Connecticut
Light & Power

The Northeast Utilities System

MUNICIPAL CONSULTATION FILING
Connecticut General Statutes Section 16-50*l* (e)

FOR A

CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED

FOR THE

Rood Avenue Substation
264 Rood Avenue and 25 Shelley Avenue
Windsor, Connecticut

September 2007

Submitted to:

Town of Windsor Chief Elected Official
Windsor, Connecticut

Submitted by:

The Connecticut Light & Power Company
107 Selden Street
Berlin, CT 06037

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A. SUMMARY DESCRIPTION AND LOCATION OF THE PROJECT

The Applicant, The Connecticut Light and Power Company ("CL&P"), is proposing to construct a bulk power 115- kilovolt ("kV") Substation ("Rood Avenue Substation" or "Substation") on its property located north of Rood Avenue and west of Shelley Avenue in Windsor, Connecticut. The Rood Avenue Substation will add needed delivery-system capacity to serve the growing electric power demands in Windsor, a town that does not currently have its own bulk power substation source. This upgrade will be accomplished through the connection of a new 115-kV to 23-kV, 47-Megavolt-Ampere ("MVA") power transformer to an existing 115-kV transmission line and to the local 23-kV distribution system.

The existing distribution system lacks the capacity and reliability to efficiently meet growing peak-load demands. Currently, CL&P's electric load in the Town of Windsor is served from bulk power substations located in Bloomfield, North Bloomfield, Windsor Locks, and Northwest Hartford. Growing peak demands are straining the capacity of these four substations. The addition of a new power substation in Windsor will create a more robust and reliable system that will serve the growing needs of the Town while effectively alleviating loads on the existing substations.

The Substation will be strategically placed within CL&P's property, comprised of two lots identified by the Windsor Tax Assessor on Map 56, Block 31, as Lots 12 (File Code 1570; 25 Shelley Avenue) and 30 (File Code 1564; 264 Rood Avenue) (the "Property"). The Property location is identified on a United States Geological Survey ("USGS") and aerial photograph provided as Figure A-1 (S*ite Location Map, USGS*) and Figure A-2 (S*ite Location Map, Aerial*), respectively. The Property is currently occupied by a 23-kV distribution line switching station

(former substation), 115-kV and 345-kV transmission lines, 23-kV distribution lines, and a gravel access drive that extends northward from Rood Avenue to the switching station. The remainder of the Property is undeveloped and wooded.

Figure A-1: Site Location Map, USGS

Source: U.S.G.S. Quad: Hartford North, CT (1992)

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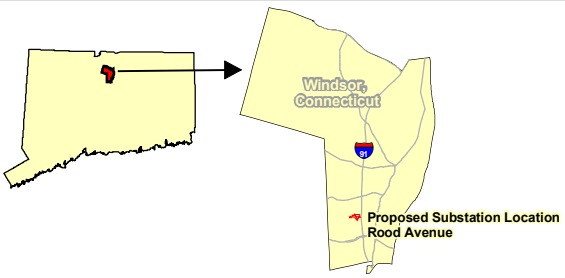

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Figure A-2: Site Location Map, Aerial

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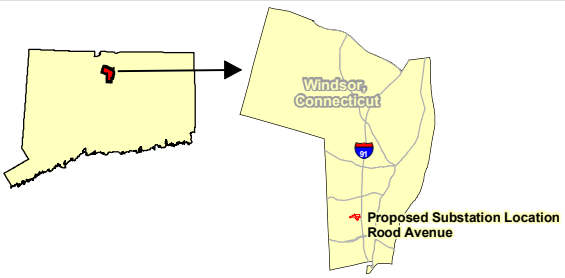

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B. PURPOSE OF THE APPLICATION

CL&P intends to apply to the Connecticut Siting Council ("CSC" or the "Council") for a Certificate of Environmental Compatibility and Public Need ("Certificate") for the Rood Avenue Substation Project (the "Project"). The purpose of the Project is to address a need for additional distribution system capacity and thus improve future reliability in the Town of Windsor by establishing a new, strategically positioned bulk power source in the Town.

C. STATUTORY AUTHORITY FOR APPLICATION

Pursuant to the Public Utility Environmental Standards Act, Conn. Gen. Stat. § 16-50g et seq., CL&P has an obligation to consult with all municipalities in which the primary or alternative plans for a substation facility are proposed (and all municipalities within 2,500 feet of the proposed Substation facility, which is not applicable in this case). Specifically, Conn. Gen. Stat. § 16-50*l*(e) requires that:

> … at least sixty days prior to the filing of an application with the council, the applicant shall consult with the municipality in which the facility may be located and with any other municipality required to be served with a copy of the application under subdivision (1) of subsection (b) of this section concerning the proposed and alternative site locations of the facility…. Such consultation with the municipality shall include, but not be limited to good faith efforts to meet with the chief elected official of the municipality. At the time of the consultation, the applicant shall provide the chief elected official with any technical reports concerning the public need, the site selection process and the environmental effects of the proposed facility.

This municipal consultation filing ("MCF") provides information and technical reports concerning the need, site selection process, and potential environmental effects of the Rood Avenue Substation, as required by Conn. Gen. Stat. § 16-50*l*(e). The MCF process is designed to solicit public input to CL&P's development of the application for the Certificate from the CSC. The MCF is a key initial step in the CSC's comprehensive regulatory process that governs the siting of a substation. The goals of this municipal consultation process are to:

- Provide information about the Rood Avenue Substation to the Town of Windsor; and,
- Obtain input and feedback from the Town concerning the Rood Avenue Substation.

The public can obtain information about the Rood Avenue Substation at the Town Hall offices and the Windsor Public Library, or from the NU Transmission website (refer to page D-1 of this document).

C.1 Municipal Participation During The Consultation Process

On many occasions over the past twelve months, CL&P has consulted with Town of Windsor officials, including the Town Manager, Peter P. Souza, and the Assistant Town Manager, Emily Moon, regarding the electric service provided by CL&P to the Windsor community and CL&P's desire to improve the reliability of that service. CL&P officials also met with the Chief Elected Official, Mayor Donald Trinks. To meet the Town's growing need for additional capacity, CL&P determined that a new substation would be required in Windsor. After evaluating several sites, CL&P considers the Rood Avenue Property to be the best location for a new substation.

As part of the State review process, Connecticut law provides a mechanism for input by certain town land use agencies on electric substation locations. Specifically, Conn. Gen. Stat. § 16-50x(d) permits zoning commissions and inland wetland commissions to "regulate and restrict the proposed location" of such public utility facilities. CL&P filed "Location Review" submissions with the Windsor Inland Wetlands and Watercourses Commission (the "IWWC") on May 30, 2007 and the Planning and Zoning Commission (the "P&Z") on June 6, 2007.

At its regular meeting on June 5, 2007, the IWWC unanimously granted CL&P location approval for placement of a substation on the Property. Likewise, at its regular meeting on June 12, 2007, the P&Z unanimously granted location approval to CL&P for development of a substation on the Property. Copies of the municipal location approval letters are attached as Exhibit 1.

CL&P also met with the Windsor Economic Development Commission at its regularly scheduled meeting on July 18, 2007 to present the Project and its benefits to the community. The Commission unanimously voted to support the Project.

Conn. Gen. Stat. § 16-50*l*(e) requires a proponent to file certain information about the proposed project, known as a municipal consultation filing, with the affected municipality and outlines the duties and responsibilities of a municipality during the consultation period preceding the filing of an application for a Certificate by the proponent with the Council. Under § 16-50*l*(e), once the applicant submits the MCF:

> [t]he municipality may conduct public hearings and meetings as it deems necessary for it to advise the applicant of its recommendations concerning the proposed facility. Within sixty days of the initial consultation, the municipality shall issue its recommendations to the applicant. No later than fifteen days after submitting an application to the council, the applicant shall provide to the council all materials provided to the municipality and a summary of the consultations with the municipality including all recommendations issued by the municipality.

CL&P is submitting this MCF for review and comment by the Town of Windsor. The filing of the MCF with the Chief Elected Official of the municipality begins the required 60-day review process by the municipality. During the municipal consultation process, CL&P is seeking additional comments from representatives of the municipality and from the interested public for consideration and incorporation into the application that will be filed for the Project with the Council. This approach provides an opportunity for CL&P to address municipal concerns prior to submitting the formal application to the Council.

C.2 Public Outreach

On May 24, 2007, CL&P sent informational packages by mail to neighboring residents on Rood Avenue, Shelley Avenue, Sunnyfield Drive, Matianuck Avenue, Hope Circle, and

Country Club Drive to inform them of the upcoming Project, its associated permitting process and a preliminary schedule of events. CL&P representatives conducted a door-to-door public outreach program in the Project area on Friday June 1, 2007, in an effort to meet with abutting neighbors to discuss the Project. The CL&P representatives spoke directly with several abutting property owners and informed them of upcoming municipal agency meetings, answered preliminary questions, and provided them with a point of contact should they have additional questions. For those neighbors not at home that day, Project and contact information was left on their door. Copies of the public outreach documents provided in the mailing and door hangers are provided in Exhibit 2.

C.3 Description of Filing Contents

This filing presents information concerning the Applicant, conditions at the Property and the proposed Substation, including:

- its location and design;
- the various alternatives considered to date and the process by which the proposed site was identified;
- the need for its construction and operation; and,
- its potential effects on the environment.

D. LEGAL NAME AND ADDRESS OF APPLICANT

The Connecticut Light and Power Company (a specially chartered Connecticut corporation)
107 Selden Street
Berlin, CT 06037

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Hartford, CT 06141-0270
Telephone: (860) 665-5000

Internet Address: Northeast Utilities Transmission website
www.transmission-nu.com

E. APPLICANT CONTACTS

Correspondence and other communications with regard to the Rood Avenue Substation should be addressed to, and notices, orders and other papers should be served upon, the following:

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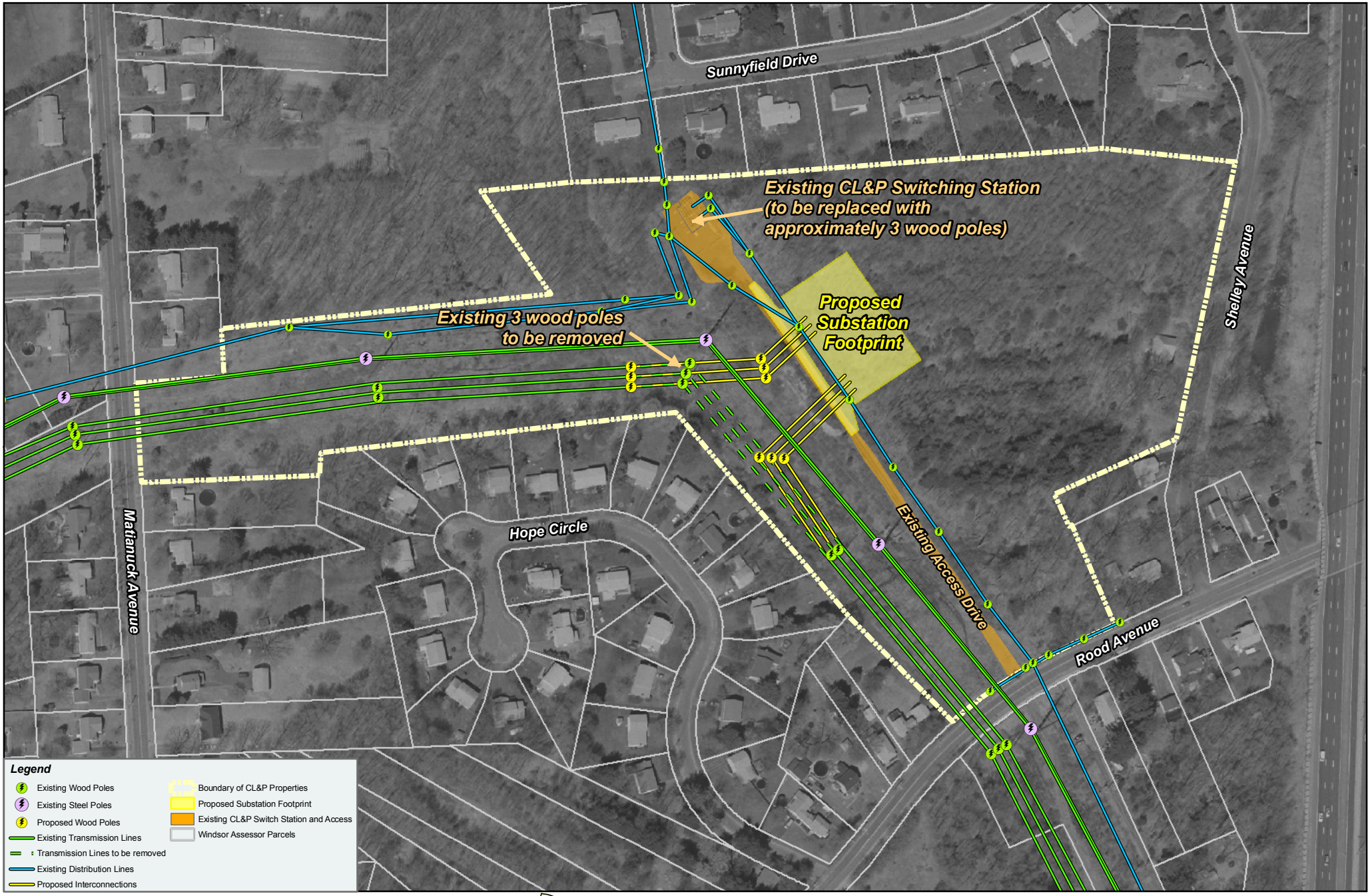
F. DESCRIPTION OF FACILITY

The CL&P Property on which the Rood Avenue Substation would be located was acquired as several parcels over an approximately ten-year period from the mid-1950s to mid-1960s and encompasses over twenty acres of land. This Property has historically been used as an overhead transmission/distribution line corridor (first established in the 1950s), as well as the site of a former electrical substation (circa 1965–1991) and current switching station. Because of its size, configuration, location and existing infrastructure, the Property was identified by CL&P as a future bulk-power substation site in anticipation of area load growth and potential long-term limitations of the existing local distribution system.

The Substation would be accessible from Rood Avenue and would be located to the northeast of the existing overhead transmission line corridor (see Figure F-1, *Substation Location*). The Substation would occupy an area measuring approximately 220 feet by 137 feet and be covered with a trap rock surface and secured by a seven-foot high chain link fence with one foot of barbed wire (three strands). A gravel driveway will be established generally along the route of the existing unimproved, dirt access. The Property will accommodate the construction and operation of the Substation without need to purchase any additional real estate.

Once constructed, the Substation would connect into one of the existing 115-kV overhead transmission line circuits (1751 line) which interconnect to the Manchester Substation in Manchester, Northwest Hartford Substation in Hartford and the North Bloomfield Substation in Bloomfield. This transmission line is the southernmost of two crossing the Property. The other line employs steel pole structures and supports a 345-kV circuit (#395) and a 115-kV circuit (#1779). The 1751 transmission line will be looped beneath the other line and the Substation and a new 115-kV circuit breaker will be installed to separate the existing 1751 transmission line into two circuits.

Figure F-1: Substation Location



The 115-kV interconnections between the Substation and the transmission line would be accomplished by installing two new terminal structures within the Substation, each of which would also support a line disconnect switch and two new wood-pole structures (structures #10142A and #10143A), each consisting of three wood poles. Existing wood-pole structure #10143 would also be relocated about 70 feet to the west. From wood-pole structure #10142A a new line segment would connect to one of the line terminal structures located inside the Substation's fenced area. From the re-located wood- pole structure #10143 a new line segment will be connected to the new wood-pole structure #10143A and then to the second line terminal structure located inside the fenced area. Both new line segments will cross under the circuits on the steel-pole transmission line.

The Substation would be outfitted with three transformer disconnect switches and two transformer circuit switchers. One disconnect switch and one circuit switcher will be in the supply path to the 47-MVA power transformer, used to step down the voltage from 115 kV to 23 kV. The second transformer disconnect would provide for a future 47-MVA power transformer, if needed, and the third transformer disconnect switch and transformer circuit switcher will be used for a mobile transformer connection, when necessary, to perform maintenance or to replace a failed piece of equipment. The site is large enough to accommodate two additional 47-MVA transformers at a later date, if needed. A metal-clad switchgear enclosure, approximately 27-feet long, 14-feet wide and 14-feet high will be installed to provide the switching equipment for four 23-kV distribution feeders, of which three will be activated initially. The cables for each distribution feeder will exit the Substation via underground conduits and be connected to existing overhead distribution lines already on the Property. Consistent with the present feeder configuration, two of these initial feeders from the Substation will follow the general route of the

access drive to Rood Avenue, and one feeder will exit the Property on an existing right-of-way ("ROW") to the north.

In addition to the switchgear enclosure, a 48-foot by 14-foot by 14-foot high protective relay and control equipment enclosure (the "control enclosure") and a 24-foot by 14-foot by 14-foot high battery enclosure will be installed at the north end of the Substation. The battery enclosure will house the Substation battery, charger and transmission equipment used to operate the Substation. The control enclosure will house protective relaying and control equipment.

Development of the Substation requires protective relay system changes within the control enclosures at three other existing bulk substations (Manchester, Northwest Hartford and Bloomfield). These upgrades are required for the safe and proper operation of the proposed Rood Avenue Substation.

Technical specifications and related information are presented in Exhibit 3 (*Site Plan Drawings*).

F.1 Estimated Cost of the Rood Avenue Substation

The estimated costs for the siting, design, and construction of the Substation and supporting infrastructure total approximately $9,000,000.

F.2 Facility Service Life

The Substation would have a service life of approximately 40 years and would be capable of capacity increases during this time.

G. NEED FOR FACILITY

The purpose of the Project is to increase electric distribution-system capacity and improve reliability in Windsor by establishing a new, strategically positioned bulk power substation source in the Town. Windsor does not have a bulk power substation located within the Town. Currently, the electric load in Windsor is served from four bulk power substations in other towns: Bloomfield Substation and North Bloomfield Substation located in Bloomfield; Windsor Locks Substation in Windsor Locks; and, Northwest Hartford Substation in Hartford. Figure G-1 depicts the locations of these substations and their respective service areas in Windsor. The current configuration, which relies on the sharing of Windsor's load by substations in other towns, is not a viable long-term option to meet growing peak-load demands in the Town. Development of the Rood Avenue Substation would effectively alleviate loads on the existing area substations by adding a new capacity source to the distribution system. The addition of the Rood Avenue Substation to the distribution system, and the resultant load redistribution in Windsor, is graphically depicted in Figure G-2.

Figure G-1: Existing Windsor Area Substation System

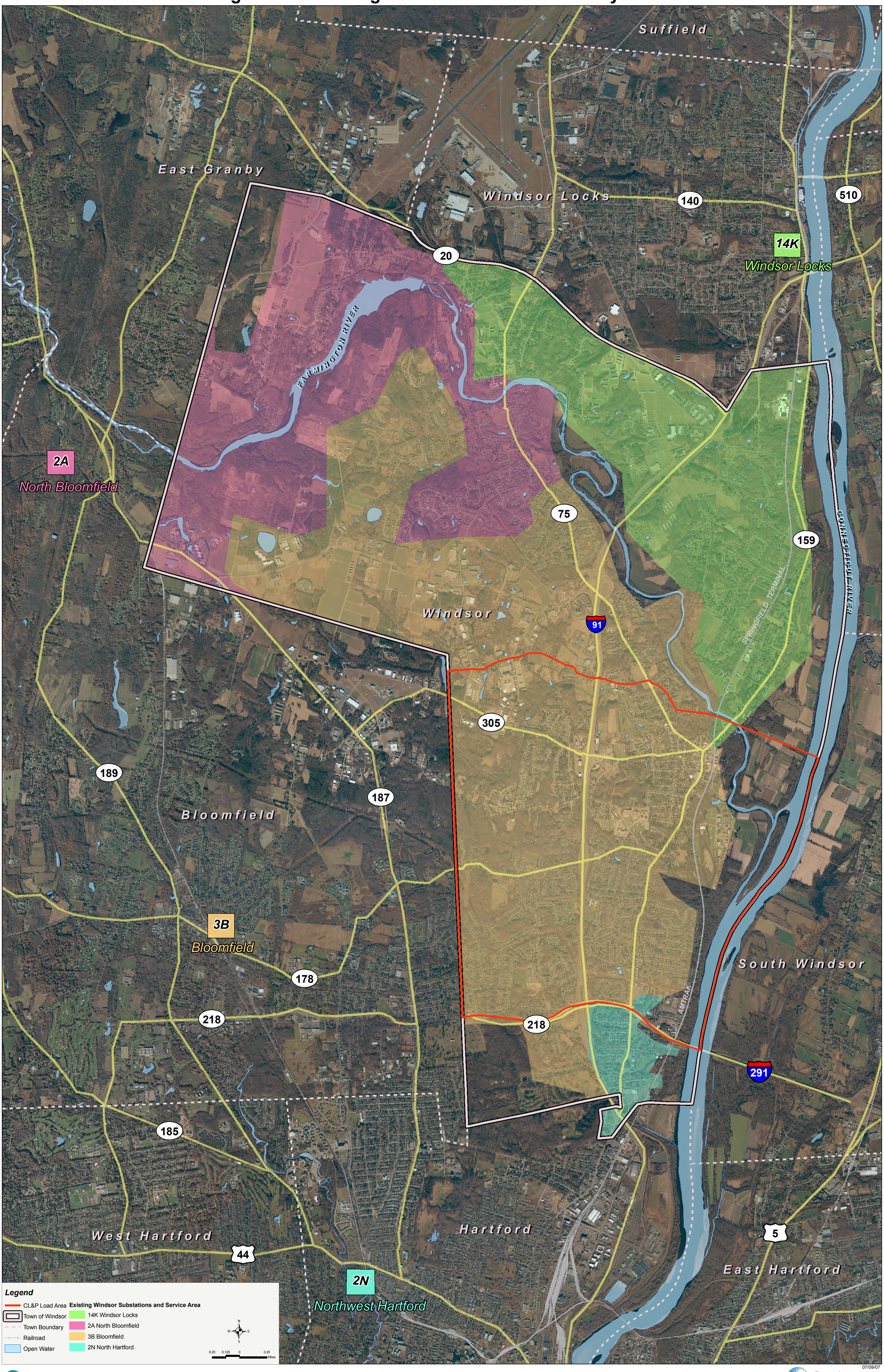


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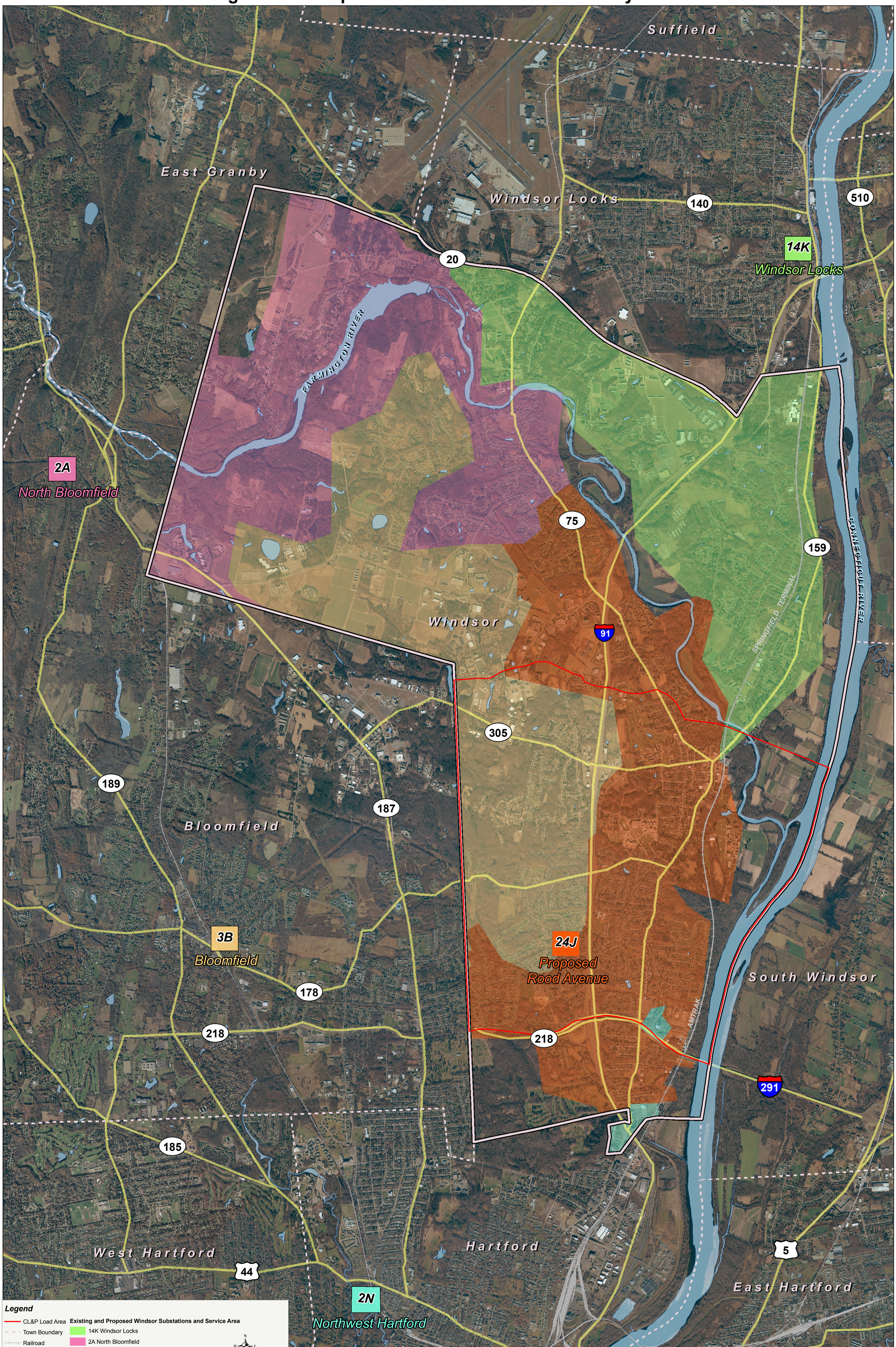
Figure G-2: Proposed Windsor Area Substation System



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In Windsor, electricity consumption continues to steadily increase. Table G-1 presents electric power use in Windsor over a 24-year period (1981 – 2005).

