the time of writing this Decommissioning Plan, it is not possible to definitively confirm which facilities will be employed for recycling, reuse, or disposal, as it is not currently known which facilities will be operational at the time of Project decommissioning.

At the time of decommissioning, competitive bids will be obtained for reuse, recycling, and disposal services at the time of decommissioning.

3.4 Soil Decompaction

1. At decommissioning, agricultural fields where topsoil was stripped to install access roads, the road will be removed to expose the original subsoil.

2. This subsoil will then be broken up by deep tillage using a deep-ripper or heavy-duty chisel plow when penetrometer readings exceed adjacent areas.
3. Upon approval of the subsoil decompaction by the Inspector, any topsoil that has been maintained in vegetated windrows will be applied.
4. Agricultural land restoration will be completed when soils are not excessively wet, frozen, or incapable of vegetative stabilization.

3.5 Soil Compaction Testing and Remedial Action

1. After Project decommissioning is complete and during a period of relatively low soil moisture (e.g., at least 48 hours after a rainfall event during the growing season), subsoil compaction will be tested using a soil penetrometer or other soil strength/density measuring device.
2. Representative soil compaction tests will be performed for each soil map unit identified within the decommissioned arrays in the former agricultural fields. Soil compaction readings will be compared with farmland soils in the same soil map unit outside of project limits.
3. Where representative subsoil compaction within the decommissioned array exceeds the baseline subsoil compaction, shattering of the soil profile will be performed using appropriate agricultural equipment.
4. Deep shattering will be applied during periods of relatively low soil moisture to ensure the desired mitigation and to prevent additional subsoil compaction.

3.6 Soil Testing After Decommissioning

Soil tests for the macronutrients nitrogen (N), phosphorus (P), and potassium (K), potential hydrogen (pH) and organic matter content will be taken at a rate of one sample per 50 acres.

4 Site Reclamation and Decommissioning Budget

Gravel Pit Solar, LLC has prepared Attachment A, the decommissioning budget for the 120 MW AC Gravel Pit Solar Project to be located in East Windsor, Connecticut. The estimated budget represents a probable cost, in present value, for the decommissioning based on the assumption that the solar modules, module support structures/racking, electrical system, interconnection facilities and other project components will be disassembled and recycled or disposed of following completion of use of the solar electric power system. The budget is built on the assumption that the cost of decommissioning will be fully or partially offset by the scrap value of the used project components, however the dollar values are presented separately.

4.1 Information Sources for this Review

The budget (Attachment A) is based on the civil and electrical site plans and materials information available at the time of writing in the Development and Management Plan, and through discussions with contractors familiar with this type of construction. Wage rates used in these estimates are based on hourly wages and are determined for each discipline by the city and state nearest and most indicative of the Site's location. Typical disciplines utilized for decommissioning are a principal electrician, equipment operator and general laborer.

Each task lists both the total worker hours needed to complete the Project as well as the breakdown for each discipline. The total cost of that task is a function of the worker's class and time, and scales with the quantity or magnitude of the task. Project specific equipment is calculated by determining the number of teams necessary to complete each task as a function of project duration.

4.2 Wage Determination

Worker Title	Class (If applicable)	Fully Burdened Rate ($/hr.)	Total Rate ($/hr.)
Electrician	Principal	$ 74.38	$ 74.38
General Laborer	Class 1	$ 51.24	$ 51.24
Equipment Operator	Class 1	$ 62.26	$ 62.26

Wage Source: RS Means
County, State: Hartford Co., Conn.
Table: "Installing Contractor Overhead & Profit"
Tabulation Date: 1/15/2019

4.3 Decommissioning Scope

The decommissioning and restoration process in the plan consists of the following steps:

1. Disassembly and removal of above ground structures
2. Removal of below-ground structures
3. Restoration of Project Site

Above-ground structures include the solar modules, module support structures, combiner boxes, inverters, switchgear, switchboards, transformers, meteorological stations and all structures or concrete pads to support them. Below-ground structures are limited to concrete pad foundations, conduit, pull boxes and electrical conductors. For the purposes of this estimate, it is practical to assume that underground conduit under permanent concrete and asphalt surfaces will not be removed.

Following removal of all equipment and structures, the disturbed areas will be re-graded to be consistent with surrounding areas and reseeded to promote vegetation. The cost for disposal for any materials that are not scrapped is considered incidental, unless otherwise noted.

4.4 Decommissioning Budget

The decommissioning process has been divided into seven general work items for budgeting purposes. Quantities and unit prices for these individual work items are presented and discussed detail in Attachment A.