TABLE G-1: Power Use in Windsor ([kWh] kilowatt-hours)

Year	Residential	Commercial	Industrial	Total
1981	68,035,456	76,172,624	118,995,945	263,164,025
2005	102,662,154	192,498,815	109,035,011	404,195,980
Percent Change (1981-2005)	66.3%	39.6%	-9.2%	65.1%

Beyond the recent growth experienced in Windsor, there is significant potential for additional industrial/commercial development, specifically in the Pigeon Hill Road/Day Hill Road area, further increasing peak loads and the need for a dedicated power source in the Town. Also, because Windsor relies on electric power sources located in surrounding towns, where customer demand is also on the rise, available capacity at these substations is limited. Furthermore, substantial regional projects such as CIGNA's $500 million re-development plan within its Bloomfield campus and new developments in the vicinity of Bradley International Airport and Route 20 and I-91 (particularly along Rainbow Road and International Drive in Windsor/East Granby) are placing further stress on the overall system. Table G-2 provides a summary of available capacity and forecasted summer peak-load growth associated with the area's electric distribution system.

TABLE G-2: Available Capacity and Forecasted Summer Peak Load (MVA)

	Permissible Load Rating (MVA)	2006 Actual	2007	2008	2009	2010	2011	2012
Bloomfield*	134	119.3	128.8	136.1	111.0	114.9	117.3	119.8
N. Bloomfield**	102	69.7	76.7	88.5	83.6	86.9	88.6	90.7
Windsor (Rood Ave.)***	55	0	0	0	41.4	42.2	43.1	44.0
Total (MVA)	**236 (291 in 2009)********	**189**	**205.5**	**224.6**	**236**	**244**	**249**	**254.5**

* Rating based on a new Forced Load Transfer (FLT) scheme that allows for the automatic temporary transfer of up to 14 MVA of load off of the Bloomfield Substation following a transformer outage.

** Rating assumes a Forced Load Transfer (FLT) scheme, slated for completion in 2008/2009 that allows for the automatic temporary transfer of up to 23 MVA of load off of the North Bloomfield Substation following a transformer outage.

*** Rating based on a 30-MVA mobile transformer capacity and the ability to temporarily transfer all load off of Rood Avenue Substation following a transformer outage.

**** With Rood Avenue Substation in operation.

As the area experiences increased growth, the demands placed on the existing substations currently providing service to Windsor require relief to meet this growing need and maintain system reliability. The challenges of load growth in this geographic region have been recognized and strategies have been employed as interim measures to delay the need for a new facility. For instance, the load on the Bloomfield Substation nearly reached the substation's permissible load rating of 120 MVA in 2006 and was projected to exceed this rating in 2007[1]. To alleviate the immediate need, a Forced Load Transfer (FLT) scheme has been instituted at the Bloomfield Substation using two separate circuits. Installation of the FLT scheme allows the transfer of approximately 14 MVA of load off of Bloomfield Substation (to North Bloomfield and Northwest Hartford), thus increasing the permissible load rating of this substation by 14 MVA and providing the necessary time window to construct the Rood Avenue Substation for operation beginning in 2009.

[1] Substation Permissible Load Ratings are based on the loss of one power transformer, without dropping any load, and without damaging all remaining equipment engaged in temporarily serving the load until (and after) a mobile power transformer can be installed.

North Bloomfield Substation is projected to exceed its permissible load rating of 79 MVA in 2008. Installing a similar FLT scheme at North Bloomfield Substation would ultimately allow the transfer of approximately 23 MVA of load, thereby increasing this substation's permissible load rating to 88 MVA. Installation of a FLT scheme at North Bloomfield Substation by June 2008 would delay the Rood Avenue Substation's in-service date and allow CL&P to delay installing a third transformer at North Bloomfield Substation to 2012. While these interim measures have delayed the need for a new substation, soon the necessity will be too great.

Construction of the proposed Substation in Windsor would add necessary capacity to the system through the installation of a 47-MVA, 115- to 23-kV, bulk power transformer. This new 23-kV distribution power source would allow loads to be reduced by 30.8-MVA at Bloomfield Substation and adds more than 40 MVA of new capacity to the distribution system. Once Rood Avenue Substation is operative and the Bloomfield Substation has been off-loaded, a new 23-kV circuit would be created from Bloomfield Substation and provide load relief for North Bloomfield Substation, allowing the permanent transfer of approximately 11 MVA of load.

Based on current forecasts and implementation of these proposed remedies, the next projected overload is anticipated to occur in 2012. Installing a third bulk power transformer at North Bloomfield Substation at that time would add 42 MVA of new capacity to the distribution system.

G.1 System Alternatives

CL&P considered alternative system options to meet the challenges in Windsor. However, available options would produce a Windsor distribution system that is not as reliable and flexible as the system which will result from the proposed Project and, ultimately, would not

eliminate the need for the proposed facility to meet system capacity projections. The Rood Avenue Substation was found to be the preferred solution based, in part, on the following:

- Proximity to customer load
- Improved reliability with decreased feeder length
- Improved reliability for load transfers during feeder outages

Alternative system options that were considered are discussed below.

Bloomfield Substation

The addition of a mobile transformer connection position at Bloomfield Substation is not an effective solution because of its associated cost (approximately $550,000) relative to the small gain in station capacity (an increase of only 9 MVA in the substation rating). Also, the resulting rating of 115 MVA is lower than the existing normal rating of 120-MVA.

Replacement of the three existing power transformers at this substation with larger transformers was evaluated and ultimately rejected. Although the purchase of new transformers could be off-set by the reuse of the existing transformers elsewhere in CL&P's system, the actual change out would be labor intensive, and the net capacity increase is less than the proposed Substation with one transformer. Furthermore, there is no mobile transformer connection position at Bloomfield Substation. Therefore, each transformer would have to be replaced during a seasonal window of low demand. Switching required to keep the remaining transformers loaded below their ratings would be limited to just a few weeks per year during off-peak periods. The load normally served by the 45-MVA transformer being replaced would have to be transferred for a prolonged length of time, requiring that all associated automatic loop schemes be disabled for prolonged periods, further compromising system reliability.

North Bloomfield Substation

Construction of the Rood Avenue Substation along with the installation of a new Bloomfield Substation circuit and the North Bloomfield FLT scheme pushes out the projected overload year at North Bloomfield Substation to 2012. At that point in time, a third transformer would be added to North Bloomfield and the FLT scheme would be disabled.

Immediate installation of a third transformer at North Bloomfield was also considered. Although this option would add 42 MVA of new capacity to the distribution system, it can only shift approximately 13 MVA of load off the Bloomfield Substation. By instituting this option and the existing Bloomfield FLT scheme, the next projected overload year at the Bloomfield Substation occurs in 2011. At that time, the Rood Avenue Substation would still need to be constructed. Both options (Rood Avenue Substation and a third transformer at North Bloomfield) are needed within the next ten years. Constructing Rood Avenue Substation first provides necessary load relief for the Bloomfield Substation, adds similar new capacity to the distribution system, and provides for an additional year's delay (2011 to 2012) before the next major expenditure is required at the North Bloomfield Substation.

Windsor Locks Substation

This option considered the installation of a third 115- to 23-kV power transformer and three new distribution circuits at the Windsor Locks Substation. This option adds 45 MVA of new capacity to the distribution system but its estimated cost is around $20,000,000. The cost is high because of the need to relocate the existing 23-kV yard at Windsor Locks, as well as the difficulties of bringing out new circuits from this location. In addition, transmission constraints north of the Manchester Substation would need to be resolved prior to the installation of the third

transformer. It is unlikely that these transmission constraints can be resolved by 2009, which is when the third transformer is needed.

Tobacco Substation

This option considered the expansion of the existing 27.6-kV system supplied out of Windsor Locks Substation and included the installation of two (2) 115- to 27.6-kV transformers and two (2) Power Control Enclosures ("PCEs") at the North Bloomfield Substation; installation of two (2) new 27.6-kV circuits from North Bloomfield Substation to Rainbow Road in Windsor ("Tobacco " site); and development of the Tobacco Substation [two (2) 27.6- to 23-kV transformers; four (4) PCE's; and six (6) distribution circuits]. This option adds 45 MVA of new capacity to the distribution system at an estimated cost of $15,000,000. High cost aside, this expansion option is contrary to CL&P's long-range plans to phase out the non-standard 27.6-kV system.

Although the Tobacco site appears to be an adequate location for a new bulk substation, there is no 115-kV transmission source nearby. Extending 115-kV transmission lines to this site would exceed the cost of the proposed Substation.

Northwest Hartford Substation

In comparison to other options, this station is too far south of the high growth areas of Windsor to provide long-term load relief for both the Bloomfield and North Bloomfield Substations. For this option to be effective, a great deal of additional high cost distribution work would be required.

Northwest Hartford Substation is currently a three-transformer (36/48/60 MVA) substation and expansion to a fourth transformer would be non-standard and very costly. Likewise, replacement of the three existing transformers with larger 80-MVA transformers

would be very expensive due to required upgrades of substation equipment to meet the ampacity and fault duty ratings associated with the larger transformers.

Northeast Hartford Substation (Future)

This option calls for a future bulk substation to be constructed on Windsor Street in Hartford, the site of the existing 23- to 4.8-kV Windsor Street Substation, now supplied by a feeder from the Northwest Hartford Substation. Similar to Northwest Hartford Substation, this location shares the same disadvantage of being located too far south to service the high growth areas within the Town of Windsor. Another drawback of this site is that costly 4.8-kV overhead line and underground cable system conversions would be required in order to bring out new 23-kV feeders.

Establishing a bulk substation on this site will also be expensive because of the need to extend 115-kV high-pressure fluid-filled, pipe-type underground cable through city streets. This bulk substation may be established in the future (beyond 10 years) to provide additional capacity for the Hartford area when existing substations at South Meadow, Northwest Hartford, and Southwest Hartford require load relief.

H. EXISTING CONDITIONS

An *Existing Conditions Map*, depicting current conditions on the Property, its access, abutting properties, and several key features discussed herein, is provided as Figure H-1. The purpose of this section is to describe current conditions on the Property. A detailed discussion of the Rood Avenue Substation's effects on the environment is provided in Section K of this document.

H.1. Existing Development

The Property encompasses over 20 acres. The combination of the Property and two additional, abutting and contiguous CL&P-owned parcels provides a total of 21.03 acres of land to effectively buffer the Substation from neighboring residences as well as Rood Avenue and Shelley Avenue. These parcels are identified by the Windsor Tax Assessor as:

Property:

- 264 Rood Avenue - Map 56, Block 31, Lot 30; 11.09 acres
- 25 Shelley Avenue - Map 56, Block 31, Lot 12; 8.97 acres

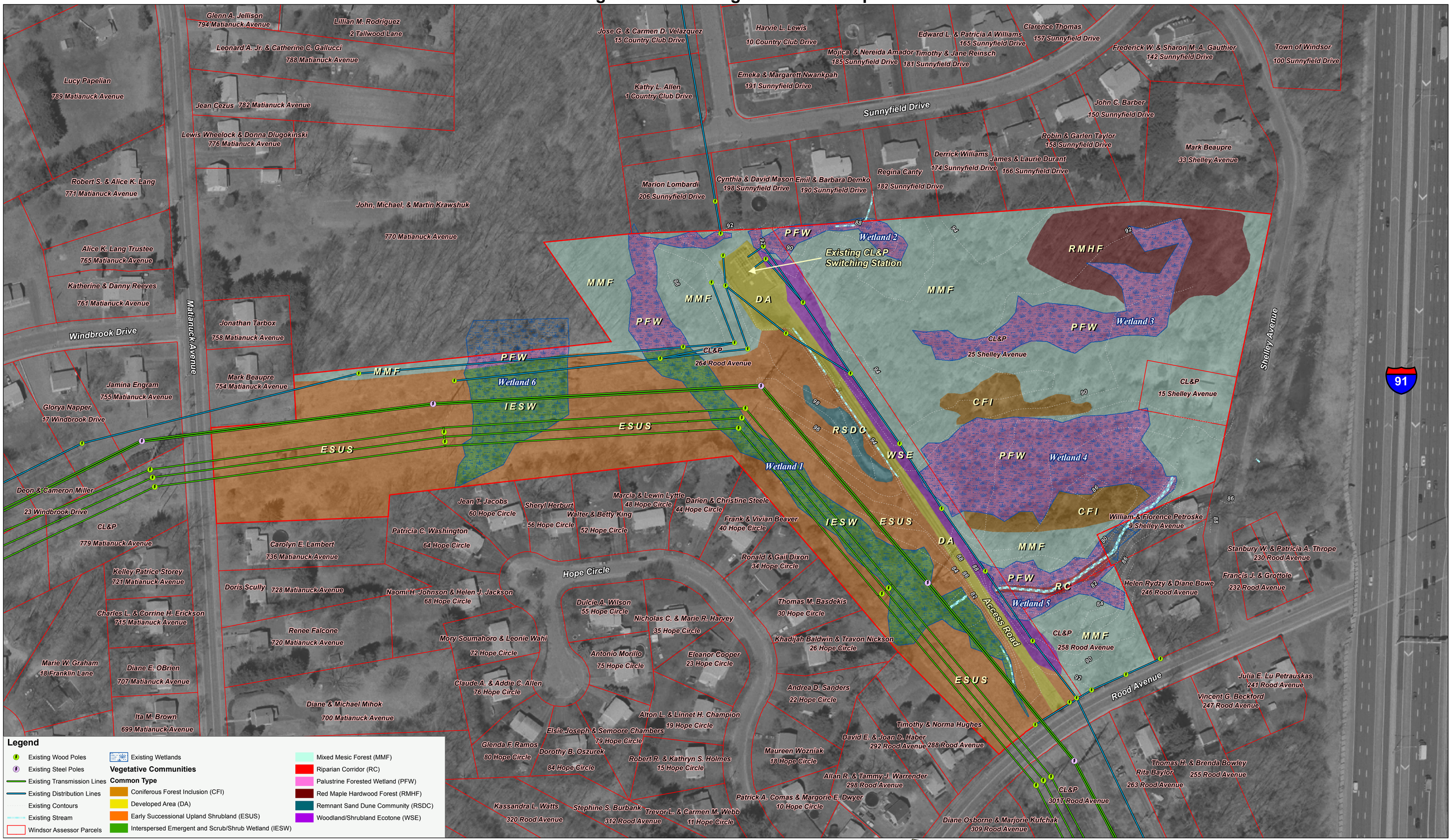
According to the Tax Assessor's field cards, these two parcels are located within an Agricultural Land Zone area.

Adjoining Parcels:

- 15 Shelley Avenue - Map 56, Block 31, Lot 12; 0.29 acre
- 258 Rood Avenue - Map 56, Block 31, Lot 14; 0.68 acre

According to the Tax Assessor's field cards, these two parcels are located in a Residential Zone.

Figure H-1: Existing Conditions Map



Legend

- Existing Wood Poles
- Existing Steel Poles
- Existing Transmission Lines
- Existing Distribution Lines
- Existing Contours
- Existing Stream
- Windsor Assessor Parcels
- Existing Wetlands

Vegetative Communities

Common Type

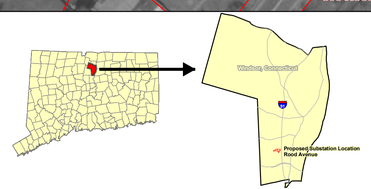
- Coniferous Forest Inclusion (CFI)
- Developed Area (DA)
- Early Successional Upland Shrubland (ESUS)
- Interspersed Emergent and Scrub/Shrub Wetland (IESW)
- Mixed Mesic Forest (MMF)
- Riparian Corridor (RC)
- Palustrine Forested Wetland (PFW)
- Red Maple Hardwood Forest (RMHF)
- Remnant Sand Dune Community (RSDC)
- Woodland/Shrubland Ecotone (WSE)

07/03/07

Vanasse Hangen Brustlin, Inc.
Transportation Land Development Environmental Services

N W E S

100 50 0 100 Feet



Connecticut Light & Power
The Northeast Utilities System

The Property is currently occupied by a 23-kV distribution line switching station (former substation), 115-kV and 345-kV transmission lines, 23-kV distribution lines, and a dirt access drive that extends northward from Rood Avenue to the switching station.

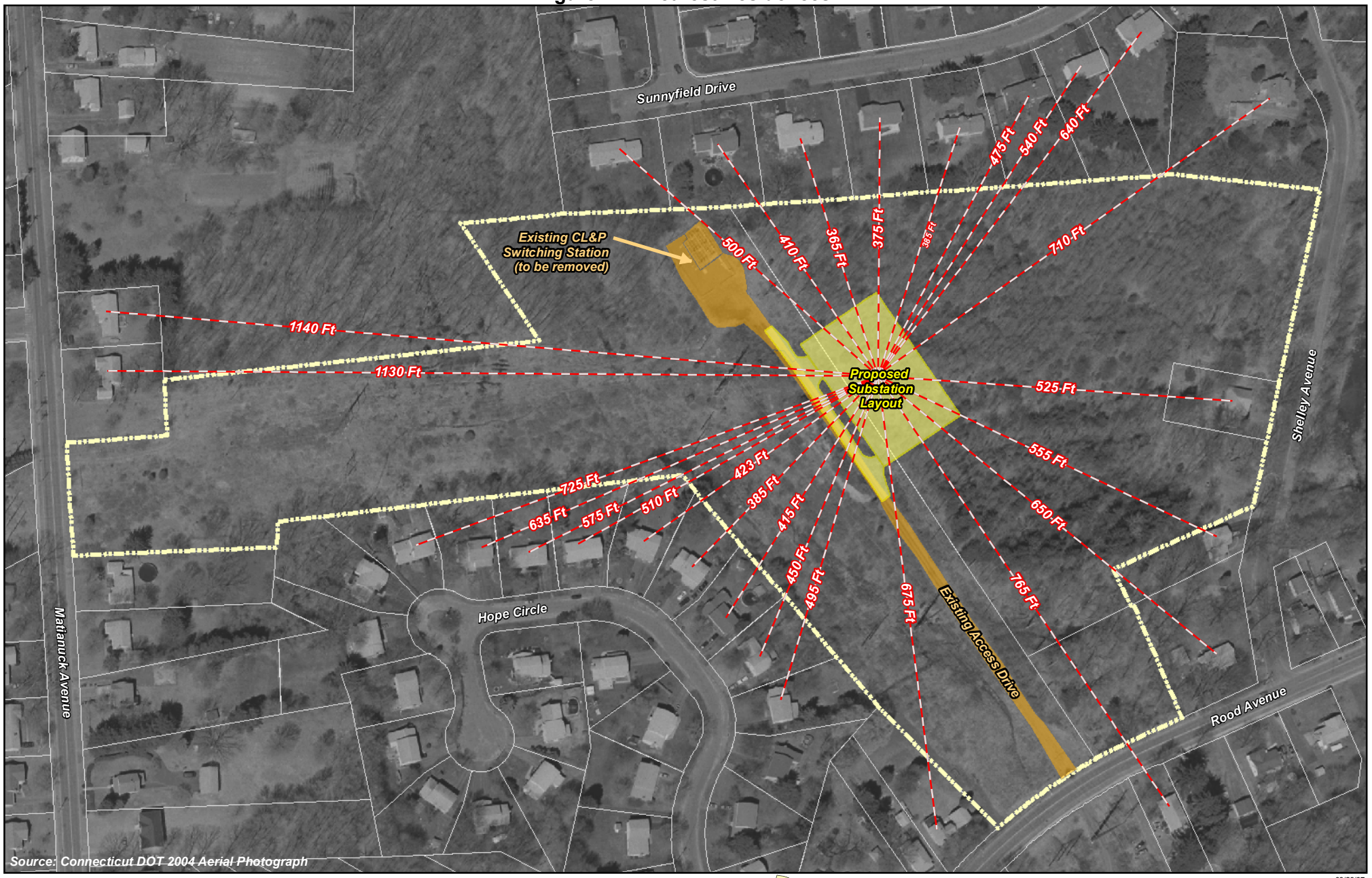
The remainder of the Property is undeveloped and wooded. A vacant residence occupies the CL&P parcel at 15 Shelley Avenue. Overhead transmission and distribution lines traverse the western portion of the Property (Lot 30) extending southeast, north, and west off the Property. Twenty-eight wood poles and three steel poles, supporting the overhead transmission and distribution lines, are currently located on the Property.