1. Mobilization & Management
2. Module and Rack Disassembly
3. Shallow Pile Foundation Removal
4. Electrical Demolition
5. Civil Site Reclamation
6. Materials Transportation and Disposal
7. Profit & Contingency

Attachment A - Decommissioning Budget Summary

1. Mobilization & Management

1.1 Mobilization. The decommissioning and removal process will require an estimated 12 weeks.

A. Mobilization and demobilization of trash dumpsters, storage containers, pallets, portable toilets, etc.

$ 129,500

B. Mobilization and demobilization of construction equipment, tools and consumables. Cost is estimated to be:

$ 515,500

Subtotal:	$	645,000
1.2 Project Management. Planning and oversight is a function of system type and size estimated at:	$	42,000
Total estimate for **Mobilization & Management:**		**$ 687,000**

2. Module and Rack Disassembly

2.1 Removal of Solar Array:

A. Removal of the individual solar modules will require laborers, off-road forklift operators and electricians. Modules will be palletized for shipping.

Worker Title:	Workers Per Team [B]	(hr.) /person/mod. [C]		[A] x [B] x [C] x Labor Rate
Electrician: De-energizes circuits, disconnects module, 2nd electrician certifies safe for laborer	2	0.01	$	238,000
General Laborer: Dismount modules, palletize and band	2	0.0075	$	122,000
Equipment Operator: Off road forklift, salvage truck	2	0.02	$	398,900
(A): Module				
Subtotal:			$	758,900

B. Demolition of the racking structure will require laborers with pneumatic impact tools or saws for the disassembly of racking members. All structural members will be collected by an end loader for transfer to salvage truck.

Worker Title	Workers Per Team [B]	(hr.) /person/equip. [C]		[A] x [B] x [C] x Labor Rate
General Laborer: Demolition team	4	0.3	$	259,000
Equipment Operator: End Loader, salvage truck	2	0.15	$	78,600
Subtotal:			$	337,600
(A): Racking				
Total estimate for **Module and Rack Disassembly:**				**$ 1,096,500**

3. Shallow Pile Foundation Removal

3.1 Removal of Shallow Piles

Removal of piles with vibratory extractor. Each pile will be pulled and directly loaded onto salvage truck following extractor.

Worker Title	Workers Per Team [B]	(hr.) /person/pile [B]		[A] x [B] x [C] x Labor Rate
General Laborer: Demolition team	2	0.025	$	34,100
Equipment Operator: Vibratory Pile Extractor, Salvage Truck	2	0.025	$	41,700
Subtotal:			$	75,800
(A): Pilings				
Total estimate for **Shallow Pile Foundation Removal:**				**$ 75,800**

4. Electrical Demolition

The majority of the electrical system is composed of power aggregation string wiring, combiner boxes, panels, and inverter pads. All conductors are assumed to be removed and aggregated for recycling. All subterranean conduit, conductors and inverter pad equipment, will be removed for off-site recycling.

4.1 Excavation and removal of underground conductors and communications cables

The estimated cost for excavation and removal of underground direct-buried conductors for scrap and/or disposal is based on labor costs for excavation & earthwork, conduit removal, and transportation of materials in two person teams.

Worker Title	Workers Per Team [B]	(hr.) /person/100 ft. [C]		[A] x [B] x [C] x Labor Rate
General Laborer: Wire pull operator	2	0.15	$	2,500
Equipment Operator: Off road forklift, excavator	1	2.5	$	18,200
Subtotal:			$	20,700
(A): Trench Feet				

4.2 Removal of above ground conductors

The estimated cost for removal of above ground conductors for scrap and/or disposal is based on labor costs for conductor scrapping and transportation of materials. Pull rate is assumed to be an average of 120 ft./minute.

Worker Title	Workers Per Team [B]	(hr.) /person/100 ft. [C]	[A] x [B] x [C] x Labor Rate	
General Laborer: Decoupling, equipment and backhoe	1	0.05	$	30,000
Equipment Operator: Forklift driver, End loader	2	0.03	$	40,100
Subtotal:			$	70,100

4.3 Removal of step-up transformers

Removal work includes cutting and removal of cable and conduit as well as containment of transformer for recycling or disposal.

Worker Title	Workers Per Team [B]	(hr.) /person/trans. [C]	[A] x [B] x [C] x Labor Rate	
Electrician: De-energizes circuits, 2nd electrician certifies safe	2	1	$	5,000
General Laborer: Cutting conduit/wire, harnessing	1	6	$	4,000
Equipment Operator: 15 Ton Crane	2	2	$	2,900
Subtotal: (A): Transformer			$	11,900

4.4 Removal of Inverters

Removal of inverters. Removal work includes crane removal of inverter, cable, and conduit to a three-foot depth.