The Property is bounded by a total of twenty-five abutting parcels. Numerous residences exist in the vicinity of the Property along Rood Avenue, Shelley Avenue, Hope Circle, Matianuck Avenue, Windbrook Avenue, Sunnyfield Drive, Country Club Drive, Tallwood Lane, Franklin Avenue, Green Manor Avenue, and Pine Lane Extension. The nearest residence is located at 190 Sunnyfield Drive (approximately 365 feet north of the Substation). Figure H-2 (*Nearest Residences*) depicts the locations and distances of surrounding residences to the proposed Substation.

Several alternate site locations along the transmission line corridor were evaluated for development of this Project (See Section I, *Alternatives Evaluated*, of this MCF). For the following reasons, the Property is best suited for the Substation:

- Existing 115-kV transmission lines currently traverse the Property;
- Optimal interconnection opportunities to existing 23-kV distribution feeders;
- The Property currently houses a switching station and significant utility infrastructure;
- The Property was formerly occupied by a distribution substation;
- Substantial buffer for neighboring residences; and,
- Sufficient access currently exists from a local road.
- Environmental effects of the Project are minimal.

Figure H-2: Nearest Residences

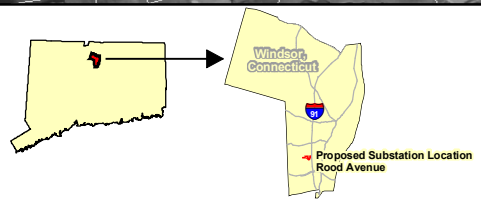


08/29/07

VHB Vanasse Hangen Brustlin, Inc.
Transportation Land Development Environmental Services

N W E S

100 50 0 100 Feet



Connecticut Light & Power
The Northeast Utilities System

H.2. Site Access

A dirt access drive is situated off of Rood Avenue in the central portion of the Property, allowing authorized vehicular access to the existing 23-kV switching station located proximate to the northern Property boundary.

H.3. Wetlands and Watercourses

Wetlands in the vicinity of the proposed Substation were inspected and delineated in the field by professional soil scientists Jeff Peterson and Dean Gustafson of VHB ,during the first and second weeks of April 2007. VHB wetland scientists identified wetland boundaries based on both Federal criteria (defined at 33 CFR 328-329) and State criteria set forth in the Connecticut Inland Wetlands and Watercourses Act (sections 22a-36 through 22a-45 of the Conn. Gen. Stat.). The Federal wetland delineation methodology is based on three technical criteria: evidence of prolonged hydrology, dominance of hydrophytic vegetation and presence of hydric soils. The State of Connecticut wetland identification criteria is based solely on soil type (i.e., includes soil classifications of poorly drained, very poorly drained, floodplain and alluvial). Wetland boundaries determined utilizing these two sets of criteria were consistent with the exception of a small portion of Wetland 3 where the Connecticut-regulated boundary encompasses a slightly larger area than the Federal-recognized boundary. Wetland areas not in proximity to the proposed Substation footprint were previously delineated in 2006 by another consultant, reviewed by VHB, and found to be substantially correct. Wetland areas identified on the Property have been assigned numbers 1 through 6 for descriptive purposes. The limits of wetlands delineated on the Property and their respective identifiers are illustrated in Figure H-1 (*Existing Conditions Map*). Details of the investigation can be found in Appendix B of Exhibit 4 (*Environmental Assessment Report*).

Wetland 1

Wetland 1 (±1.4 acres) is a linear system that discharges through-flow held above a slowly permeable lakebed deposit. This wetland is surrounded by development including the existing transmission line, residential subdivisions to the north and west, the switching station to the north and the access road from Rood Avenue that crosses the wetland. This wetland experiences seasonal saturation with small areas of shallow inundation. Surface flows driven by precipitation and reflow travel southward through an intermittent watercourse consisting of braided channels. Flows within the watercourse are conveyed under the existing access drive via a 32-inch reinforced concrete pipe (RCP) east to Wetland 5. This intermittent watercourse is a tributary to Deckers Brook located approximately 700 feet east of the Property and east of Interstate-91. The far northern component of this wetland discharges surface runoff and reflow to the east in a swale north of the switching station to Wetland 2. A narrow strip of fill material placed across this swale separates Wetland 1 from Wetland 2. This flow passes through the fill material (possibly in a stone drain or buried pipe) and into Wetland 2.

Cover types in Wetland 1 include forest, scrub-shrub and emergent marsh. Remnant forested areas are dominated by red maple, pin oak, American elm, arrowwood and ironwood. Scrub-shrub areas are dominated by silky dogwood, Bebb willow, sensitive fern, skunk cabbage, jewelweed and purple loosestrife. Emergent marsh areas commonly consist of skunk cabbage, cattail, purple loosestrife, soft rush, sedges, woolgrass, goldenrod, boneset, arrow-leaved tear-thumb, Joe Pye-weed, deer tongue grass and eastern marsh fern.

Wetland 2

Wetland 2 (±0.2 acre) is primarily a groundwater/surface water depression (southeast end is a groundwater discharge area) that has been disturbed by land grading associated with the

residential development to the north and the switching station to the west. The wetland drains north through a ditch into a lawn and culvert under Sunnyfield Drive.

The western part of the wetland contains a small seasonally inundated basin-shaped depression that was investigated for the presence of vernal pool habitat. Water depths in this pool were approximately 8 to 12 inches on April 9, 2007. No egg masses were found, though three adult wood frogs were present in the pool on this date. No wood frogs or other obligate vernal pool species were observed during follow up inspections conducted later in April and May. Despite heavy spring rainfall, the pool was nearly dry by May 3, 2007. Due to the absence of obligate vernal pool species and apparent short hydroperiod, it was concluded that Wetland 2 does not support vernal pool habitat.

The western portion of Wetland 2 is forested and the eastern portion supports scrub-shrub vegetation. Forested areas are occupied by swamp white oak, red maple, American elm, serviceberry, arrowwood, Bebb willow, highbush blueberry, silky dogwood and skunk cabbage. Scrub-shrub areas are dominated by silky dogwood, elderberry, arrowwood, highbush blueberry, sensitive fern, jewelweed, and skunk cabbage.

Wetland 3

Wetland 3 (±0.8 acre) occurs in a forested area of the Property east of the access drive. The wetland had been farmed and portions of the wetland have been partially buried by native soil materials that were either deposited as sediment or graded over the original soil surface. The wetland gently slopes to the east where it drains into a culvert that flows under Shelley Avenue.

The hydrology of this wetland is driven by surface runoff and throughflow held above slowly permeable lakebed deposits. The early successional forest in this wetland is dominated by red maple, red oak, apple, arrowwood and silky dogwood.

Wetland 4

Forested Wetland 4 (±1.4 acres) is located east of the existing switching station access drive and north of Wetland 5. Sheet flow from Wetland 4 enters Wetland 5 at the extreme eastern end of the Property. Wetland 4 has also been disturbed by historic agricultural activities and other development and contains areas of buried wetland soils. The hydrology of this depressional wetland is supported by through-flow held above the slowly permeable lakebed deposit and surface runoff.

A small shallow pool (< 6 inches) was present at the eastern part of this wetland above its confluence with Wetland 5. No vernal pool species were identified within the area during various inspections in April. This pool had dried by May 4, 2007. Based on this evidence it was determined that Wetland 4 does not support vernal pool habitat.

Dominant plant species within the wetland include red maple, gray birch, spruce, American elm, cottonwood, winterberry, black cherry, spicebush, highbush blueberry, arrowwood, sensitive fern, skunk cabbage, cinnamon fern and Canada may flower.

Wetland 5

Wetland 5 (±0.4 acre) is a riparian corridor consisting of an incised watercourse and narrow bordering forested wetland. Seasonally, the watercourse receives flows from Wetland 1 and Wetland 4 and reflow emerging from its steeply cut banks and conveys this flow east to a culvert located off of the Property. This watercourse is depicted as an intermittent stream on the

USGS quadrangle map of the area. The small upstream watershed and field observations of limited flow suggest that the stream periodically dries in the summer.

Forested portions of the wetland are dominantly occupied by red maple, silky dogwood, arrowwood, cinnamon fern and skunk cabbage.

Wetland 6

Wetland 6 (±0.7 acre) occurs in the western end of the Property. Cover types beneath the transmission line are emergent marsh and scrub-shrub, which are maintained by vegetation management to protect the electrical facilities. Northern portions of this wetland beyond the transmission corridor are forested. Emergent vegetation consisted mainly of skunk cabbage, cattail, jewelweed, purple loosestrife, soft rush, sedges, woolgrass, goldenrod, boneset, arrow-leaved tear-thumb, Joe Pye-weed, deer tongue grass, and eastern marsh fern. Areas occupied by scrub-shrub habitat are dominated by buttonbush, highbush blueberry, silky dogwood, alder, elderberry, northern arrowwood and spicebush. The forested area is dominated by red maple.

H.4. Vegetation and Wildlife

The vegetation communities on the Property are common to post agricultural mid-successional growth with areas controlled for maintenance of the existing electrical transmission lines. VHB identified the following vegetative communities on the Property: early successional upland shrubland, interspersed emergent and scrub-shrub wetland, forested wetland, riparian corridor, mixed mesic forest, coniferous forest, red maple hardwood forest, woodland/shrubland ecotone, remnant sand dune community, and maintained transmission and distribution line corridor and distribution line switching station (developed area). The location(s) of the vegetative communities on the Property are illustrated in Figure H-1 (*Existing Conditions Map*).

A vegetation and wildlife habitat survey of the Property was performed by Maguire Group, Inc. ("Maguire") in 2006, reviewed by VHB and found to be substantially correct. The results of the survey conducted by Maguire are detailed in a report titled *Vegetation and Wildlife Survey/Habitat for the NU Rood Avenue – Windsor, CT Location*, which is included as Appendix A of Exhibit 4 (*Environmental Assessment Report*). The wildlife assessment included field inventory inspections to identify herpetofauna, avian, and mammal species present, taking into account the habitat conditions present within each resource area. Habitat variables considered in the wildlife evaluation included the size of the vegetative communities, the plant cover types present, the degree of habitat disturbance, interspersion of cover types, the abundance and diversity of fruit and seed-bearing plants, the size (average diameter) and abundance of tree snags and ground debris, and surrounding land uses. These vegetative communities were evaluated for their capacities to provide cover, forage, and breeding habitat. The results of the wildlife habitat assessment found that the utility line corridor most likely provides the highest degree of wildlife habitat value on the Property due to its function as a wildlife corridor and stopover site for migratory birds and bats.

H.5. Rare, Threatened, and Endangered Species

The Applicant reviewed the Connecticut Department of Environmental Protection ("CTDEP") Natural Diversity Data Base ("NDDB") geographic information system (GIS) data layer (dated June 2007), and the Property is not located within a buffered area of concern.

The vegetation and wildlife survey conducted by Maguire found that the vegetative communities present on the Property are not considered rare or unique habitat types in Connecticut with the possible exception of a small remnant sand dune located west of the existing access road. The State of Connecticut does not have a legal definition of "significant

natural community" and the CT DEP evaluates habitats on a case-by-case basis to determine their conservation need. The CTDEP NDDB may designate a specific area as a "significant natural community" if it is found to contain unusual and/or exemplary wildlife habitat. Based on this criterion, it does not appear that the small sand dune would be considered a "significant natural community."

H.6. Water Supply Areas

Groundwater below and near the Property is classified by the CTDEP as a GA groundwater area. The GA classification indicates groundwater within the area of existing private water supply wells or an area with the potential to provide water to public or private water supply wells. CTDEP presumes that groundwater in such an area is, at a minimum, suitable for drinking or other domestic uses without treatment.

The closest public water supply wells are part of the Windsor Locks Wellfield (a State-designated Preliminary Aquifer Protection Area), located approximately 4.5 miles north of the proposed Substation. The Property is not located within this or any other Aquifer Protection Area

H.7. Scenic Areas

Based on information provided by the Town of Windsor's Planning and Zoning Office, there are no State or locally designated scenic roads or Natural Scenic Resources in the Town.

H.8. Historic and Archaeological Resources

Initial consultation with the State Historic Preservation Office ("SHPO") in August 2006 revealed that the Project area possesses moderate to high sensitivity for prehistoric and historic archaeological resources. The SHPO further recommended that CL&P undertake a professional reconnaissance survey to identify and evaluate archeological resources which may exist at the

site. (see Exhibit 5, *SHPO Response Letter*) This survey was conducted in July 2007 (see Section K of this MCF).

H.9. Natural Resources

Site bedrock and surficial geology was determined by reviewing the Environmental GIS Data for Connecticut 2003 Edition compiled by the CTDEP. Bedrock geology underlying the Property is identified as the Portland Arkose Formation. This formation/bedrock consists of red-to-brown, medium-to-coarse grained, sandstone-like, sedimentary rock, consisting of quartz, feldspar, and other various rock fragments. Soils at the Property are mainly classified as fines with the north-central portion of the Property classified as sand overlaying fines and the western-most tip of the Property classified as sand and gravel. Soils in the general vicinity of the Property are classified as fines.

H.10. Floodplain Areas

According to Flood Insurance Rate Map, Community-Panel Number 0900410010D, dated September 29, 1986, there are no flood hazard areas on the Property. The nearest floodplain is associated with Deckers Brook, located approximately 900 feet northeast of the proposed Substation (and east of Interstate 91). A southwesterly flowing tributary of Deckers Brook intersects the southeastern portion of the Property. The 100-year base flood elevation in the general area is approximately 80 feet above mean sea level ("AMSL"). Elevations on the Property range between 80 and 98 feet AMSL.

H.11. Recreational Areas

There are no recreational areas directly abutting or within 0.25 mile of the Property. The nearest recreational area is Stroh Park located approximately 0.34 mile southeast of the Property. Other recreational facilities located further from the Property include Windsor Meadows State

Park located approximately 1.2 miles to the southeast of the Property; Keney Park and Golf Course located approximately 1.2 miles to the south of the Property; Washington Park located approximately 1.3 miles to the northwest of the Property; Pershing Park located approximately 1.5 miles to the southwest of the Property; Windsor American Little League baseball fields located 1.75 miles northeast of the Property; Mill Brook Country Club located approximately 1.8 miles to the northeast of the Property; and Trent Park located approximately 1.9 miles northwest of the Property.

H.12. Seismic Areas

The USGS-National Earthquake Reduction Program has developed a series of maps that depict the estimated probability that certain levels of ground shaking from an earthquake will occur within a given period of time. USGS takes into account the seismic history of an area and the expected decrease in intensity with distance from the epicenter. Based on a review of USGS-National Earthquake Reduction Program maps and information obtained by the Weston Observatory (a geophysical research laboratory), there are no seismic areas located at the Property or within its immediate area.

H.13. Noise

Because the Property is undeveloped, existing noise levels are below those established for residential areas by the CTDEP's noise control regulations (RCSA Title 22a, §22a-69-1 to 22a-69-7.4) and the Town of Windsor's Noise Control Ordinance. Contributing factors for noise generation in the area are traffic noises generated from Interstate 91 and the surrounding local road system.

H.14. Lighting

Currently, there are no lighting facilities present on the Property.

H.15. Other Surrounding Features

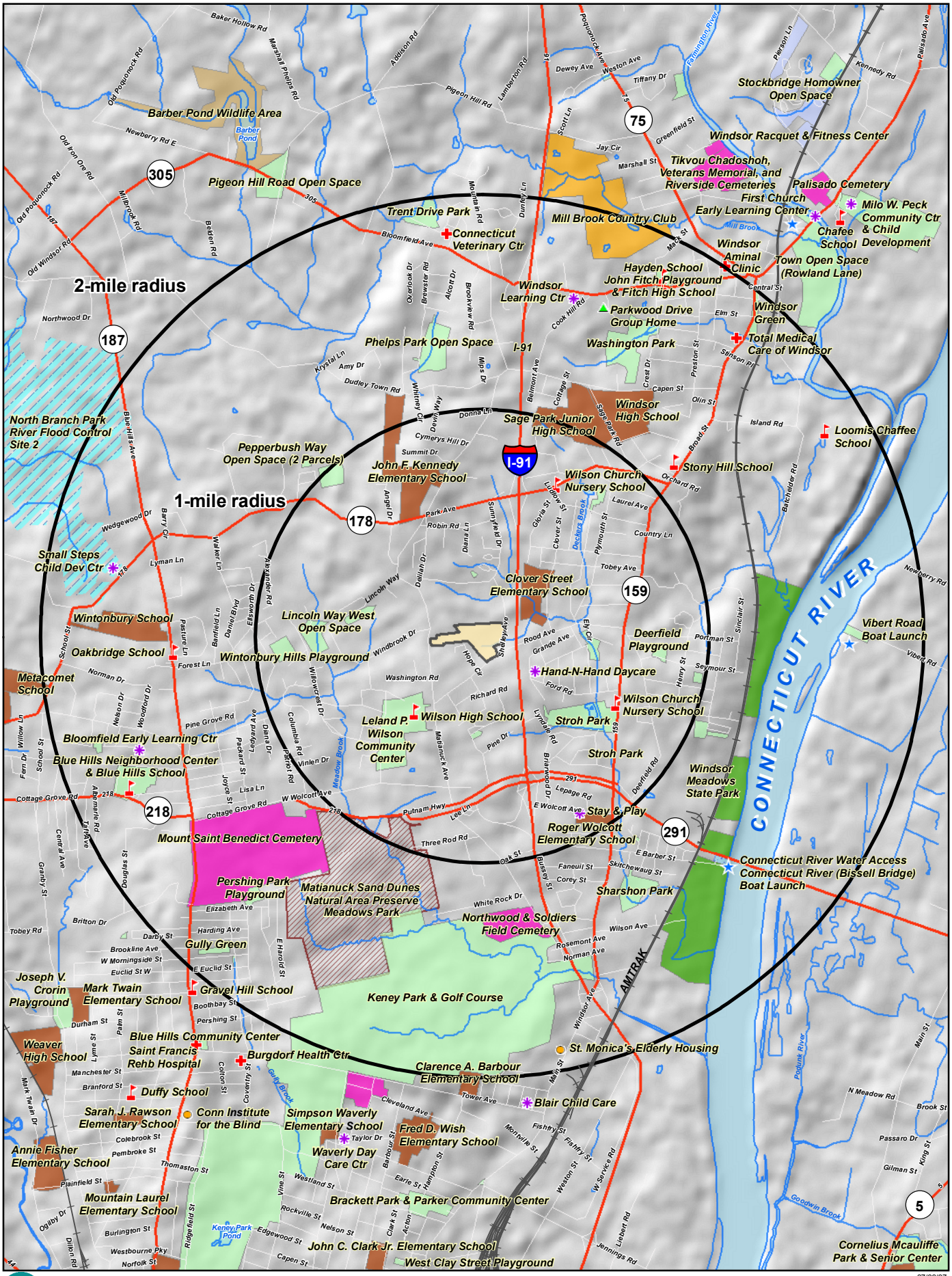
Table H-1 lists non-residential features within two miles of the Property. Figure H-3 (*Surrounding Features*) depicts the nearest locations of non-residential development.

TABLE H-1: Surrounding Non-Residential Features Within Two Miles of the Property

Name	**Address**	**Location from Property**
Schools		
Clover Street Elementary School	57 Clover Street	400 feet east
Wilson High School	Matianuck Avenue	0.35 mile southwest
John F. Kennedy Elementary School	530 Park Avenue	0.5 mile northwest
Wilson Church Nursery School	691 Windsor Avenue	0.6 mile northeast
Trinity Christian School	180 Park Ave	0.66 mile northeast
Roger Wolcott Elementary School	57 E Wolcott Avenue	0.85 mile southeast
Sage Park Junior High School	25 Sage Park Road	0.9 mile northeast
Windsor High School	50 Sage Park Road	1 mile northeast
Stony Hill School	1185 Windsor Avenue	1.1 miles northeast
Oakbridge School	1095 Blue Hills Ave	1.2 mile west
Wintonbury School	Blue Hills Avenue	1.2 miles west
Blue Hills School	Walsh Street	1.5 mile southwest
Loomis Chaffee School	l 4 Batchelder Road	1.7 miles northeast
John Fitch High School	Hayden Court	1.75 miles northeast
Hayden School	Hayden Court	1.8 miles northeast
Daycares		
Hand-N-Hand Daycare, Inc.	70 Grande Avenue	0.2 mile southeast
Stay & Play Daycare	57 E Wolcott Avenue	0.8 mile southeast
Small Steps Child Development Center	9 Brooke Street	1.5 mile northwest
Bloomfield Early Learning Center	73 Rockwell Avenue	1.4 mile southwest
Windsor Learning Center	313 Bloomfield Avenue	1.6 mile northeast
Playgrounds		
Deerfield Playground	Deerfield Road	0.7 mile east
Wintonbury Hills Playground	Shields Drive	0.7 mile west
Pershing Park Playground	Elizabeth Drive	1.5 miles southwest
John Fitch Playground	Hayden Court	1.8 miles northeast
Hospitals		
Connecticut Veterinary Center	620 Bloomfield Avenue	1.8 mile north
Windsor Animal Clinic	46 Poquonock Avenue	2 miles northeast
Total Medical Care of Windsor	340 Broad Street	1.7 mile northeast
Group Homes		
Parkwood Drive Group Home	15 Parkwood Drive	1.5 miles northeast
Licensed Youth Camps (none identified within two miles)		
Hunting or wildlife management areas (none within two miles)		
Settled and Residential areas - see Figure H-2 (*Nearest Residences*)		

There are no tidal wetlands or coastal zone management areas involved with this Project.