Worker Title	Workers Per Team [B]	(hr.) /person/inv. [C]	[A] x [B] x [C] x Labor Rate	
Electrician: De-energizes circuits, removes terminations	1	1		
General Laborer: Cutting conduit/wire, harnessing	1	6		
Equipment Operator: 15 Ton Crane	2	6		
Subtotal: (A): Inverter			$	19,200

4.5 Removal of switchboards

Removal of switchboards from site with any support structures, cable, and conduit to a depth of three fee below grade.

Worker Title	Workers Per Team [B]	(hr.) /person/equip. [C]	[A] x [B] x [C] x Labor Rate	
Electrician: De-energizes circuits, removes terminations	1	1	$	74
General Laborer: Cutting conduit/pulling wire, harnessing	1	4	$	205
Equipment Operator: Off road forklift	1	1	$	62
Subtotal: (A): Switchboards			$	700

4.6 Removal of Additional Electrical Equipment

Removal of combiner/recombiner boxes, DC/AC disconnects, panel boards, and other auxiliary electrical equipment. Cost estimate accounts for equipment and labor costs for removal to a depth of three feet below grade.

Number of combiner and recombiner boxes [A]:
Number of ancillary installations at inverters [B]:

Worker Title	Workers Per Team [C]	(hr.) /person/equip. [D]	[A+B] x [C] x [D] x Labor Rate	
Electrician: De-energizes circuits, removes terminations	2	0.25	$	13,000
General Laborer: Conduit/wire, harnessing	1	0.5	$	7,000
Equipment Operator: End loader, salvage truck	1	0.5	$	8,000
Subtotal:			$	28,000

Total estimate for **Electrical System Removal:** **$ 150,600**

5. Civil Site Reclamation

All developed areas will be restored to pre-construction conditions or as stated in decommissioning contract.

5.1 Concrete Equipment Pad and Fence Footing Demolition

The equipment pads contain an inverter, a transformer, and ancillary electrical equipment. This equipment has been accounted for in Removal of Inverter and Transformer Sections and will not be counted here. Concrete fence foundations will also be removed.

Total Volume of Concrete on site to be removed cubic yards [A]

Worker Title	Workers Per Team [B]	(hr.) / person / cu yd. [C]	[A] x [B] x [C] x Labor Rate	
General laborer	1	0.70	$	1,975
Equipment Operator: Off road forklift, salvage truck	1	0.70	$	2,400
Subtotal:			$	7,400

5.2 Fence Removal

The decommissioning plan includes removing chain link fence around the project perimeter including gates and fence posts.

Worker Title	Workers Per Team [B]	(hr.)/person/ft. [C]	[A] x [B] x [C] x Labor Rate
General Laborer: Fence detachment, aggregating	1	0.03	$ 27,650
Equipment Operator: Backhoe-pull and load fence posts, salvage truck	1	0.02	$ 27,650
Subtotal:			$ 55,300

(A): fence length

5.3 Trench Remediation

The decommissioning plan includes remediation of trench where underground conduit occurs.

Worker Title	Workers Per Team [B]	(hr.)/person/ft. [C]	[A] x [B] x [C] x Labor Rate
General Laborer: Excavation	1	0.01	$ 8,300
Subtotal:			$ 8,300

(A): trench length

5.4 Aggregate Baserock Removal

The decommissioning plan includes removing gravel from roads in order to restore the site to pre-project conditions. The cost for removal is estimated based on a baserock depth of 3" for all access roads.

Volume of gravel on site cubic yards [A]

Worker Title	Workers Per Team [B]	(hr.)/person/cu yd.	[A] x [B] x [C] x Labor Rate
Equipment Operator: Grader, end loader, dump truck	3	0.20	
Subtotal:			$ 39,600

5.5 Re-grading of Site

The decommissioning plan includes excavation and removal of underground materials and foundations. After removal, all excavated areas will need to be filled, compacted, and re-graded to return the site to pre-project conditions. Re-grading accounts for the time needed to perform the necessary earthwork required to return the site to preconstruction conditions.

Acres of grading required [A]:

Worker Title	Workers Per Team [B]	(hr.) /person/acre [C]	[A] x [B] x [C] x Labor Rate
Equipment Operator: Maintainer-Grader	1	1.5	$ 26,500
Subtotal:			$ 26,500

5.6 Site Rehabilitation

The estimated cost of this restoration work accounts for all costs of mowing, disking, and hydraulic seeding of the project site. The labor costs associated with this task are lumped to include equipment as well as labor rates from an external party.