Figure H-3: Surrounding Features


2-mile radius
1-mile radius
CONNECTICUT RIVER
I-91
AMTRAK
Barber Pond Wildlife Area
Pigeon Hill Road Open Space
Trent Drive Park
Connecticut Veterinary Ctr
Mill Brook Country Club
Stockbridge Homowner Open Space
Windsor Racquet & Fitness Center
Tikvou Chadoshoh, Veterans Memorial, and Riverside Cemeteries
Palisado Cemetery
First Church Early Learning Center
Milo W. Peck Community Ctr & Child Development
Chafee School
Windsor Aminal Clinic
Town Open Space (Rowland Lane)
Hayden School John Fitch Playground & Fitch High School
Windsor Learning Ctr
Parkwood Drive Group Home
Windsor Green
Total Medical Care of Windsor
Phelps Park Open Space
Washington Park
North Branch Park River Flood Control Site 2
Pepperbush Way Open Space (2 Parcels)
John F. Kennedy Elementary School
Sage Park Junior High School
Windsor High School
Loomis Chaffee School
Stony Hill School
Wilson Church Nursery School
Small Steps Child Dev Ctr
Clover Street Elementary School
Wintonbury School
Lincoln Way West Open Space
Oakbridge School
Wintonbury Hills Playground
Deerfield Playground
Vibert Road Boat Launch
Metacomet School
Hand-N-Hand Daycare
Wilson Church Nursery School
Leland P. Wilson Community Center
Wilson High School
Stroh Park
Bloomfield Early Learning Ctr
Blue Hills Neighborhood Center & Blue Hills School
Windsor Meadows State Park
Mount Saint Benedict Cemetery
Stay & Play
Roger Wolcott Elementary School
Connecticut River Water Access
Connecticut River (Bissell Bridge) Boat Launch
Pershing Park Playground
Matianuck Sand Dunes Natural Area Preserve
Meadows Park
Sharshon Park
Northwood & Soldiers Field Cemetery
Gully Green
Joseph V. Corrin Playground
Mark Twain Elementary School
Gravel Hill School
Keney Park & Golf Course
Blue Hills Community Center
Weaver High School
Saint Francis Rehb Hospital
Burgdorf Health Ctr
St. Monica's Elderly Housing
Clarence A. Barbour Elementary School
Duffy School
Blair Child Care
Sarah J. Rawson Elementary School
Conn Institute for the Blind
Simpson Waverly Elementary School
Fred D. Wish Elementary School
Waverly Day Care Ctr
Annie Fisher Elementary School
Brackett Park & Parker Community Center
Mountain Laurel Elementary School
John C. Clark Jr. Elementary School
West Clay Street Playground
Cornelius Mcauliffe Park & Senior Center
Keney Park Pond
Goodwin Brook
Gully Brook
Meadow Brook
Datcha Brook
Farmington River
Portlink River
Baker Hollow Rd
Marshall Phelps Rd
Addison Rd
Old Pequonnock Rd
Newberry Rd E
Old Iron Ore Rd
Millbrook Rd
Old Windsor Rd
Bloomfield Ave
Northwood Dr
Blue Hills Ave
Dudley Town Rd
Park Ave
Broad St
Orchard Rd
Island Rd
Batchelder Rd
Newberry Rd
Vibert Rd
Seymour St
Portman St
Sinclair St
Country Ln
Tobey Ave
Laurel Ave
Plymouth St
Ely Ct
Rood Ave
Grande Ave
Windbrook Dr
Washington Rd
Richard Rd
Ford Rd
Henry St
Pine Dr
Lyndale Rd
Briarwood Dr
Lepage Rd
Deerfield Rd
Wilson Ave
Rosemont Ave
Norman Ave
White Rock Dr
E Wolcott Ave
W Wolcott Ave
Putnam Hwy
Lee Ln
Three Rod Rd
Oak St
Fanueil St
E Barber St
Skitchewaug St
Corey St
Bassey St
Cottage Grove Rd
Lisa Ln
Joyce St
Columbia Rd
Pine Grove Rd
Norman Dr
Nelson Dr
Woodford Dr
Willow Ln
Fern Dr
School St
Tarbell Ave
Central Ave
Granby St
Dodge St
Britton Dr
Tobey Rd
Darby St
Harding Ave
Brookline Ave
W Morningside St
Euclid St W
E Euclid St
E Harold St
Elizabeth Ave
Durham St
Palm St
Lyme St
Manchester St
Branford St
Colton St
Coventry St
Mark Twain Dr
Colebrook St
Pembroke St
Thomaston St
Plainfield St
Ogilby Dr
Burlington St
Westbourne Pky
Norfolk St
Dillon Rd
Ridgefield St
Rockville St
Edgewood St
Nelson St
Clark St
Acton
Westland St
Vine St
Earle St
Hampton St
Barbour St
Taylor Dr
Cleveland Ave
Tower Ave
Fishhry St
Monnville St
W Service Rd
Weston St
Liebert Rd
Jennings Rd
Main St
Windsor Ave
Elm St
Central St
Mill Brook
Mack St
Preston St
Stetson Pl
Creat Dr
Capen St
Olin St
Cook Hill Rd
Dunbar Ln
Scott Ln
Greenfield St
Jay Cir
Marshall St
Tiffany Dr
Dewey Ave
Weston Ave
Pequonnock Ave
Kennedy Rd
Palisado Ave
Person Ln
Pigeon Hill Rd
Lamberton Rd
Mohican Rd
Overlook Dr
Brewster Rd
Alcott Dr
Brookview Rd
Belden Rd
Whitney Dr
Deming Way
Donna Ln
Cymerys Hill Dr
Summit Dr
Angell Dr
Krystal Ln
Amy Dr
Mipps Dr
Belmont Ave
Cottage St
Sage Park Rd
Sunnyfield Dr
Diana Ln
Robin Rd
Clover St
Gloria St
Ludlow St
Dellian Dr
Lincoln Way
Ellsworth Dr
Alexander Rd
Daniel Blvd
Banfield Ln
Pasture Ln
Forest Ln
Barry Cir
Wedgewood Dr
Walker Ln
Lyman Ln
Hope Cir
Shelley Ave
Willowcrest Dr
Windbrook Dr
Meadow Brook
Matianuck Ave
Packard St
Ledyard Ave
Diana Dr
Patrol Rd
Vinlen Dr
Abernarie Rd
Cottage Grove Rd
Lisa Ln
Joyce St
Lee Ln
Putnam Hwy
Three Rod Rd
Oak St
Fanueil St
Corey St
Bassey St
Skitchewaug St
E Barber St
Lepage Rd
Deerfield Rd
Briarwood Dr
Lyndale Rd
Pine Dr
Matianuck Ave
Meadow Brook
Vinlen Dr
Patrol Rd
Columbia Rd
Diana Dr
Packard St
Ledyard Ave

I. ALTERNATIVES EVALUATED

CL&P identified an area in Windsor, Connecticut where bulk substation capacity is needed (i.e., the "load pocket"). The solution to this need is the establishment of a new bulk power substation in the Town. The ideal location for this substation is: close to an existing 115-kV transmission circuit; within the distribution load pocket; and, accessible from a public road. Locating the facility near an existing 115-kV transmission circuit avoids new transmission line construction and ROW acquisitions. A site located within the load pocket would minimize distribution circuit lengths and enhances contingency tie capabilities with distribution circuits emanating from adjacent substations. Additionally, direct access to the substation site is important, as is minimizing new transmission and distribution line construction costs. Based on these considerations, a site search area was identified near CL&P's 115-kV transmission circuits along Park Avenue, Washington Road, Matianuck Avenue, Rood Avenue, Windsor Avenue, Deerfield Road, and Midian Avenue in Windsor.

Undeveloped or vacated properties in the search area generally greater than two acres in size and generally square in shape, which also satisfied the parameters discussed above, were initially selected as potential sites. For this Substation, sites of this size would typically provide suitable buffer to surrounding properties, consequently providing favorable noise reduction and visual screening opportunities. Land that is currently developed and being utilized was excluded, unless the property is intended to be sold. Industrially-zoned sites meeting the same parameters are preferred over non-industrial sites, all else being equal. In this case, the transmission circuits and load pocket are located predominantly within a non-industrial area.

I.1 Offsite Alternatives

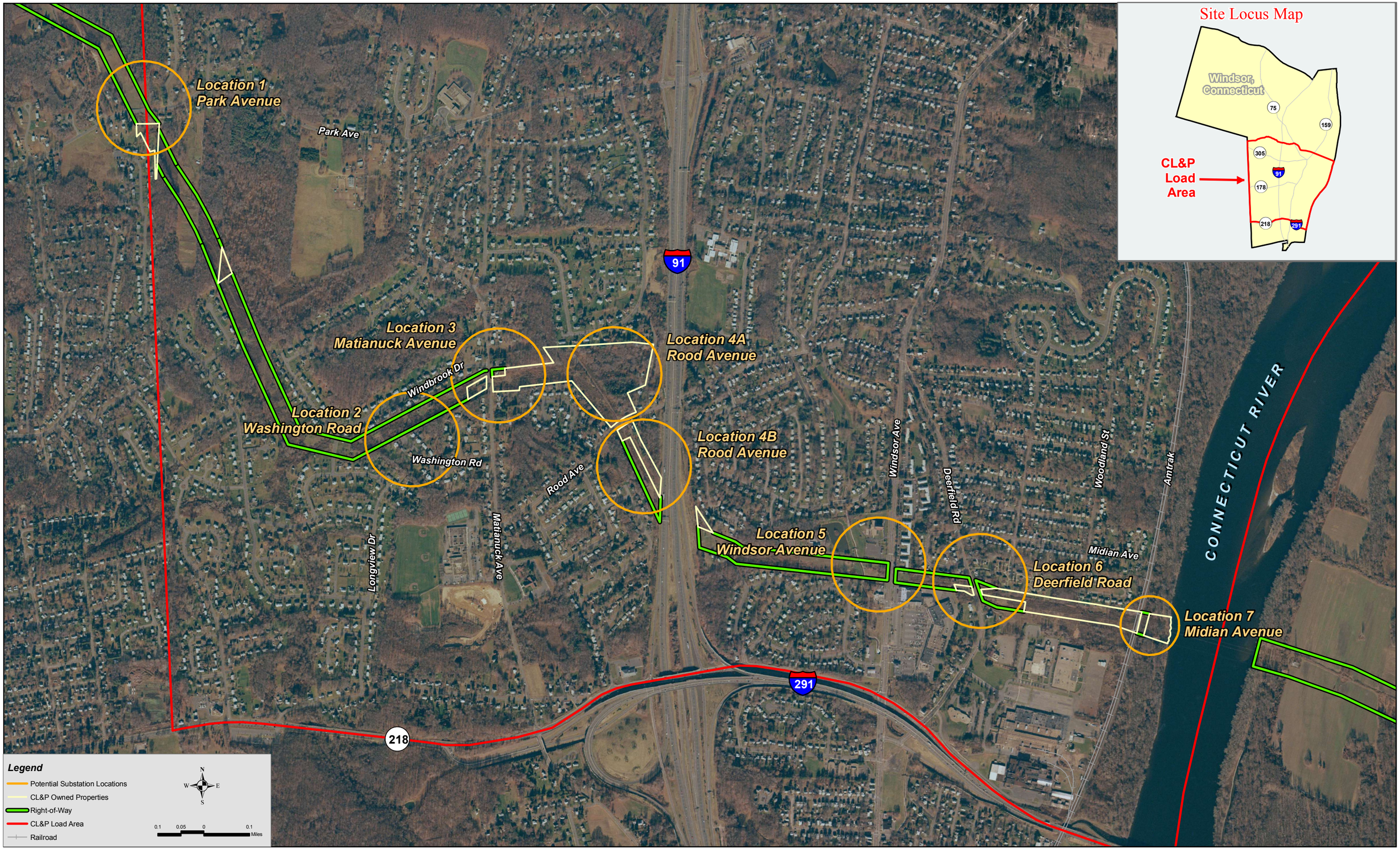
Eight locations having potentially viable sites were identified within the search area (see Figure I-1). These locations were then evaluated, using the following major criteria, to determine the most suitable location for construction of this new Substation:

- Proximity to distribution load pocket and existing feeders
- Proximity to existing transmission electrical circuits
- Ease of access
- Earthwork requirements
- Sufficient size and shape
- Zoning and land-use constraints
- Wildlife and habitat
- Wetlands and water resources
- Proximity to public water supply watershed and/or aquifer areas

The Rood Avenue Property best satisfied the criteria and is therefore the most feasible location. A summary of the potential site locations is provided below.

Location 1, Park Avenue - This location is at the very westerly edge of the search area and would require longer distribution feeders, resulting in increased costs. This alternative would require additional ROW purchases, significant land clearing and installation of new utility structures and interconnecting lines. In addition, residences are located on all four potential sites where the ROW crosses Park Avenue. One possible substation site was identified 500± feet north of Park Avenue and east of the ROW; however, this location contains mostly wetlands.

Figure I-1: Alternative Sites Evaluated



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Location 2, Washington Road – The Washington Road cul-de-sac terminus is located at the edge of the transmission ROW. The area is well developed with residences with insufficient buffer. Wetland constraints also exist in this area. As a result, no suitable land for a substation was identified.

Location 3, Matianuck Avenue - Residences occupy all potential site areas where the ROW crosses Matianuck Avenue. Therefore, no suitable land for a substation exists at this location.

Location 4, Rood Avenue at Utility Corridor– CL&P evaluated company-owned parcels on both the north and south sides of Rood Avenue where the transmission and distribution systems cross overhead (identified in this evaluation as Location 4A and 4B, respectively).

Location 4A, north of Rood Avenue [the Property] - An existing switching station and significant utility facilities (overhead transmission and distribution lines and support structures). The Property formerly housed a distribution substation. Vehicular access (a maintained dirt roadbed) currently exists from Rood Avenue. A new Substation at this location would provide for direct connections to an existing 115-kV transmission circuit and distribution feeders on the Property. The combination of the Property and abutting CL&P-owned parcels totals 21.03 acres, providing a setback of 490± feet from Rood Avenue. Significant existing vegetation can be preserved in the north and northeast portions of the Property to provide substantial buffer to neighboring residences. The work associated with constructing the Substation minimally affects wetlands.

Location 4B, south of Rood Avenue at Utility Corridor – This two-acre parcel has significant wetland constraints and does not provide sufficient buffering from neighboring residences.

Location 5, Windsor Avenue - Most sites in this area are residentially developed. Some vacant land is available, but development of a substation would require land acquisition from an active adjacent property owner (church parking lot). Sites in this area provide insufficient buffer from neighboring residences. Most of adjoining land to the west is also constrained by floodplain (associated with Deckers Brook) and bordering wetlands.

Location 6, Deerfield Road – No currently vacant land was identified to support a substation. Close to the east end of the search area, development here would necessitate longer distribution feeders, additional ROW purchases, significant land clearing and installation of new utility structures and lines. The area is well developed with residences, with minimal vegetative buffer, and in the case of the east portion of this area, significant wetland constraints.

Location 7, Midian Avenue – At the end of Midian Avenue, adjacent to the ROW, and at the east edge of search area, this location poses significant challenges for the interconnection of a substation to existing distribution feeders. Development here would necessitate longer distribution feeders resulting in additional ROW purchases and extensive tree clearing for the installation of new utility structures and lines. Nearby residences are located to the north and lack adequate distance/vegetation buffer. No direct access to the ROW exists in this area; development would require new road construction. Sites closest to the Connecticut River are constrained by inland wetlands and flood plain elevations. In addition, an active rail line extends through the area and development would likely require installation of an at-grade crossing.

I.2 Alternate Sites at the Property

Once the Rood Avenue Property was determined to provide the best opportunity to support the needed Substation development, alternative substation footprints (size and configuration) and locations were evaluated for placement of the facility. Evaluation factors

included proximity to: existing utility infrastructure (to accommodate interconnections and required line profile separations); neighboring homes; existing vegetation; and wetland resources. Because an existing 115-kV circuit and access road extend through the central portion of the site, this general area was identified as having the highest potential for development of the Substation. The proposed footprint location and configuration was ultimately selected because it best balances technical and safety requirements; provides adequate buffers for neighboring properties, and limits direct effects to existing natural resources by minimizing tree clearing, earthwork, and alteration of wetlands.

I.3 System Alternatives

As previously discussed, CL&P considered alternative system redesign options to meet the challenges in Windsor. However, available options would produce a Windsor distribution system that is not as reliable and flexible as the system which will result from the proposed Project and, ultimately, would not eliminate the need for the proposed facility to meet system capacity projections.

J. SAFETY AND RELIABILITY INFORMATION

The Project would be constructed in full compliance with the standards of the National Electrical Safety Code, the Connecticut Department of Public Utility Control, and good utility practice. Should energized line or substation equipment fail, protective relaying equipment would immediately remove the equipment from service, thereby protecting the public and the remaining equipment within the Substation.

The Rood Avenue Substation would be equipped with measures to ensure continued service in the event of outages or faults on transmission or substation equipment. Continued reliability would be achieved by incorporating a "loop through" design configuration for the existing 115-kV overhead transmission line, transformer protection, and redundant automatic protective relaying equipment.

Protective relaying equipment would be provided to automatically detect abnormal system conditions (e.g., a faulted overhead transmission line) and would send a protective trip signal to circuit breakers to isolate the faulted section of the transmission system. The protective relaying schemes would include fully redundant primary and backup equipment so that a failure of one scheme does not require the portion of the system being monitored by the protective relaying equipment to be removed from service.

The protective relaying and associated equipment, along with a Supervisory Control and Data Acquisition ("SCADA") system for remote control and equipment monitoring by the Connecticut Valley Electric Exchange ("CONVEX") System Operator, would be housed in a weatherproof, environmentally-controlled electrical enclosure.

CL&P incorporates IEEE/ANSI and NFPA standards for fire protection in its substation design and operates these facilities to minimize the impact of fire, in the unlikely event it occurs.

CL&P also trains its employees and the local fire department on the safe methods to deal with a substation fire. The control enclosure would be locked and equipped with fire extinguishers, as well as smoke and heat detectors that would be monitored from a remote location. Fire/smoke detection would automatically activate an alarm at CONVEX and the system operators would then take appropriate action.

Additional devices would constantly monitor the Substation to alert CL&P of any abnormal or emergency situations. The perimeter of the Substation would be enclosed by a seven-foot high chain link fence topped with an additional foot of three strands of barbed wire to discourage unauthorized entry and/or vandalism. The Substation entrance would be gated and locked. Lighting would be available within the Substation yard to facilitate work at night or during inclement weather.

CL&P would install a sump to serve as an oil-spill containment chamber around the proposed transformer. The sumps would be sized with sufficient capacity to contain a spill in the event of an inadvertent release of oil. CL&P would propose to install an Imbiber Beads Drain Protection System® for the sump, similar to containment systems installed at other CL&P substations, including Shunock Substation in North Stonington.

K. EFFECTS ON THE ENVIRONMENT

The development of the Rood Avenue Substation would not have any significant, long-term adverse effects on the existing environment and ecology, nor would it affect the scenic, historic and recreational values of the vicinity. A *Proposed Conditions Map* is included as Figure K-1.

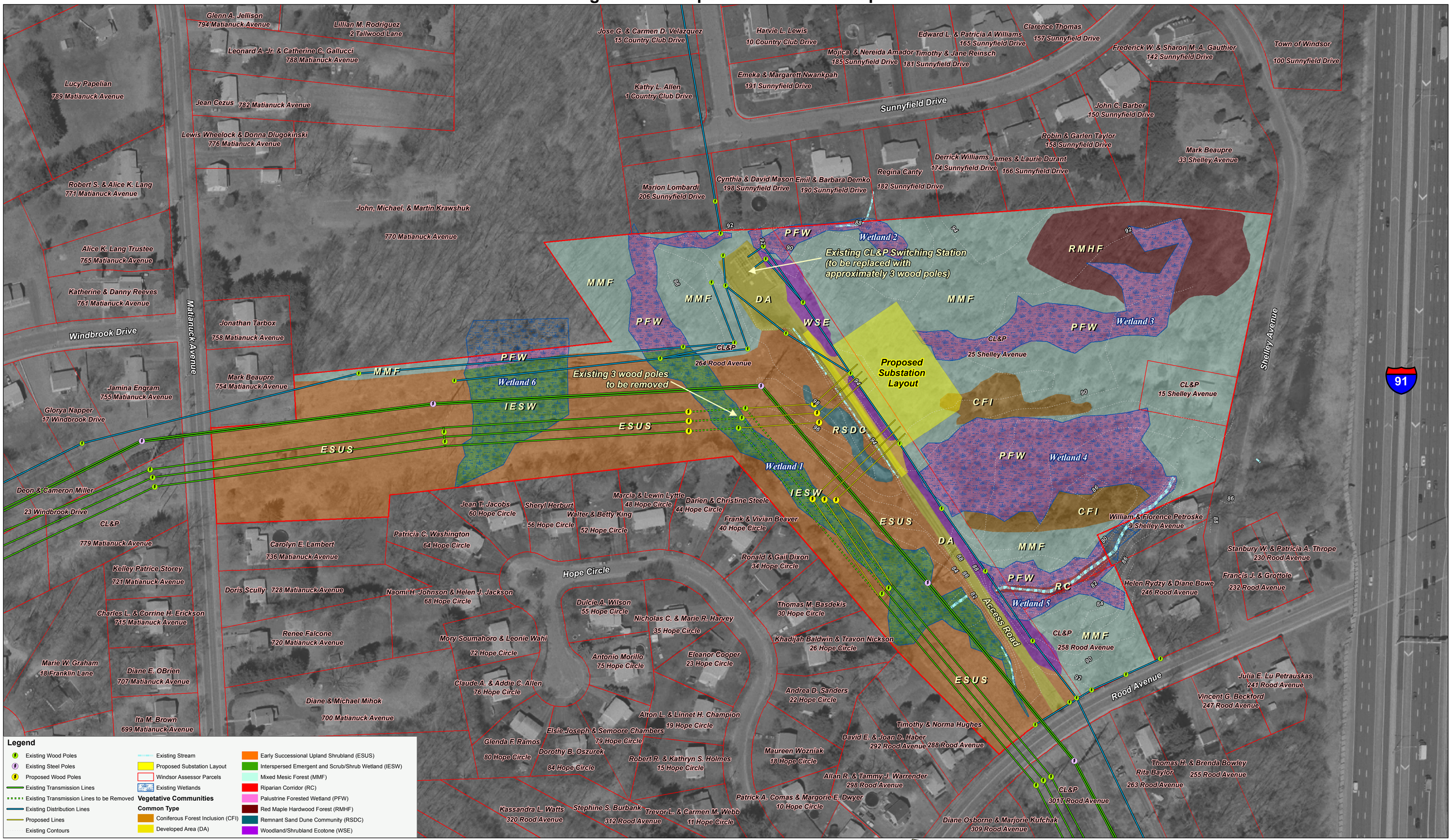
K.1. Public Health and Safety

The Rood Avenue Substation would be designed to applicable CL&P, industry, State, and local codes and standards and would not pose a safety concern or create undue hazard to the general public. The Substation would not consume any raw materials, would not produce any by-products and would be unmanned during normal operating conditions. Applicable signage would be installed alerting the general public of the dangers of high voltage associated with the Substation.

K.2. Local, State and Federal Land Use Plans

The proposed Project is consistent with local, State, and Federal land use plans. Local land use application processes do not specifically apply to the Project. However, the Project has been designed to meet the intent of local land use regulations. CL&P has met with Town officials and provided a Location Review submission to Windsor's Inland Wetlands and Watercourses Commission, which unanimously approved the location on June 5, 2007. A similar submission was also received and reviewed by the Planning and Zoning Commission, which unanimously provided location approval at its June 12, 2007 meeting. CL&P also met with the Town's Economic Development Commission on July 18, 2007 at which time they voted unanimously to support the Project.

Figure K-1: Proposed Conditions Map



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Windsor, Connecticut
Proposed Substation Location
Rood Avenue

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K.3. Existing and Future Development

The Rood Avenue Substation would benefit the community by improving electrical service for existing development in Windsor and encouraging additional development through enhanced reliability and the capacity to serve additional load. The Town of Windsor does not currently have its own bulk power substation source.

The Substation would be situated immediately east of the existing transmission line corridor and access drive, generally in the north central portion of the Property. The Substation would have a fenced area of approximately 220 feet by 137 feet. The existing dirt access drive would be upgraded and continue to serve as entry/egress to the Property's facilities. Connecting the Substation to the existing 115-kV line requires the installation of three wood poles and six guy wires along the western Property line, the removal and relocation of a wood-pole angle structure where the existing transmission line turns to the west, and installation of wood-pole support structure immediately west of the Substation footprint and access drive. As part of the overall improvement plans on the Property, the 23-kV switching station near the northern Property boundary will be removed and replaced with approximately three wood poles.

K.4. Roads

Minor improvements would be made to the existing driveway to allow for more reliable access to the Substation by construction and maintenance vehicles. Modifications to the access drive include re-grading, widening to accommodate larger vehicles, and resurfacing with gravel upon completion of the Project. A bituminous concrete apron would be provided at the entrance of the Property at its junction with Rood Avenue. At the terminus of the access drive, a level, crushed stone parking/turn-around area would be created for vehicles. As a result, the driveway improvements would not require tree clearing. During construction, the driveway would be

stabilized with stone, and anti-tracking mats installed at the intersection of Rood Avenue, to prevent tracking of soil onto local streets. Upon completion of the Substation, the driveway would be finished with a gravel base and gated. After construction is completed, approximately three to four vehicular trips per month to the Property would be anticipated for maintenance and inspection activities.

K.5. Wetlands

Six wetland areas were identified on the Property. Development of the Rood Avenue Substation would result in temporary and permanent impacts to portions of two of these wetlands. These impacts are associated with construction of the Substation footprint and installation of transmission line structures that will connect the existing transmission line to the Substation. Permanent and temporary wetland impacts associated with the proposed activities are described in detail below and summarized in Table K-1 at the end of this subsection. The Town of Windsor Inland Wetlands and Watercourses Commission regulates a 150-foot upland review area for wetlands and watercourses. Due to the size and extent of wetlands on the Property, only small outlying portions of the Property fall outside of upland review areas.

K.5.1 Substation Footprint

The Substation would result in minimal temporary and permanent impacts to two wetland areas. Approximately 490 square feet of Wetland 3 would be permanently impacted by the Substation footprint. Wetland 3 would also experience ±575 square feet of temporary impacts associated with vegetation clearing around the perimeter of the Substation to facilitate construction activities and for technical and safety reasons. Historical disturbances to these relatively small wetland areas have diminished their functions and values.

K.5.2 Transmission Line Work

Connecting the existing 115-kV 1751 transmission line to the Substation would require the installation of three wood poles within five-foot diameter cassions and eight associated guy-wire anchors within and adjacent to Wetland 1, resulting in approximately 40 square feet of permanent impacts and 2,228 square feet of temporary impacts. Removal of a wood-pole angle structure from Wetland 1 at the western turn of the 115-kV line would require minimal temporary impacts (290 square feet). Replacement of the angle structure west of Wetland 1 requires temporary impacts (approximately 1,190 square feet) to cross this wetland via 14-foot wide timber mats to allow for construction access to this location. Work associated with these transmission line modifications would result in 40 square feet of permanent wetland impacts and 3,708 square feet of temporary wetland impacts. Areas temporarily disturbed by construction activities would be restored with native shrubs, grasses and forbs as appropriate. The relatively small area of permanent impacts resulting from new utility pole work is not expected to adversely impact the principal functions or values of Wetland 1. This wetland area is primarily occupied by disturbed emergent and scrub/shrub habitat and such habitat would be maintained post-construction.

The existing access drive from Rood Avenue would be upgraded and improved with gravel. No temporary or permanent disturbance to wetlands would result from this work.

Removal of the 23-kV switching station and installation of wood poles would require work in proximity to Wetlands 1 and 2 but will not result in any direct temporary or permanent impacts.

TABLE K-1: Wetland Impact Summary

Activity ID	Activity	Wetland # Impacted	Permanent (sq. ft.)	Temporary (sq. ft.)
A	Install 3 poles & associated guy wires & caissons	1	40	2,228
B	Remove 3 poles from wetland	1	0	290
C	Temporary wetland crossing	1	0	1,190
D	Establish substation footprint	3	490	575
	Total:		530	4,283

Note: No permanent or temporary impacts are proposed within Wetland 2 , Wetland 3, Wetland 4 or Wetland 5.

K.6. Wildlife and Vegetation

Construction of the Substation would not have significant adverse effects on vegetation, wildlife or habitat values. The majority of the Rood Avenue Substation site would occupy what is currently upland forest habitat with a small portion of the Substation footprint occurring in a forested wetland. Permanent and temporary wetland impacts associated with connections and improvements to the existing transmission line corridor (i.e., installation of poles and associated guy wires and caissons, removal of poles and temporary wetland crossing) occur primarily within emergent and scrub-shrub wetland areas. The vegetation and wildlife survey of the Property conducted by Maguire determined that the most significant wildlife attribute of the Property is its function as a wildlife corridor, which is a feature that will be maintained post-construction. Therefore, the Project would not have an adverse effect on wildlife due to maintenance of the valuable wildlife corridor feature, the conifer inclusion, and the Substation footprint's immediate proximity to similar habitats that would allow for natural relocation of potential wildlife from the construction zone.

K.6.1. Rare, Threatened, and Endangered Species

No state or federally endangered, threatened or special concern species were found to occur on-site during the various inspections of the Property. Based on current CTDEP NDDB review criteria, the proposed Substation project does not present a potential conflict with a listed

species or significant natural community. In addition, CL&P corresponded directly with the CTDEP and was provided a letter of "No Effect" on August 22, 2006. A copy of the *CTDEP Correspondence* is provided as Exhibit 6.

Maguire identified a small (± 2,000 square foot) sand dune during their vegetation and habitat survey of the Property. Portions of the sand dune would be disturbed due to grading activities associated with connecting the Substation to the existing transmission lines. Maguire reported that the sand dune exists as a small remnant patch of habitat and therefore was not considered exemplary.

K.7. Water Supply Areas

The closest public water supply wells are part of the Windsor Locks Wellfield (a State-designated Preliminary Aquifer Protection Area), located approximately 4.5 miles north of the proposed Substation. The transformer at the Rood Avenue Substation would contain insulating oil; however, the equipment would have secondary containment and accidental spill prevention provisions in place. Based on these design considerations and the physical distance of the water supply wells to the Rood Avenue Substation, the Project would have no adverse environmental effect on the aquifer.

K.8. Historic and Archaeological Resources

Consultation with the Connecticut SHPO indicated concern for the potential for this property to yield significant subsurface cultural deposits. At the request of SHPO, a cultural resources survey was conducted at the Property. Prior to the initiation of subsurface testing, a pre-fieldwork archaeological assessment was completed by reviewing previous archaeological studies and resources recorded in the region, historic maps, and aerial images depicting the Property. Fieldwork for this investigation consisted of pedestrian survey, systematic subsurface testing, mapping, and photo-documentation.

The results of this investigation revealed significant soil disturbances and no evidence of cultural deposits and/or cultural features. Further, no historic standing structures or historic period cemeteries were identified. Therefore, no cultural resources will be impacted as a result of the planned Substation construction. A copy of the *Phase I Cultural Resources Reconnaissance Survey Report* is provided as Exhibit 7.

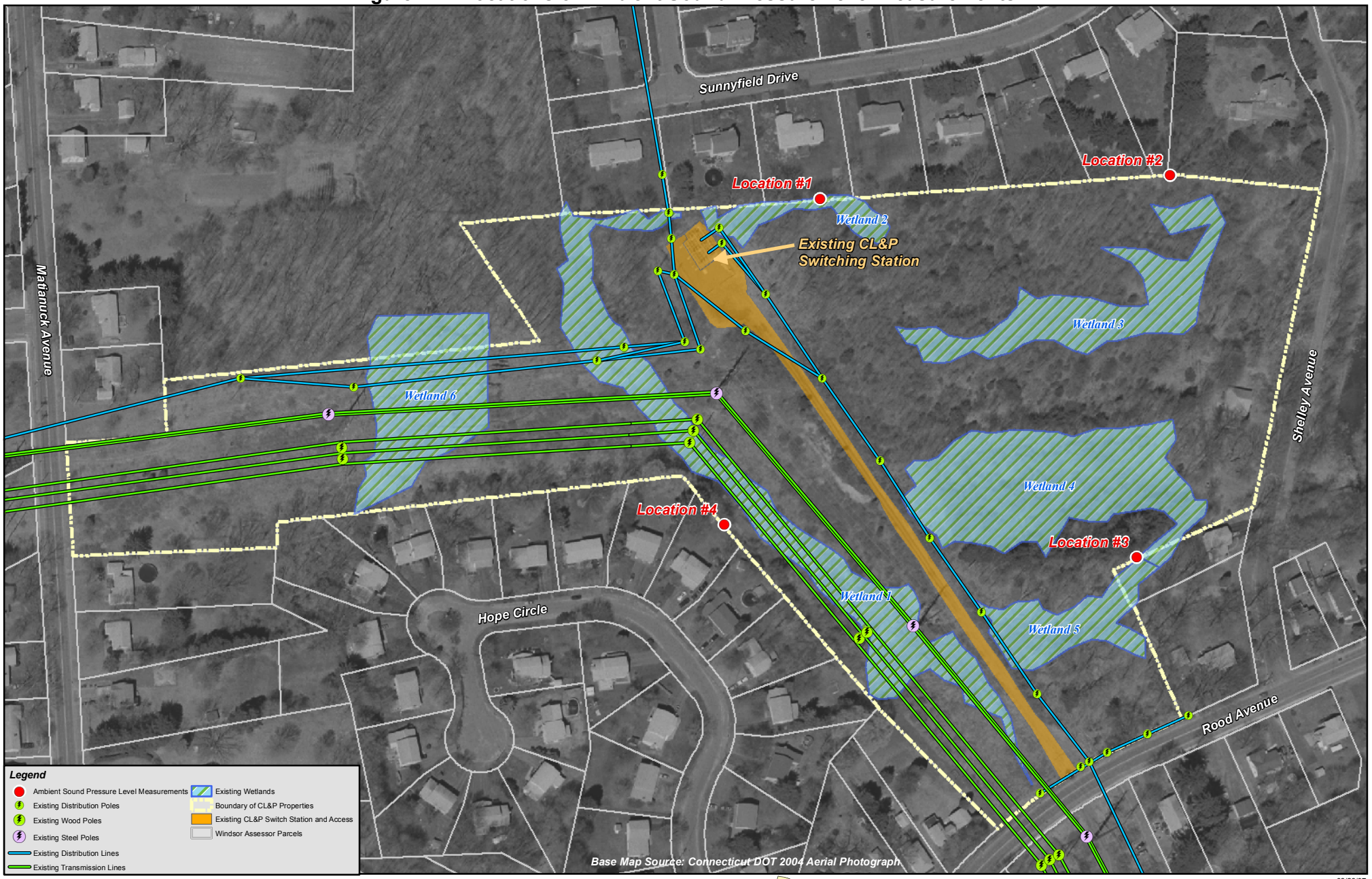
K.9. Noise

Ambient sound pressure levels were measured at four Property line locations during night time hours on July 27, 2007. These locations are depicted on Figure K-2, *Locations of Ambient Sound Level Measurements.* At two of the locations the sound pressure levels were high enough to qualify as "high back ground noise" according to State Regulations. At the remaining two locations the measured sound pressure levels were slightly less. The main source of noise in the area is traffic noise from I-91.

Due to generous buffer zones provided by the site, the increase in the Property line sound pressure levels ("SPLs") due to the addition of the Substation can best be described as "negligible", ranging from close to 0 dBA to 0.2 dBA. The projected noise levels generated by the Substation at the Property boundaries would be well below these levels and therefore will comply with applicable noise regulations.

Property line Location Number	1	2	3	4
Existing SPL (dBA)	54	53	50	47
Estimated SPL due to Transformer (dBA)	29.9	29.4	32	33.5
Estimated new total SPL (dBA)	less than 50.05	Less than 50.05	50.08	47.2
Max. allowable night time SPL per State Regulations (dBA)	59	58	51	51
Estimated increase in SPL (dBA)	Less than 0.05	Less than 0.05	0.08	0.2

Figure K-2: Locations of Ambient Sound Pressure Level Measurements



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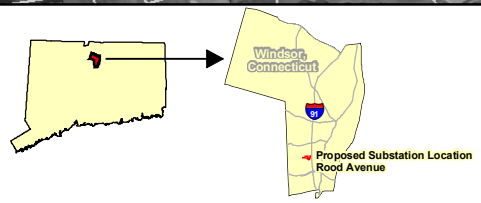

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Infrequent impulse noise would be generated from switching and circuit breaker opening and closing. The impulse noise levels are not expected to exceed the levels permitted at the Property line by CTDEP's noise control regulations.

The construction and testing of the Substation facilities is expected to occur over a 12- to 14-month period. In general, construction hours would be from 7 am to 5 pm, Monday through Friday. Site preparation, including grading and installation of foundations, would take place during the initial 6 months of construction and involve the use of earth-moving equipment and construction vehicles.

The installation and testing of equipment would take approximately 5 months and would involve the use of cranes to unload and install structural elements and large equipment. The installation of the 115-kV line and Substation terminal structures, interconnection of the supply lines to the Substation, and connections to the distribution system may occur outside of normal work hours because these activities necessitate taking critical transmission and/or distribution equipment out of service. As a result, this work could be scheduled for off-peak electrical demand hours and coordinated with the Town.

K.10. Floodplains

No construction activities would occur at elevations at or below the Deckers Brook's 100-year base flood elevation of 80 feet AMSL. Elevations within the proposed construction footprint would range from approximately 90 to 94 feet AMSL.

K.11. Seismic Areas

As with all substations constructed by CL&P, this Substation will meet or exceed the State building code, which includes seismic loading, wind loading, and snow and ice loadings, among others.

K.12. Lighting

The Rood Avenue Substation would have low-level lighting for safety and security purposes. However, these lights would be recessed or activated manually to minimize visual effects at night. Lighting would not affect existing residences in the vicinity of the Property. Additional lighting capability would exist in the Substation to allow for work at night under abnormal or emergency conditions.

K.13. Natural Resources

No adverse effects are anticipated on natural resources occurring at and/or nearby the Property. Minor earthwork is required to accommodate the Substation at the Site. No importation or exportation of soil is anticipated for this Project.

K.14. Other Surrounding Features

No adverse effects are anticipated to the facilities depicted on Figure H-3, primarily because of their sufficient distance from the Substation and/or the presence of I-91.

L. MITIGATION MEASURES

Based on the existing conditions at the Property and the proposed design, the construction and operation of the Substation would not have any significant permanent adverse effects on the environment. CL&P has incorporated measures into all phases of Project development and implementation to promote protection of the environment in accordance with Federal, State and local requirements.

L.1 Pre-Construction Considerations

Before any construction activities occur, CL&P would prepare a Development and Management Plan ("D&M Plan"), which must be approved by the CSC. The D&M Plan would include *CL&P's 2005 Construction Best Management Practices*, which are designed to minimize or eliminate potential adverse environmental effects which may result from construction activities. The content of the plan would include specific procedures and information on erosion and sedimentation control, spill prevention and control, construction staffing and hours, traffic control, and provisions for restoration and landscaping after construction of the Substation. The D&M Plan would also provide contact information should questions or concerns arise during construction or operation of the facility.

Prior to commencement of construction, CL&P intends to install erosion controls at the limits of work in accordance with the approved D&M Plan and the *2002 Connecticut Guidelines for Soil Erosion and Sedimentation Control*. The erosion controls would be inspected and maintained throughout the course of the Project until final site stabilization has been achieved.

L.2 Construction-Related Activities

All construction activities would be conducted in accordance with the D&M Plan as approved by the CSC. The siting and design of the Substation provides for a sufficient setback from Rood Avenue and neighboring residences and minimizes vegetation loss such that a natural tree and shrub buffer would be maintained. The driveway and Substation would be graded to contain stormwater runoff on the Property. The remainder of the stormwater would infiltrate through the gravel base of the Substation or would be allowed to run off through vegetated uplands.

L.3 Post-Construction Features

Upon completion of construction activities, all disturbed/exposed areas would be stabilized and revegetated. These areas would be dressed with topsoil and seeded with a New England conservation/wildlife mix, to establish a cover of native grasses, forbs, wildflowers and legumes that would provide both soil stability and wildlife habitat value. Erosion controls would remain in place until final site stabilization is achieved.

The power transformer within the Substation would contain insulating oil. Surrounding the transformer will be a secondary containment consisting of polyvinyl-lined sump, designed to hold 110% of the transformer's oil capacity.

Although the Property provides vegetative buffer to adjoining residences, CL&P has incorporated a landscape plan to further mitigate for any potential views of the substation (see Exhibit 3, *Site Plan Drawings*). The plantings would be clustered along the western and northern ends of the Substation to provide an additional visual buffer as well as habitat for resident and migratory wildlife.

Effects on wildlife and wildlife habitat would be temporary disturbance during construction and would be mitigated though restoration of disturbed areas and supplemental plantings. The Property is currently used by wildlife species that are commonly found and are adaptable to minor habitat modifications. Based on the species identified and habitat types found on the Property, the Property should maintain its species diversity and abundance after the Substation is completed and operational.

L.4 Construction Sequencing

Construction is expected to occur over a period of 12 to 14 months with the Substation in service by summer 2009. The general construction sequence for the Substation and line interconnection would include:

- Completing test borings
- Installing erosion and sedimentation control barriers
- Upgrading the driveway
- Removing trees and shrubs within the areas to be graded
- Site preparation (cut, fill, grading)
- Slope stabilization where necessary
- Installing Substation foundations, conduits and grounding grid
- Spreading of trap rock
- Installing steel structures and Substation equipment
- Making transmission line interconnections
- Energizing the Substation
- Completing landscaping and site restoration activities
- Removing erosion and sedimentation control barriers

M. HEALTH AND SAFETY

M.1 Electric and Magnetic Fields

Electric fields ("EF") are produced within the surrounding area of a conducting object (e.g., a wire) when a voltage is applied to it. Electric fields are measured in units of kilovolts per meter ("kV/m"). The level of an electric field near to an energized power line depends on the applied voltage, the distance between the conductors, and the distance to the measurement location.

Magnetic fields ("MF") are produced within the surrounding area of a conductor or device which is carrying an electric current. Magnetic fields are measured in units of milliGauss ("mG"). The level of a magnetic field near to line conductors carrying current depends on the magnitude of the current, the distance between conductors, and the distance from the conductors to the measurement location.

Both electric and magnetic fields decrease rapidly as the distance from the source increases, and even more rapidly from electric equipment in comparison to line conductors. Electric fields are further weakened by obstructions such as trees and building walls, while magnetic fields pass through most obstructions. In the case of parallel lines of circuit conductors, the levels of EF and MF are also dependent on the phasing of the circuits.

The highest levels of electric and magnetic fields around the perimeter fence of a substation occur where transmission and distribution lines cross over or under the substation boundary. The levels of fields from substation equipment decrease rapidly with distance, reaching very low levels at relatively short distances beyond the perimeter fence . Substation-caused magnetic fields off the property of a substation will commonly be in the same range as the background magnetic field levels in homes, which commonly range up to 4 mG. The

proposed Substation equipment will be positioned more than 140 feet at its closest point to any property line, and at this distance, substation-caused magnetic fields will be well under 1 mG.

Pre-Project Electric and Magnetic Fields at the Boundaries of the Property

At and beyond the boundaries of the Property, the predominant existing sources of power-frequency electric and magnetic fields ("EMF") are the transmission lines (115-kV circuits 1751and 1779 and 345-kV circuit 395) and 23-kV distribution lines (circuits 3B11 and 3B12). Two existing lines of CL&P transmission structures support the three transmission circuits. These transmission lines cross boundaries of the Property at Rood Avenue and at Matianuck Avenue, and they are near to the south boundary of the Property which abuts the Hope Circle subdivision. A two-circuit 23-kV distribution line (circuit 3B11 and 3B12) coming east from Bloomfield Substation runs parallel to and north of these transmission lines, crossing the same property boundaries, and also connecting on site to a branch line which crosses over the north property line, and continuing parallel with the transmission lines over the Rood Avenue property line.

The highest levels of EMF along the property lines will be found on the property lines at Matianuck Avenue and Rood Avenue beneath where the three transmission circuits cross over these property lines. Field levels drop off rapidly with distance from a source, so the levels of EMF at all points to either side of these transmission circuits will be much lower than the levels found beneath the circuits.

Post-Project Electric and Magnetic Fields on Boundaries of the Property

The fence of the proposed Substation is more than 100 feet at its closest point from any property line. At such a distance, the Substation equipment within the fenced area will not cause any noticeable change in either the electric or magnetic fields along the property lines. However, there will be changes to the existing magnetic field levels at points on a property line of the Property because of two factors: 1) physical changes will be made to the 1751 transmission line circuit to interconnect it with the Substation; and, 2) the Substation and associated distribution load shifts will cause changes to the currents flowing on the 115-kV transmission circuits and the 23-kV distribution circuits.

New 115-kV line spans (i.e., "substation entry spans") will be constructed to loop the existing 1751 transmission circuit in and out of the Substation. This change will alter the configuration of the 115-kV line conductors of this circuit near a section of the southerly property line. This will lead to changes in the electric and magnetic fields along the southerly property line adjacent to where the 1751 circuit has been modified. This change will be in addition to changes in magnetic field levels caused by changes in currents on the transmission circuits.

The interconnection of Rood Avenue Substation and associated distribution load shifts to it will primarily affect current flows over the 1751 circuit. CL&P's model projections for the peak circuit currents in future years are all below 600 amperes. The highest levels of EMF will continue to be found on the property lines at Matianuck Avenue and Rood Avenue directly beneath where the existing transmission circuit conductors cross over these property lines.

For an upcoming application to the Council, and as required by the Council's draft document *Electric and Magnetic Field Best Management Practices for the Construction of Electric Transmission Facilities in Connecticut, May 22, 2007*, CL&P will make projections of EMF levels on the property lines of the Property using projected peak-day line currents for a period of 5 years after the Substation's in-service date, which in this case is through the year 2014. These calculations will be made for both the pre-project condition, assuming the proposed project was not built, and the proposed post-project condition.

All calculations of electric and magnetic field will be made for points on the Property, assuming that the above-named circuits are the only source of such fields on the Property. Per standard practice, all such calculations will assume balanced three-phase line currents in the transmission and distribution circuits, equal phase angles and predominant directions for the transmission circuit currents, level terrain, and line conductor heights above grade which are typical for the locations modeled. For electric fields, bare terrain is also assumed. Electric fields will be lower at ground level if the terrain holds vegetation or other objects which will partially shield electric fields from the line.

Projected peak line currents in the year 2014, determined by system power-flow model simulations, will be used for these calculations. Other assumptions used in the system power-flow model are: ISO-NE's forecast system summer peak load in 2014, no transmission circuit outages, Rood Avenue Substation installed as proposed with anticipated load transfers from other substations, a generation and transmission system which includes all new and modified elements which have already received Council and ISO-NE approvals and which have projected in-service dates before 2014, and a reasonably expected generation dispatch and Connecticut import level for a peak-load day with some large generators unavailable for service. Magnetic

fields will be calculated using these peak line currents, and also using 70% of these peak line currents as an estimated average circuit current during the peak day (i.e., "peak-day average load") in 2014. These choices comply with Section IV of the Council's May 22, 2007 draft "Electric and Magnetic Field Best Management Practices for the Construction of Electric Transmission Facilities in Connecticut". Graphical representations of the results will be published in CL&P's application to the Council.

Measurements of Electric and Magnetic Fields

Measurements of electric and magnetic fields were taken along Rood and Matianuck Avenues in June, 2007. The *Locations of EMF Measurements* are depicted on Figure M-1. The measurement results are plotted on the four graphs following Figure M-1. Two graphs illustrate existing magnetic fields and two depict existing electric fields. Per an industry standard, these measurements were made at one meter above grade over a path on the Property that is perpendicular to the existing transmission lines. The result is called a lateral profile. The highest magnetic field level recorded was 9.3 mG, and the highest electric field recorded was 1.19 kV/m.

The magnetic field measurement results represent magnetic field levels recorded for a specific point in time, produced by the set of transmission line currents that existed at that point in time. During peak load periods of a year, the line currents would likely be higher than they were during the measurement period in June, 2007, and so magnetic field levels would also be somewhat higher. On the other hand, the electric field measurement results would be about the same no matter what the line currents are, assuming the same degree of shielding by vegetation.

For the aforementioned reasons, these measurement results should be considered only as an example of the existing conditions on the Property.