Area of site to be rehabilitated [A]:

Worker Title	Workers Per Team [B]	(hr.) /person/acre [C]	[A] x [B] x [C] x Labor Rate
Equipment Operator: Agricultural restoration	1	3	$ 35,115
Estimated equipment rate for subsoil ripping:	NA	$ 17	$ 3,207
Estimated equipment rate for cutting disk:	NA	$ 16	$ 2,970
Estimated material rate for seeding (grass or mulch)-5% of site	NA	$ 3,000	$ 28,200
Subtotal:			$ 746,900

Total estimate for **Civil Site Reclamation:** **$ 884,000**

6. Materials Transportation and Waste Disposal

6.1 Disposal of Waste and Non-Salvageable Materials

The decommissioning plan includes excavation and removal of all cement, gravel, waste materials, and other miscellaneous non-salvageable items from the project site. Mobilization accounts for a portion of disposal via dumpster rental, which includes up to 3 tons of disposal per dumpster with weekly delivery and pickup, for a weekly fee of $500. Cost of disposal for the remaining equipment waste was estimated at $67/ton, based on $0.5/ton/mile for a 20-mile round-trip, and $57/ton in tipping fees. Cost of disposal for the cement, concrete, and/or gravel was estimated at $22/ton.

Estimated weight of unsalvageable equipment:	177	tons	
Estimated weight of cement, concrete, and/or gravel:	2,177	tons	
Estimated weight of miscellaneous waste:	6	tons	
Tons accounted for in mobilization:	36	tons	
Total Net:	2,323	tons	
Subtotal:			$ 73,600

6.2 Transportation of Salvageable Materials

The decommissioning plan includes removal of all equipment and structures from the project site that may have a salvage value at the time of decommissioning, including: switchgear, inverters, transformers, racking, fencing, and other miscellaneous items. There is an assumed cost associated with the transportation of these items to the salvage yard, which is based on $0.5/ton/mile for a 20-mile round-trip, the average distance traveled round trip and cost per ton of transported material.

Estimated weight of salvageable steel:	1,229 tons		
Estimated weight of salvageable aluminum:	24 tons		
Estimated weight of salvageable copper:	42 tons		
Total:	1,295 tons		
Subtotal:		$	16,500

6.2A Transportation of PV Modules

The decommissioning plan includes removal, palletizing and placing pallets in a standard 53' trailer to be provided by a module salvage company. All transport costs for removal of modules are assumed to be paid by the module salvage company. No payment for any inherent value the modules may have is anticipated.

Total estimate for **Materials Transportation and Waste Disposal:** **$ 90,100**

7. Profit & Contingencies

7.1	Raw Disassembly, Transportation and Disposal Cost	$	2,980,200
7.2	Firm Profit. We assume a 3% profit margin for the company	$	89,400
7.3	Contingency. Approximately 5% of the decommissioning scope is recommended:	$	149,000
7.4	Permits & Inspection. Approximately 1% of the decommissioning scope is recommended:	$	29,800
7.5	Liability & Insurance. Approximately 1% of the decommissioning scope is recommended:	$	29,800

Total estimate for **Project Management & General Conditions**: **$ 3,278,000**

Disassembly & Removal Summary

The total estimated disassembly and removal costs from summing the items above: **$ 3,278,000**

Scrap Value
The estimated scrap value is based on the following material estimates:

1. Estimated value of scrap metal salvaged from equipment excluding conductors

Current average price for aluminum scrap:	$	0.48 /lb.	
Current average price for steel scrap:	$	0.04 /lb.	
Current average price for copper scrap:	$	2.06 /lb.	
Subtotal:			$ 202,300

2. Estimated scrap value of conductors

The conductor system is direct burial or encased in cement duct on site. Quantities of underground wire and wire sizes and lengths were based on electrical drawings forwarded, and were used as a basis for estimated scrapable metal amounts. Underground wiring consists of aluminum and copper conductors with bare copper grounds. It is assumed that the fiber optic cable is not salvageable and will be disposed.

Subtotal: $ 298,000

Scrap Value Summary

The total estimate of scrap value from summing the items above: **$ 500,300**

Decommissioning Summary

The total estimate of disassembly and removal costs is:	**$ 2,777,700**
The total estimate of scrap value for the project is:	**$ 500,300**

Please do not hesitate to contact us with any questions regarding the information contained in this review. We appreciate the opportunity to work with you on this project.