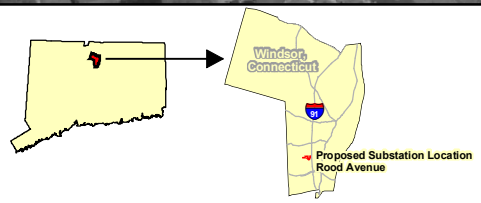
Figure M-1: Locations of EMF Measurements

08/29/07

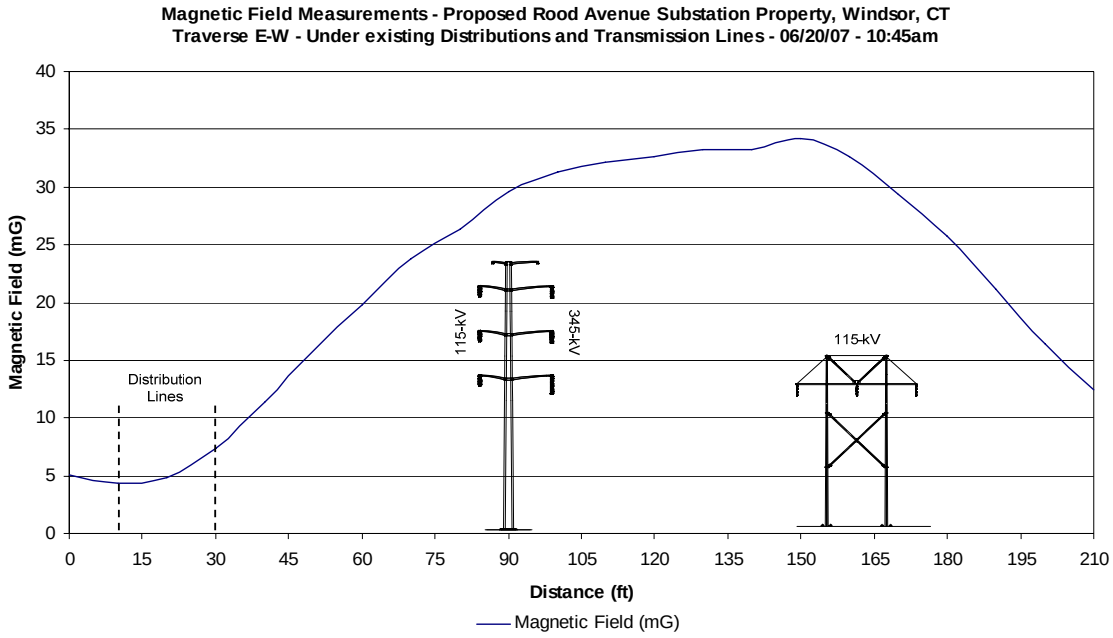
VHB Vanasse Hangen Brustlin, Inc.
Transportation Land Development Environmental Services

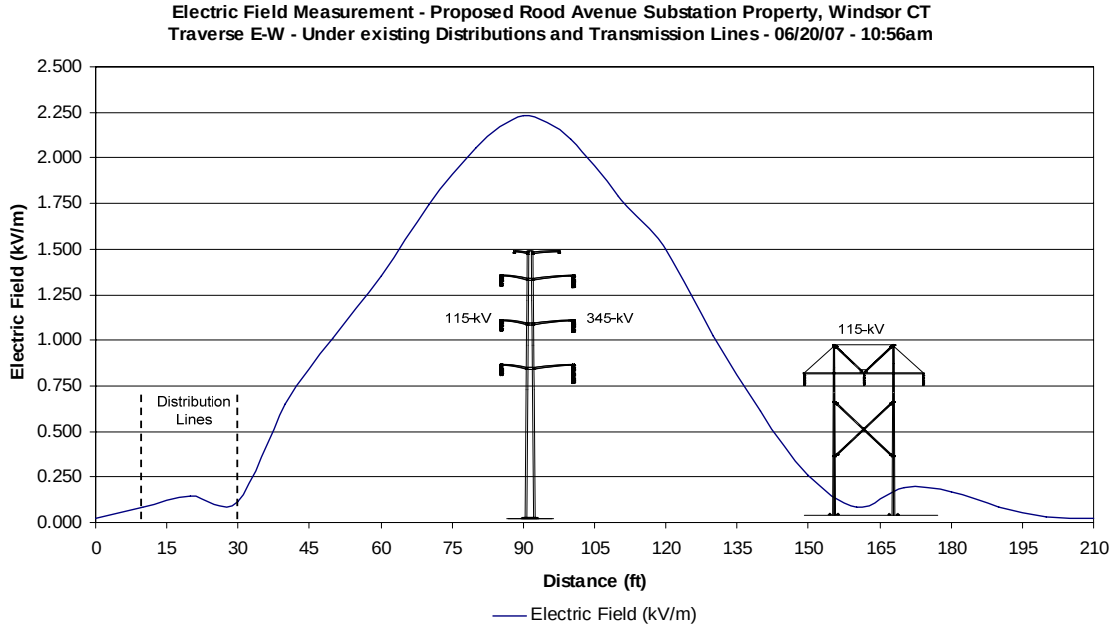
N W E S

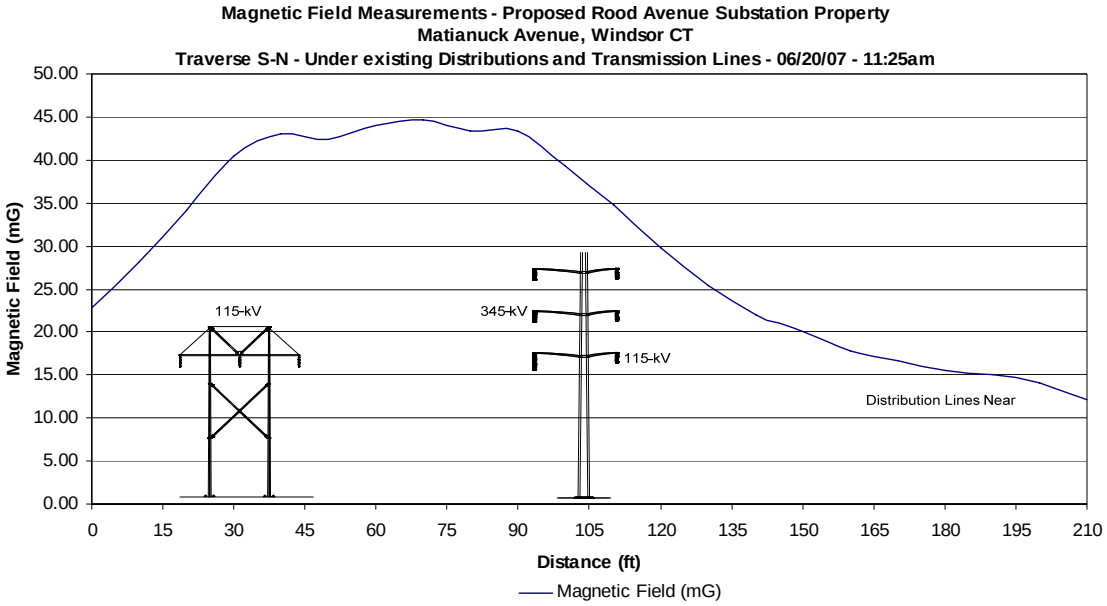
100 50 0 100 Feet

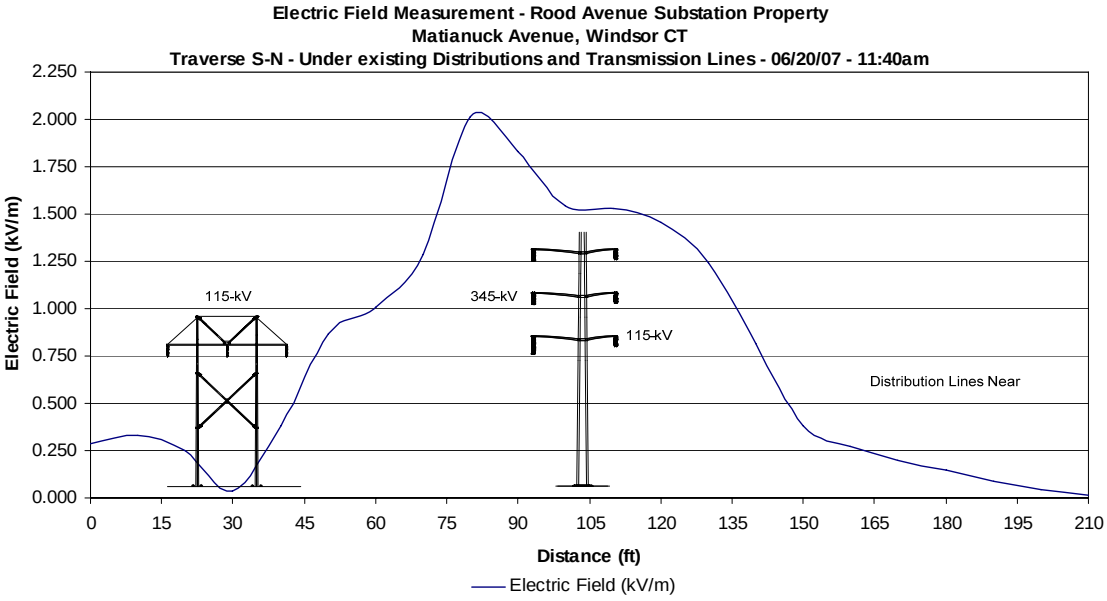


Connecticut Light & Power
The Northeast Utilities System


Magnetic Field Measurements - Proposed Rood Avenue Substation Property, Windsor, CT
Traverse E-W - Under existing Distributions and Transmission Lines - 06/20/07 - 10:45am
Magnetic Field (mG)
Distance (ft)
Distribution Lines
115-kV
345-kV
115-kV
Magnetic Field (mG)


Electric Field Measurement - Proposed Rood Avenue Substation Property, Windsor CT
Traverse E-W - Under existing Distributions and Transmission Lines - 06/20/07 - 10:56am
Electric Field (kV/m)
Distance (ft)
Distribution Lines
115-kV
345-kV
115-kV
Electric Field (kV/m)


Magnetic Field Measurements - Proposed Rood Avenue Substation Property
Matianuck Avenue, Windsor CT
Traverse S-N - Under existing Distributions and Transmission Lines - 06/20/07 - 11:25am
Magnetic Field (mG)
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
0
15
30
45
60
75
90
105
120
135
150
165
180
195
210
Distance (ft)
115-kV
345-kV
115-kV
Distribution Lines Near
Magnetic Field (mG)


Electric Field Measurement - Rood Avenue Substation Property
Matianuck Avenue, Windsor CT
Traverse S-N - Under existing Distributions and Transmission Lines - 06/20/07 - 11:40am
Electric Field (kV/m)
2.250
2.000
1.750
1.500
1.250
1.000
0.750
0.500
0.250
0.000
0
15
30
45
60
75
90
105
120
135
150
165
180
195
210
Distance (ft)
115-kV
345-kV
115-kV
Distribution Lines Near
Electric Field (kV/m)

Summary

Consistent with the Connecticut Siting Council's *Electric and Magnetic Field Best Management Practices for the Construction of Electric Transmission Facilities in Connecticut, May 22, 2007*, the design of the Substation will incorporate field management practices as follows:

- the Substation has been located very close to an existing transmission line so that the length of Substation entry spans is very short
- the Substation equipment has been located at a sufficient distance from property lines so that this equipment makes no noticeable contribution to EMF levels along these property lines
- vegetation will effectively screen electric fields

There are no state or federal limits for electric or magnetic field levels at the property line of a substation. However, the Institute of Electrical and Electronic Engineers ("IEEE") and the International Commission on Non-ionizing Radiation Protection ("ICNIRP") have issued guideline limits for long-term public exposures to these fields. These limits are:

	EF (kV/m)	MF (mG)
IEEE	5.0	9,040
ICNIRP	4.2	833

The existing and proposed levels of electric and magnetic fields at and beyond the property lines of the proposed Substation are typical for all similar Substations and will be well below these IEEE and ICNIRP limits. Based on these aforementioned guidelines and science peer group reviews of epidemiological and laboratory studies, these electric and magnetic field exposure levels will not pose an undue safety or health hazard to persons or property at or adjacent to the Substation property.

M.2 Site Security

A seven-foot-high chain link fence topped by three strands of barbed wire would enclose the Substation yard to prevent unauthorized access. The Substation yard would also be gated and locked. All gates would be padlocked at the end of the workday during construction activities and at all times once the Substation is in service. Appropriate signage would be posted at the Substation alerting the general public of high voltage facilities located within the Substation. Should equipment experience a failure, protective relaying would immediately remove the equipment from service, thereby protecting the public and the equipment within the Substation. Other devices installed within the Substation would constantly monitor the equipment to alert CL&P of any abnormal or emergency situations. The access road would be gated and locked at its entrance along Rood Avenue.

M.3 Traffic Considerations and Hours of Operation

Construction traffic would not greatly affect local traffic because Rood Avenue provides an east-west route used by motorists traveling through the area and site access would be gained from the existing, at-grade drive established along Rood Avenue. Post-construction site conditions would not substantially affect existing traffic patterns. Once construction of the Substation is complete, the facility would be remotely operated, with personnel onsite only for periodic inspections, maintenance and emergency work.

N. PROJECT SCHEDULE

Construction is expected to occur over a period of 12 to 14 months, with the Substation in service by June 2009.

Exhibit 1 - Municipal
Location Approval Letters

TOWN OF WINDSOR
First in Connecticut. First for its citizens.

June 27, 2007

Mr. Robert E. Carberry,
Manager, Transmission Siting & Permitting
Northeast Utilities Company
P.O. Box 270
Hartford, CT 06141-0270

SUBJECT: 264 Rood Avenue & 25 Shelley Avenue, Windsor

Dear Mr. Carberry:

Representatives from CL&P and Vanasse Hangen Brustlin, Inc. made a presentation to the Windsor Inland Wetlands Commission at the regular meeting on June 5, 2007. They showed maps and pictures while discussing the feasible and prudent alternatives that had been considered for a site and location of the substation proposed for the Rood Avenue property. There were some questions from the Commissioners that were answered.

The Commission unanimously approved the Rood Avenue property for the site of the substation and the proposed location of the equipment on the property.

If you have any questions or concerns, please call me at 860-285-1987.

Sincerely,

Cyd R. Groff

Cyd R. Groff
Environmental Planner & Inland Wetlands Agent

C: Marianne Dubuque

CERT #7006 0810 0006 5142 8163

TOWN OF
WINDSOR
First in Connecticut. First for its citizens.

June 27, 2007

Northeast Utilities Service Co.
Attn: Robert Carberry
P.O. Box 270
Hartford, CT 06141

Subject: Preliminary Plan Review CL&P – Proposed substation at 264 Rood Avenue and 25 Shelley Avenue

Dear Mr. Carberry:

At its meeting on June 12, 2007 the Windsor Town Planning & Zoning Commission made the following decision on the subject preliminary plan:

Motion: Commissioner Profe moved that the Windsor Town Planning and Zoning Commission recommend to the Connecticut Siting Council the site located at 264 Rood Avenue and 25 Shelley Avenue for the location of a CL&P substation. Commissioner Kelsey seconded the motion and it passed unanimously, 5-0-0.

Very truly yours,

Marian Madison

Marian Madison
Planning Secretary

Sent Via Certified Mail #70062150000576261820

Exhibit 2
Public Outreach Documents

Connecticut
Light & Power

107 Selden Street, Berlin, CT 06037

The Connecticut Light and Power Company
P.O. Box 270
Hartford, CT 06141-0270
(860) 665-5000
www.cl-p.com

The Northeast Utilities System

May 24, 2007

Dear Resident:

With demand for electricity growing in the area, The Connecticut Light & Power Company (CL&P) is looking for ways to better serve our customers in Windsor.

CL&P is in the preliminary steps of planning to build a new substation for Windsor – a first for the town. Windsor customers are currently served by a similar facility in Bloomfield.

A parcel of land, currently owned by CL&P, adjacent to Rood Avenue has been selected as the best possible location for this facility (please see the site map attached to this letter). Electrical equipment located on the north side of the site will be removed.

We are working closely with local officials to design a facility that fits into the surrounding residential neighborhood. The project site plan will be reviewed by the Inland Wetlands and Watercourses Commission on Tuesday, June 5, 2007, and the Planning and Zoning Commission on Tuesday, June 12, 2007, at the Windsor Town Hall. Both meetings start at 7 p.m.

Our long-term schedule calls for:

- Preliminary planning through 2007
- Regulatory review to begin mid 2008
- Construction to start fall 2008
- In service 2009

Please contact Frank Poirot at 860-665-3409 if you have any questions.

We thank you in advance for your patience and cooperation in this effort.

Sincerely,

Marcella Ferrara , Project Manager
The Connecticut Light & Power Company

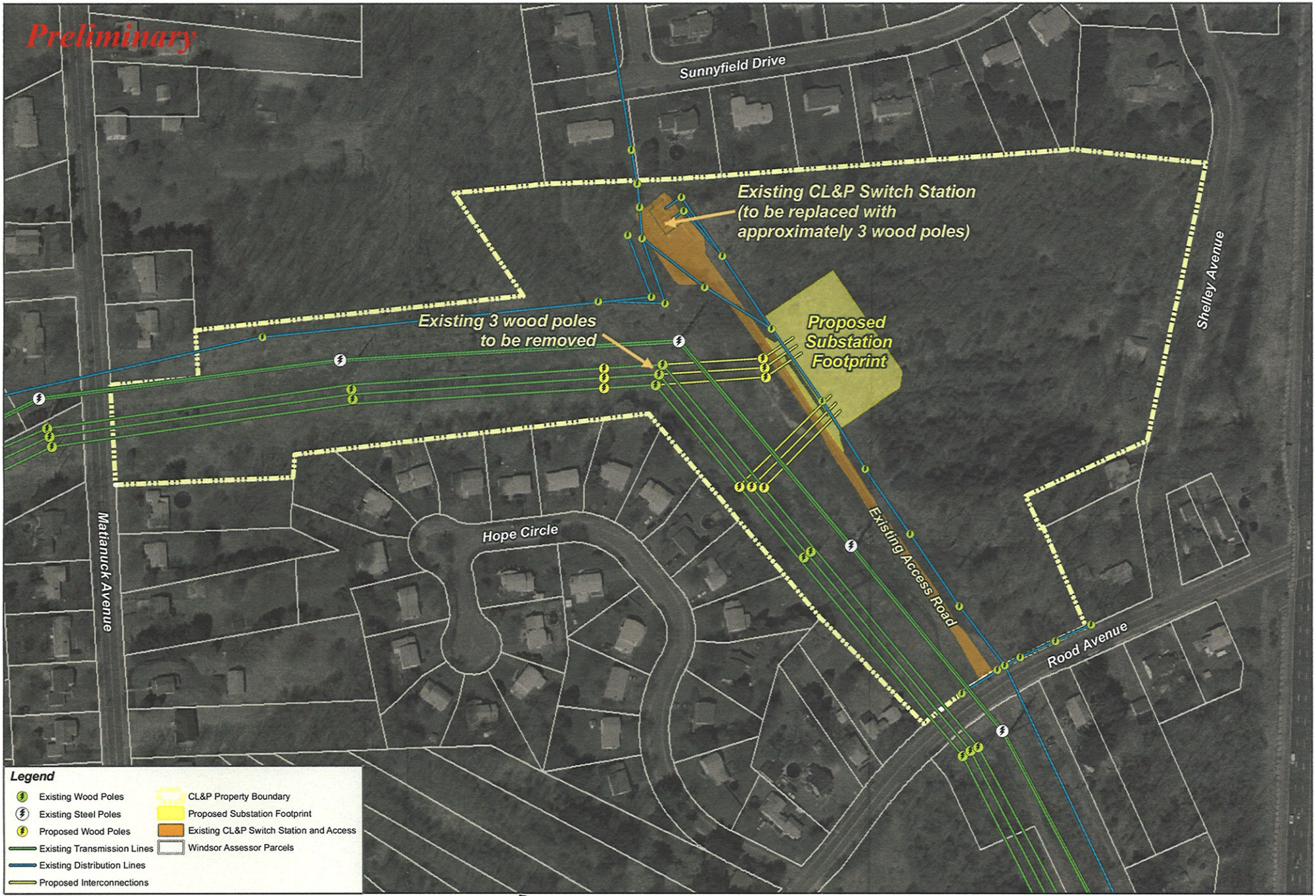

Preliminary
Sunnyfield Drive
Existing CL&P Switch Station
(to be replaced with
approximately 3 wood poles)
Existing 3 wood poles
to be removed
Proposed
Substation
Footprint
Shelley Avenue
Matianuck Avenue
Hope Circle
Existing Access Road
Rood Avenue
Legend
Existing Wood Poles
Existing Steel Poles
Proposed Wood Poles
Existing Transmission Lines
Existing Distribution Lines
Proposed Interconnections
CL&P Property Boundary
Proposed Substation Footprint
Existing CL&P Switch Station and Access
Windsor Assessor Parcels
Windsor,
Connecticut
Proposed Substation
Location
Rood Avenue
CL&P
Property
Boundary
N
W
E
S
150
75
0
150
Feet

Exhibit 3
Site Plan Drawings

Site Plans

Issued for: **Municipal Consultation Filing**

Date Issued: August 29, 2007

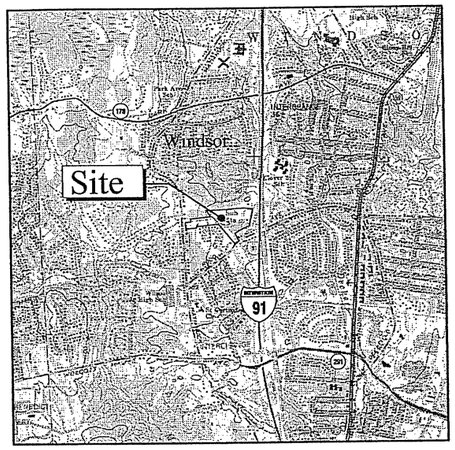
Latest Issue: August 29, 2007

Index

No.	Drawing Title	Latest Issue
C-1	Legend and General Notes	08/29/07
C-2	Overall Site Plan	08/29/07
C-3	Layout and Materials Plan	08/29/07
C-4	Grading, Drainage & Erosion Control Plan	08/29/07
C-5	Landscape Plan	08/29/07
C-6	Site Details	08/29/07
	Reference Drawings	
Ex-1	Existing Conditions Plan	08/29/07

Rood Avenue 24J Substation

Rood Avenue
Windsor, Connecticut



Site Location Map

Property Information

Site:
The Connecticut Light and Power Company
258 & 264 Rood Avenue and 15 & 25 Shelley Avenue
Windsor, Connecticut

Applicant:
The Connecticut Light and Power Company
P.O. Box 270
Hartford, Connecticut 061414-0270
(860) 605-5000

Assessor's Plat: Map 56 Block 31
Lots: 14, 30 and 12

Connecticut Light & Power

The Northeast Utilities System

Vanasse Hangen Brustlin, Inc.
Transportation
Land Development
Environmental Services

VHB Project No. 41260.00
Rood Avenue, Windsor, CT
Issued for: Municipal Consultation Filing - 08/29/07

F:\41200.00 \CAD \ev planset \41200g.dwg

Legend

Exist.	Prop.	
		PROPERTY LINE
		PROJECT LIMIT LINE
		RIGHT-OF-WAY/PROPERTY LINE
		EASEMENT
		BUILDING SETBACK
10+00	10+00	BASELINE
		CONSTRUCTION LAYOUT
		ZONING LINE
		TOWN LINE
		LIMIT OF DISTURBANCE
		WETLAND LINE WITH FLAG BY VHB
		WETLAND BY OTHERS/REVIEWED BY VHB
BLSF	BLSF	BORDERING LAND SUBJECT TO FLOODING
BZ	BZ	WETLAND BUFFER ZONE
NDZ	NDZ	NO DISTURB ZONE
200'RA	200'RA	200' RIVERFRONT AREA
		GRAVEL ROAD
EOP	EOP	EDGE OF PAVEMENT
BB	BB	BITUMINOUS BERM
BC	BC	BITUMINOUS CURB
CC	CC	CONCRETE CURB
CG	CG	CURB AND GUTTER
ECC	ECC	EXTRUDED CONCRETE CURB
MCC	MCC	MONOLITHIC CONCRETE CURB
PCC	PCC	PRECAST CONC. CURB
SGE	SGE	SLOPED GRAN. EDGING
VGC	VGC	VERT. GRAN. CURB
		LIMIT OF CURB TYPE
		SAWCUT
		BUILDING
	EN	BUILDING ENTRANCE
	LD	LOADING DOCK
		BOLLARD
D	D	DUMPSTER PAD
		SIGN
		DOUBLE SIGN
		STEEL GUARDRAIL
		WOOD GUARDRAIL
		PATH
		TREE LINE
		WIRE FENCE
		FENCE
		STOCKADE FENCE
		STONE WALL
		RETAINING WALL
		STREAM / POND / WATER COURSE
		DETENTION BASIN
		HAY BALES
		SILT FENCE
4	4	MINOR CONTOUR
20	20	MAJOR CONTOUR
(10)	(10)	PARKING COUNT
	(C10)	COMPACT PARKING STALLS
DYL	DYL	DOUBLE YELLOW LINE
SL	SL	STOP LINE
		CROSSWALK
		ACCESSIBLE CURB RAMP
		ACCESSIBLE PARKING
VAN	VAN	VAN-ACCESSIBLE PARKING

Exist.	Prop.	
		CONCRETE
		HEAVY DUTY PAVEMENT
		RIPRAP
		CONSTRUCTION ENTRANCE
27.35 TC×	27.35 TC×	TOP OF CURB ELEVATION
26.85 BC×	26.85 BC×	BOTTOM OF CURB ELEVATION
132.75 ×	132.75 ×	SPOT ELEVATION
45.0 TW× 38.5 BW×	45.0 TW× 38.5 BW×	TOP & BOTTOM OF WALL ELEVATION
		BORING LOCATION
TP		TEST PIT LOCATION
MW	MW	MONITORING WELL
UD	UD	UNDERDRAIN
12"D	12"D	DRAIN
6"RD	6"RD	ROOF DRAIN
12"S	12"S	SEWER
FM	FM	FORCE MAIN
OHW	OHW	OVERHEAD WIRE
6"W	6"W	WATER
4"FP	4"FP	FIRE PROTECTION
	2"DW	DOMESTIC WATER
G	G	GAS
E	E	ELECTRIC
STM	STM	STEAM
T	T	TELEPHONE
FA	FA	FIRE ALARM
CATV	CATV	CABLE TV
		CATCH BASIN
		DOUBLE CATCH BASIN
		GUTTER INLET
		DRAIN MANHOLE
		TRENCH DRAIN
		PLUG OR CAP
CO	CO	CLEANOUT
		FLARED END SECTION
		HEADWALL
		SEWER MANHOLE
CS	CS	CURB STOP & BOX
WV	WV	WATER VALVE & BOX
TSV	TSV	TAPPING SLEEVE, VALVE & BOX
		SIAMESE CONNECTION
HYD	HYD	FIRE HYDRANT
WM	WM	WATER METER
PIV	PIV	POST INDICATOR VALVE
W	W	WATER WELL
GG	GG	GAS GATE
GM	GM	GAS METER
EMH	EMH	ELECTRIC MANHOLE
EM	EM	ELECTRIC METER
		LIGHT POLE
TMH	TMH	TELEPHONE MANHOLE
T	T	TRANSFORMER PAD
		UTILITY POLE
		GUY POLE
		GUY WIRE & ANCHOR
HH	HH	HAND HOLE
PB	PB	PULL BOX

Abbreviations

General

ABAN	ABANDON
ACR	ACCESSIBLE CURB RAMP
ADJ	ADJUST
APPROX	APPROXIMATE
BIT	BITUMINOUS
BS	BOTTOM OF SLOPE
BWLL	BROKEN WHITE LANE LINE
CONC	CONCRETE
DYCL	DOUBLE YELLOW CENTER LINE
EL	ELEVATION
ELEV	ELEVATION
EXIST	EXISTING
FDN	FOUNDATION
FFE	FIRST FLOOR ELEVATION
GRAN	GRANITE
GTD	GRADE TO DRAIN
LA	LANDSCAPE AREA
LOD	LIMIT OF DISTURBANCE
MAX	MAXIMUM
MIN	MINIMUM
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
PERF	PERFORATED
PROP	PROPOSED
REM	REMOVE
RET	RETAIN
R&D	REMOVE AND DISPOSE
R&R	REMOVE AND RESET
SWEL	SOLID WHITE EDGE LINE
SWLL	SOLID WHITE LANE LINE
TS	TOP OF SLOPE
TYP	TYPICAL

Utility

CB	CATCH BASIN
CMP	CORRUGATED METAL PIPE
CO	CLEANOUT
DCB	DOUBLE CATCH BASIN
DMH	DRAIN MANHOLE
CIP	CAST IRON PIPE
COND	CONDUIT
DIP	DUCTILE IRON PIPE
FES	FLARED END SECTION
FM	FORCE MAIN
F&G	FRAME AND GRATE
F&C	FRAME AND COVER
GI	GUTTER INLET
GT	GREASE TRAP
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HH	HANDHOLE
HW	HEADWALL
HYD	HYDRANT
INV	INVERT ELEVATION
I=	INVERT ELEVATION
LP	LIGHT POLE
MES	METAL END SECTION
PWW	PAVED WATER WAY
PVC	POLYVINYLCHLORIDE PIPE
RCP	REINFORCED CONCRETE PIPE
R=	RIM ELEVATION
SMH	SEWER MANHOLE
TSV	TAPPING SLEEVE, VALVE AND BOX
UG	UNDERGROUND
UP	UTILITY POLE

Notes:

General

1. CONTRACTOR SHALL NOTIFY "CALL BEFORE YOU DIG" (1-800-922-4455) AT LEAST 72 HOURS BEFORE EXCAVATING.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR SITE SECURITY AND JOB SAFETY. CONSTRUCTION ACTIVITIES SHALL BE IN ACCORDANCE WITH OSHA STANDARDS AND LOCAL REQUIREMENTS.
3. AREAS DISTURBED DURING CONSTRUCTION AND NOT RESTORED WITH IMPERVIOUS SURFACES (BUILDINGS, PAVEMENTS, WALKS, ETC.) SHALL RECEIVE 6 INCHES LOAM AND SEED.
4. WORK WITHIN THE LOCAL RIGHTS-OF-WAY SHALL CONFORM TO LOCAL MUNICIPAL STANDARDS. WORK WITHIN STATE RIGHTS-OF-WAY SHALL CONFORM TO THE LATEST EDITION OF THE STATE HIGHWAY DEPARTMENTS STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES.
5. UPON AWARD OF CONTRACT, CONTRACTOR SHALL MAKE NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN NECESSARY PERMITS, PAY FEES, AND POST BONDS ASSOCIATED WITH THE WORK INDICATED ON THE DRAWINGS, IN THE SPECIFICATIONS, AND IN THE CONTRACT DOCUMENTS. DO NOT CLOSE OR OBSTRUCT ROADWAYS, SIDEWALKS, AND FIRE HYDRANTS, WITHOUT APPROPRIATE PERMITS.
6. TRAFFIC SIGNAGE AND PAVEMENT MARKINGS SHALL CONFORM TO THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.
7. AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT THE CONTRACTOR'S EXPENSE.
8. IN THE EVENT THAT SUSPECTED CONTAMINATED SOIL, GROUNDWATER, AND OTHER MEDIA ARE ENCOUNTERED DURING EXCAVATION AND CONSTRUCTION ACTIVITIES BASED ON VISUAL, OLFACTORY, OR OTHER EVIDENCE, THE CONTRACTOR SHALL STOP WORK IN THE VICINITY OF THE SUSPECT MATERIAL TO AVOID FURTHER SPREADING OF THE MATERIAL, AND SHALL NOTIFY THE OWNER IMMEDIATELY SO THAT THE APPROPRIATE TESTING AND SUBSEQUENT ACTION CAN BE TAKEN.
9. CONTRACTOR SHALL PREVENT DUST, SEDIMENT, AND DEBRIS FROM EXITING THE SITE AND SHALL BE RESPONSIBLE FOR CLEANUP, REPAIRS AND CORRECTIVE ACTION IF SUCH OCCURS.
10. DAMAGE RESULTING FROM CONSTRUCTION LOADS SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO OWNER.
11. CONTRACTOR SHALL CONTROL STORMWATER RUNOFF DURING CONSTRUCTION TO PREVENT ADVERSE IMPACTS TO OFF SITE AREAS, AND SHALL BE RESPONSIBLE TO REPAIR RESULTING DAMAGES, IF ANY, AT NO COST TO OWNER.
12. THIS PROJECT DISTURBS MORE THAN ONE ACRE OF LAND AND FALLS WITHIN THE NPDES CONSTRUCTION GENERAL PERMIT (CGP) PROGRAM AND EPA JURISDICTION. PRIOR TO THE START OF CONSTRUCTION CONTRACTOR IS TO FILE A CGP NOTICE OF INTENT WITH THE EPA AND PREPARE A STORMWATER POLLUTION PREVENTION PLAN IN ACCORDANCE WITH THE NPDES REGULATIONS. CONTRACTOR SHALL CONFIRM THE OWNER HAS ALSO FILED A NOTICE OF INTENT WITH THE EPA.

Utilities

1. THE LOCATIONS, SIZES, AND TYPES OF EXISTING UTILITIES ARE SHOWN AS AN APPROXIMATE REPRESENTATION ONLY. THE OWNER OR IT'S REPRESENTATIVE(S) HAVE NOT INDEPENDENTLY VERIFIED THIS INFORMATION AS SHOWN ON THE PLANS. THE UTILITY INFORMATION SHOWN DOES NOT GUARANTEE THE ACTUAL EXISTENCE, SERVICEABILITY, OR OTHER DATA CONCERNING THE UTILITIES, NOR DOES IT GUARANTEE AGAINST THE POSSIBILITY THAT ADDITIONAL UTILITIES MAY BE PRESENT THAT ARE NOT SHOWN ON THE PLANS. PRIOR TO ORDERING MATERIALS AND BEGINNING CONSTRUCTION, THE CONTRACTOR SHALL VERIFY AND DETERMINE THE EXACT LOCATIONS, SIZES, AND ELEVATIONS OF THE POINTS OF CONNECTIONS TO EXISTING UTILITIES AND, SHALL CONFIRM THAT THERE ARE NO INTERFERENCES WITH EXISTING UTILITIES AND THE PROPOSED UTILITY ROUTES, INCLUDING ROUTES WITHIN THE PUBLIC RIGHTS OF WAY.
2. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, OR EXISTING CONDITIONS DIFFER FROM THOSE SHOWN SUCH THAT THE WORK CANNOT BE COMPLETED AS INTENDED, THE LOCATION, ELEVATION, AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED IN WRITING TO THE OWNER'S REPRESENTATIVE FOR THE RESOLUTION OF THE CONFLICT AND CONTRACTOR'S FAILURE TO NOTIFY PRIOR TO PERFORMING ADDITIONAL WORK RELEASES OWNER FROM OBLIGATIONS FOR ADDITIONAL PAYMENTS WHICH OTHERWISE MAY BE WARRANTED TO RESOLVE THE CONFLICT.
3. THE LOCATION, SIZE, DEPTH, AND SPECIFICATIONS FOR CONSTRUCTION OF PROPOSED PRIVATE UTILITY SERVICES SHALL BE INSTALLED ACCORDING TO THE REQUIREMENTS PROVIDED BY, AND APPROVED BY, THE RESPECTIVE UTILITY COMPANY (GAS, TELEPHONE, ELECTRIC, FIRE ALARM, ETC.). FINAL DESIGN LOADS AND LOCATIONS TO BE COORDINATED WITH OWNER AND ARCHITECT.
4. THE CONTRACTOR SHALL MAKE ARRANGEMENTS FOR AND SHALL BE RESPONSIBLE FOR PAYING FEES FOR POLE RELOCATION AND FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE, FIRE ALARM, AND ANY OTHER PRIVATE UTILITIES, WHETHER WORK IS PERFORMED BY CONTRACTOR OR BY THE UTILITIES COMPANY.
5. UTILITY PIPE MATERIALS SHALL BE AS FOLLOWS, UNLESS OTHERWISE NOTED ON THE PLAN:
   A. WATER PIPES SHALL BE SPECIFIED BY THE WATER COMPANY.
   B. SANITARY SEWER PIPES SHALL BE POLYVINYL CHLORIDE (PVC) SEWER PIPE
   C. STORM DRAINAGE PIPES SHALL BE CLASS V RCP.
6. SITE CONTRACTOR SHALL COORDINATE WITH ELECTRICAL CONTRACTOR AND SHALL FURNISH EXCAVATION, INSTALLATION, AND BACKFILL OF ELECTRICAL FURNISHED SITEWORK RELATED ITEMS SUCH AS PULL BOXES, CONDUITS, DUCT BANKS, LIGHT POLE BASES, AND CONCRETE PADS. SITE CONTRACTOR SHALL FURNISH CONCRETE ENCASEMENT OF DUCT BANKS IF REQUIRED BY THE UTILITY COMPANY AND AS INDICATED ON THE DRAWINGS.

Layout and Materials

1. PROPOSED GRANITE BOUNDS AND ANY EXISTING PROPERTY LINE MONUMENTATION DISTURBED DURING CONSTRUCTION SHALL BE SET OR RESET BY A PROFESSIONAL LICENSED SURVEYOR.
2. PRIOR TO START OF CONSTRUCTION, CONTRACTOR SHALL VERIFY EXISTING PAVEMENT ELEVATIONS AT INTERFACE WITH PROPOSED ACCESS DRIVE, AND EXISTING GROUND ELEVATIONS ADJACENT TO DRAINAGE OUTLETS TO ASSURE PROPER TRANSITIONS BETWEEN EXISTING AND PROPOSED FACILITIES.
3. SYMBOLS AND LEGENDS OF PROJECT FEATURES ARE GRAPHIC REPRESENTATIONS AND ARE NOT NECESSARILY SCALED TO THEIR ACTUAL DIMENSIONS OR LOCATIONS ON THE DRAWINGS. THE CONTRACTOR SHALL REFER TO THE DETAIL SHEET DIMENSIONS, MANUFACTURERS' LITERATURE, SHOP DRAWINGS AND FIELD MEASUREMENTS OF SUPPLIED PRODUCTS FOR LAYOUT OF THE PROJECT FEATURES.
4. CONTRACTOR SHALL NOT RELY SOLELY ON ELECTRONIC VERSIONS OF PLANS, SPECIFICATIONS, AND DATA FILES THAT ARE OBTAINED FROM THE DESIGNERS, BUT SHALL VERIFY LOCATION OF PROJECT FEATURES IN ACCORDANCE WITH THE PAPER COPIES OF THE PLANS AND SPECIFICATIONS THAT ARE SUPPLIED AS PART OF THE CONTRACT DOCUMENTS.

Demolition

1. THE CONTRACTOR TO REMOVE AND DISPOSE OF EXISTING MANMADE SURFACE FEATURES WITHIN THE LIMIT OF WORK INCLUDING BUILDINGS, STRUCTURES, PAVEMENTS, SLABS, CURBING, FENCES, UTILITY POLES, SIGNS, ETC. UNLESS INDICATED OTHERWISE ON THE DRAWINGS. REMOVE AND DISPOSE OF EXISTING UTILITIES, FOUNDATIONS, AND UNSUITABLE MATERIAL WITHIN THE PROPOSED BUILDING FOOTPRINT AND TEN FEET BEYOND AND BENEATH PROPOSED EXTERIOR COLUMNS, PER DRAWINGS AND SPECIFICATIONS.
2. EXISTING UTILITIES SHALL BE TERMINATED, UNLESS OTHERWISE NOTED, IN CONFORMANCE WITH LOCAL, STATE, AND INDIVIDUAL UTILITY COMPANIES STANDARDS SPECIFICATIONS, AND DETAILS. THE CONTRACTOR SHALL COORDINATE UTILITY SERVICE DISCONNECTS WITH THE UTILITY REPRESENTATIVES.
3. CONTRACTOR SHALL DISPOSE OF DEMOLITION DEBRIS IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS, ORDINANCES, AND STATUTES.

Erosion Control

1. PRIOR TO STARTING ANY OTHER WORK ON THE SITE, THE CONTRACTOR SHALL NOTIFY APPROPRIATE AGENCIES AND SHALL INSTALL EROSION CONTROL MEASURES AS SHOWN ON THE PLANS AND AS IDENTIFIED IN FEDERAL, STATE, AND LOCAL APPROVAL DOCUMENTS PERTAINING TO THIS PROJECT.
2. CONTRACTOR SHALL INSPECT AND MAINTAIN EROSION CONTROL MEASURES, AND REMOVE SEDIMENT THEREFROM ON A WEEKLY BASIS AND WITHIN TWELVE HOURS AFTER EACH STORM EVENT AND DISPOSE OF SEDIMENTS IN AN UPLAND AREA SUCH THAT THEY DO NOT ENCUMBER OTHER DRAINAGE STRUCTURES AND PROTECTED AREAS.
3. CONTRACTOR SHALL BE FULLY RESPONSIBLE TO CONTROL CONSTRUCTION SUCH THAT SEDIMENTATION SHALL NOT AFFECT REGULATORY PROTECTED AREAS, WHETHER SUCH SEDIMENTATION IS CAUSED BY WATER, WIND, OR DIRECT DEPOSIT.
4. CONTRACTOR SHALL PERFORM CONSTRUCTION SEQUENCING SUCH THAT EARTH MATERIALS ARE EXPOSED FOR A MINIMUM OF TIME BEFORE THEY ARE COVERED, SEEDED, OR OTHERWISE STABILIZED TO PREVENT EROSION.
5. UPON COMPLETION OF CONSTRUCTION AND ESTABLISHMENT OF PERMANENT GROUND COVER, CONTRACTOR SHALL REMOVE AND DISPOSE OF EROSION CONTROL MEASURES AND CLEAN SEDIMENT AND DEBRIS FROM ENTIRE DRAINAGE AND SEWER SYSTEMS.

Existing Conditions Information

1. BASE PLAN: PROPERTY LINE INFORMATION SHOWN IS NOT TO BE CONSTRUED AS HAVING BEEN OBTAINED AS A RESULT OF A FIELD SURVEY BY A SURVEYPR, AND IS SUBJECT TO SUCH CHANGE AS AN ACCURATE FIELD SURVEY MAY DISCLOSE.
   A. DELINEATION OF THE WETLANDS AND PLACEMENT OF THE FLAGS WAS PERFORMED BY: VHB, INC.
   B. FLAGS MARKING THE WETLANDS WERE LOCATED BY: VHB, INC.
   C. ALL WETLANDS BOUNDARY NOT ASSOCIATED WITH WETLAND FLAGS WERE DELINEATED BY OTHERS AND REVIEWED BY VHB.
2. TOPOGRAPHY: ELEVATIONS ARE BASED ON CT NAD 83.

PLANS AND SPECIFICATIONS ARE SUBJECT TO REVISIONS PENDING FINAL SITING COUNCIL APPROVAL

PRELIMINARY

CAD GENERATED DWG

MF	NO	DATE	REVISIONS	BY	CHK	APP	APP

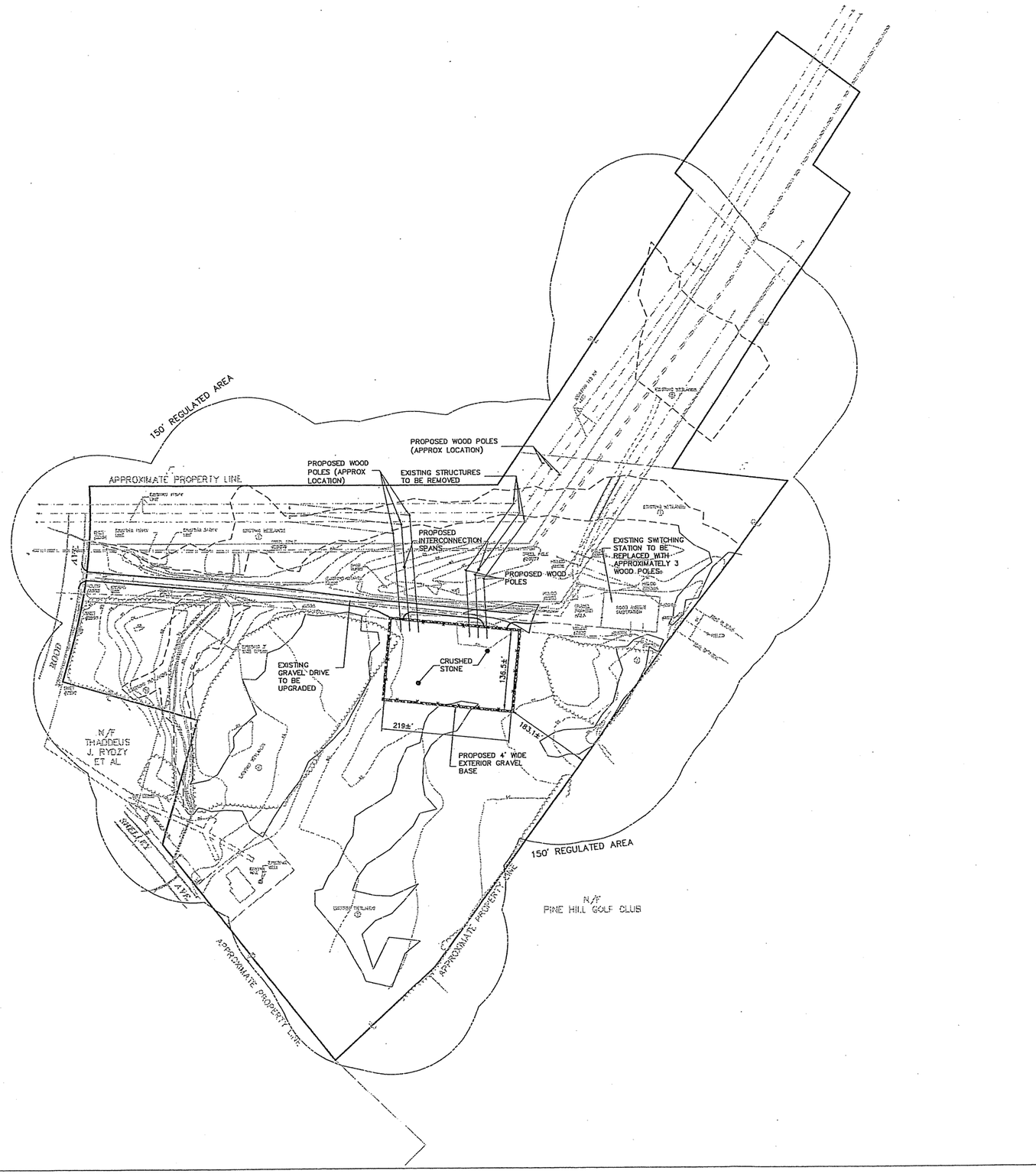
NORTHEAST UTILITIES SERVICE CO.

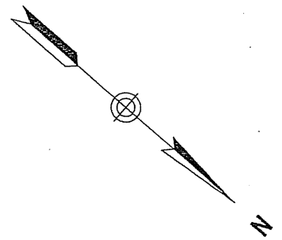
FOR THE CONNECTICUT LIGHT & POWER COMPANY

TITLE

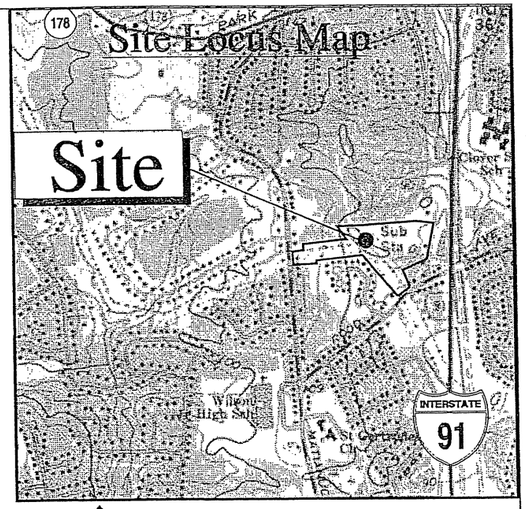
Legend and General Notes
Rood Avenue Substation
Windsor, Connecticut

BY	VHB	CHKD		APP	APP
DATE	08/29/07	DATE		DATE	DATE
SCALE	NONE			DWG. NO.	C-1





Site Locus Map



Connecticut Light & Power

The Northeast Utilities System

100 0 100 200
SCALE IN FEET

PLANS AND SPECIFICATIONS ARE SUBJECT TO REVISIONS PENDING FINAL SITING COUNCIL APPROVAL

PRELIMINARY

CAD GENERATED DWG

MF	NO	DATE	REVISIONS	BY	CHK	APP	APP

NORTHEAST UTILITIES SERVICE CO.

FOR THE CONNECTICUT LIGHT & POWER COMPANY

TITLE

Overall Site Plan
Rood Avenue Substation
Windsor, Connecticut

BY VHB	CHKD	APP	APP
DATE 08/29/07	DATE	DATE	DATE
SCALE 1"=100'		DWG. NO. C-2	

APPROXIMATE PROPERTY LINE

PROPOSED WOOD POLES (APPROX LOCATION)

EXISTING STRUCTURES TO BE REMOVED

PROPOSED WOOD POLES (APPROX LOCATION)

EXISTING LINES TO BE REMOVED BETWEEN PROPOSED STRUCTURES

PROPOSED INTERCONNECTION TRANSMISSION LINES

EXISTING 115KV LINE

EXISTING 345KV LINE

EXISTING WETLANDS 1

STEEL POLE #20078

STEEL POLE #20077

SHET #2594

SHET #2593

SHET #2592

ROOD AVE.

15'R

HELCO #2538

EXISTING GATE

HELCO #2537

SAND DUNES

PROPOSED ACCESS PROCESS AGGREGATE M.05

EXISTING GRAVEL DRIVE

PROPOSED WOOD POLES

HELCO #2203

HELCO #2529

HELCO #2530A

HELCO #2530

EXISTING SWITCHING STATION TO BE REPLACED WITH APPROXIMATELY 3 WOOD POLES

PROPOSED TEMPORARY CROSSING. USE EXISTING CROSSING (14' WIDE TIMBER MATS)

GRAVEL PARKING AREA

ROOD AVENUE SUBSTATION

EDGE OF R.O.W.

HELCO

EXISTING DRIVEWAY TO BE UPGRADED (PROCESS AGGREGATE M.05)

PROPOSED CHAIN LINK FENCE (TYP.)

CRUSHED STONE

136'±

219'±

183'±

PROPOSED 4' WIDE EXTERIOR GRAVEL BASE

EXISTING WETLANDS 2

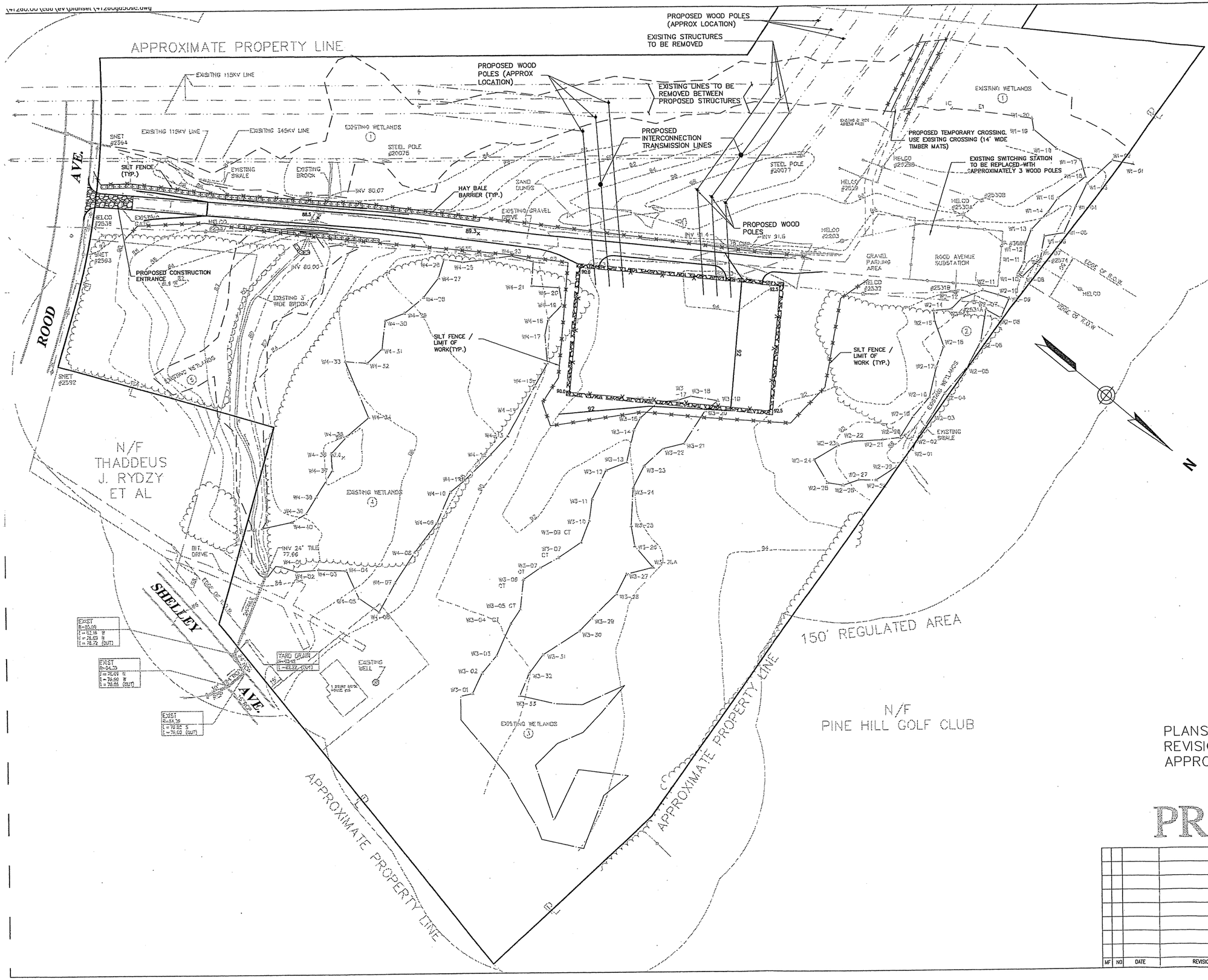
EXISTING WETLANDS 3

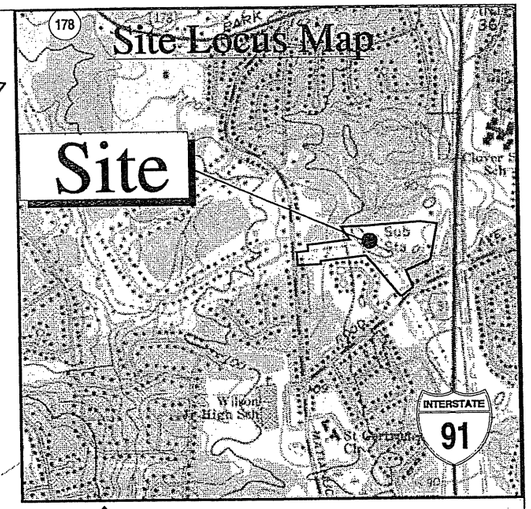
EXISTING WETLANDS 4

EXISTING WETLANDS

EXISTING WETLANDS

EXISTING WETLANDS





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PRELIMINARY

CAD GENERATED DWG

MF	NO	DATE	REVISIONS	BY	CHK	APP	APP

NORTHEAST UTILITIES SERVICE CO.

FOR THE CONNECTICUT LIGHT & POWER COMPANY

TITLE
Grading, Drainage & Erosion Control Plan
Rood Avenue Substation
Windsor, Connecticut

BY	VEB	CHKD	APP	APP
DATE	08/29/07	DATE	DATE	DATE
SCALE	1" = 50'		DWG. NO.	C-4

APPROXIMATE PROPERTY LINE

PROPOSED WOOD POLES (APPROX LOCATION)

EXISITNG STRUCTURES TO BE REMOVED

PROPOSED WOOD POLES (APPROX LOCATION)

EXISTING LINES TO BE REMOVED BETWEEN PROPOSED STRUCTURES

PROPOSED INTERCONNECTION TRANSMISSION LINES

EXISTING 115KV LINE

EXISTING 345KV LINE

EXISTING WETLANDS

STEEL POLE #20078

STEEL POLE #20077

SNET #2594

SNET #2593

SNET #2592

HELCO #2535

HELCO #2537

HELCO #2539

HELCO #2533

HELCO #2529

HELCO #2528

HELCO #2531

HELCO #2530

HELCO #2532

HELCO #2534

HELCO #2536

HELCO #2538

EXISTING SWITCHING STATION TO BE REPLACED WITH APPROXIMATELY 3 WOOD POLES

EXISTING SWALE

EXISTING BROOK

INV 80.07

OAHO DUNES

EXISTING GRAVEL DRIVE

EXISTING GATE

INV 91.4

INV 91.6

PROPOSED WOOD POLES

WETLAND BUFFER ENHANCEMENTS

GRAVEL PARKING AREA

ROAD TO PINE HILL SUBSTATION

EDGE OF ROW

EXISTING 3' WIDE BROOK

INV 80.06

EXISTING PINK LADY SLIPPER AREA

WETLAND BUFFER ENHANCEMENTS

WETLAND RESTORATION

GENERAL VEGETATIVE SCREENING AREA

WETLAND RESTORATION

RELOCATION OF PINK LADY SLIPPERS

WETLAND BUFFER ENHANCEMENTS

GENERAL VEGETATIVE SCREENING AREA

EXISTING WETLANDS

EXISTING SWALE

ROOD AVE.

SHELLEY AVE.

EST. DRIVE

INV 24" TILE 77.66

EXISTING WELL

1 FRONT DOOR HOUSE #19

YARD DRAIN INV=75.55 L=62.72 (OUT)

ENOST R=50.00 L=92.16 N L=75.72 (OUT)

ENST R=54.39 L=75.99 N L=76.66 (OUT)

ENOST R=44.50 L=79.82 S L=76.65 (OUT)

N/F THADDEUS J. RYDZY ET AL

N/F PINE HILL GOLF CLUB

150' REGULATED AREA

APPROXIMATE PROPERTY LINE

APPROXIMATE PROPERTY LINE

P.L.

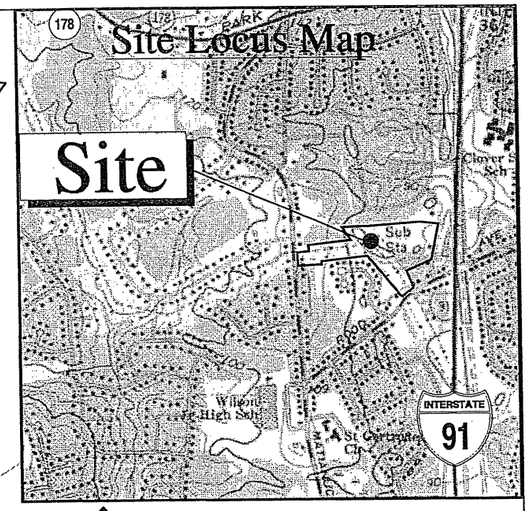
P.L.

N

50 0 50 100

SCALE IN FEET

Site Locus Map



N

1000 0 1000 2000

SCALE IN FEET

Connecticut Light & Power

The Northeast Utilities System

PLANS AND SPECIFICATIONS ARE SUBJECT TO REVISIONS PENDING FINAL SITING COUNCIL APPROVAL

PRELIMINARY

CAD GENERATED DWG

MF	NO.	DATE	REVISIONS	BY	CHK	APP	APP

NORTHEAST UTILITIES SERVICE CO.

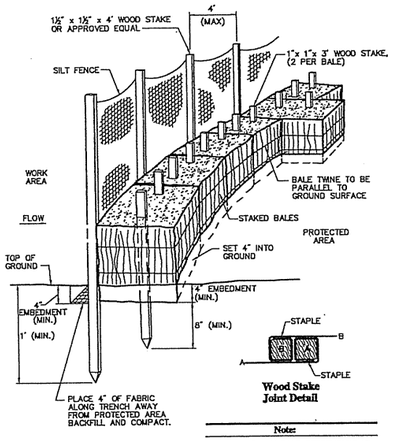
FOR THE CONNECTICUT LIGHT & POWER COMPANY

TITLE

Landscape Plan
Rood Avenue Substation
Windsor, Connecticut

BY	VHB	CHKD	APP
DATE	08/29/07	DATE	DATE
SCALE	1"=50'		DWG. NO. C-5

...: (+)20d.dd (dd \ev \plotset \+)20dd.dwg



Wood Stake Joint Detail

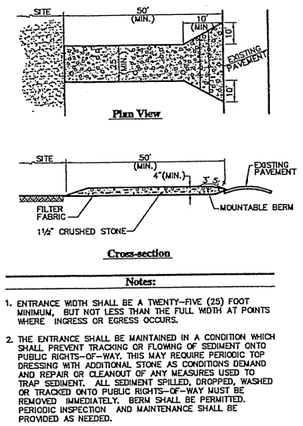
Note:

PLACE ONE HAY BALE PERPENDICULAR ALONG HAY BALE BARRIER (100' O.C.).

Silt Fence / Hay Bale Barrier (Embedded)

6/03

N.T.S. Source: VHB LD_654



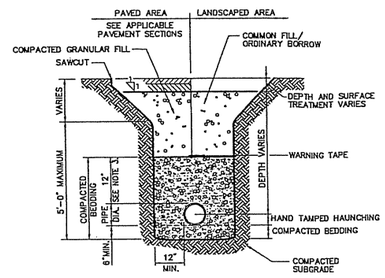
Notes:

1. ENTRANCE WIDTH SHALL BE A TWENTY-FIVE (25) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
2. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH SHALL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY. BERM SHALL BE PERMITTED. PERIODIC INSPECTION AND MAINTENANCE SHALL BE PROVIDED AS NEEDED.
3. STABILIZED CONSTRUCTION EXIT SHALL BE REMOVED PRIOR TO FINAL FINISH MATERIALS BEING INSTALLED.

Stabilized Construction Exit

6/03

N.T.S. Source: VHB LD_682



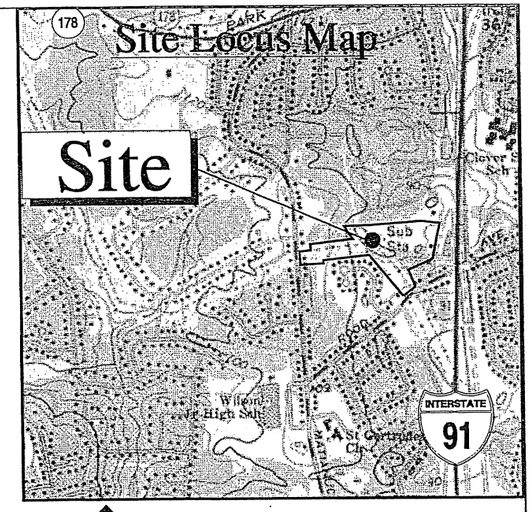
Notes:

1. WHERE UTILITY TRENCHES ARE CONSTRUCTED THROUGH DETENTION BASIN BERMS OR OTHER SUCH SPECIAL SECTIONS, PLACE TRENCH BACKFILL WITH MATERIALS SIMILAR TO THE SPECIAL SECTION REQUIREMENTS.
2. USE METALLIC TRACING/WARNING TAPE OVER ALL PIPES.
3. FOR HDPE PIPE, DIMENSION IS 24 INCHES.

Utility Trench

6/03

N.T.S. Source: VHB LD_300



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PRELIMINARY

CAD GENERATED DWG

NF	NO	DATE	REVISIONS	BY	CHK	APP	APP

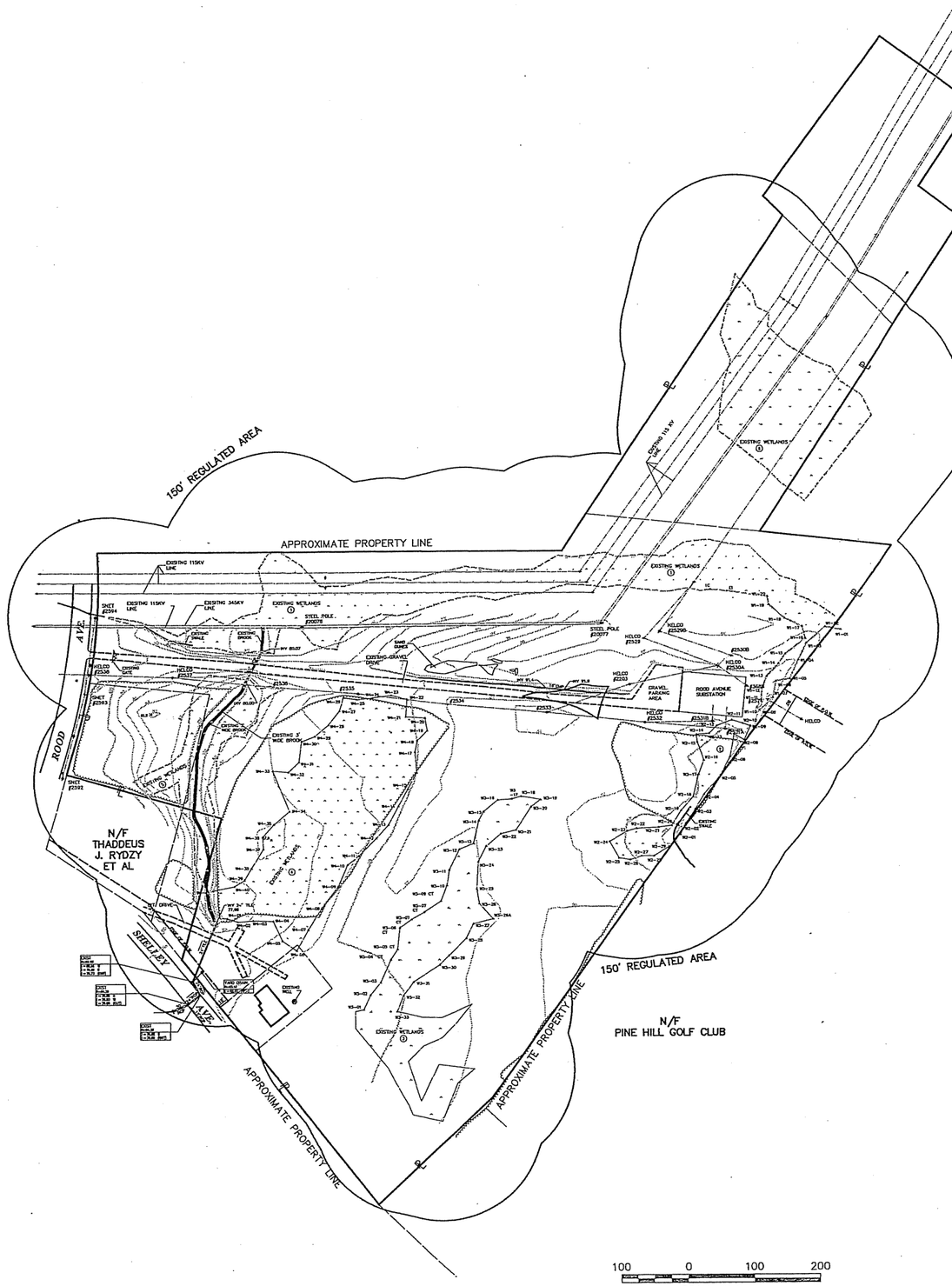
NORTHEAST UTILITIES SERVICE CO.

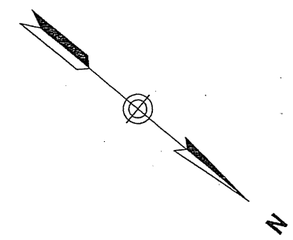
FOR THE CONNECTICUT LIGHT & POWER COMPANY

TITLE

Site Details
Rood Avenue Substation
Windsor, Connecticut

BY	VHB	CHKD		APP	APP
DATE	08/29/07	DATE		DATE	DATE
SCALE	NONE			DWG. NO.	C-6





MAP REFERENCES

1. THE HARTORD ELECTRIC LIGHT CO MAP SHOWNG LAND TO BE PURCHASED FROM THE CONNECTICUT POWER COMPANY TOWN OF WNDSOR CONNECTICUT SCALE 1" = 100' JUNE, 1954.

2. THE HARTFORD ELECTRIC COMPANY LAND ON NORTH SIDE OF ROOD ROAD TOWN OF WNDSOR SCALE 1' = 100' DATE JAN., 1955 ENGINEERING DEPT. DRAWN BY T.J.S REFERENCE 13711–C.

3. MAP OF LAND TO BE PURCHASED FROM JOHN KURLICK, JR. & JANET H. KURLICK TOWN OF WINDSOR CONNECTICUT THE HARTFORD ELECTRIC LIGHT CO. GENERAL ENGINEERING DEPARTMENT DRAWN BY T.J.S. CHECKED BY R.L. APPROVED BY R.FIELD SCALE 1" = 100' DATE SEPT. 1958 NO. M102C23.

4. LAND TO BE PURCHASED FROM JOSEPH W. DERENTHAL AND JUSTINE B. DERENTHAL WINDSOR CONN. THE HARTFORD ELECTRIC CO. GENERAL ENGINEERING DEPARTMENT DRAWN BY W.A.M. CHECKED BY R.C.F. APPROVED BY R.C.F. SCALE 1" = 100' DATE MAY 12, 1960 NO. M102E26.

5. HARTFORD–NO. BLOOMFIELD R/W LAND TO BE EXCHANGED WITH WALTER N. KRAVCHUK WINDSOR CONNECTICUT THE HARTFORD ELECTRIC CO. GENERAL ENGINEERING DEPARTMENT DRAWN BY R.H.S. CHECKED BY W.R. APPROVED BY R.C.F. SCALE 1" = 100' DATE JULY, 1960 NO. M102E30.

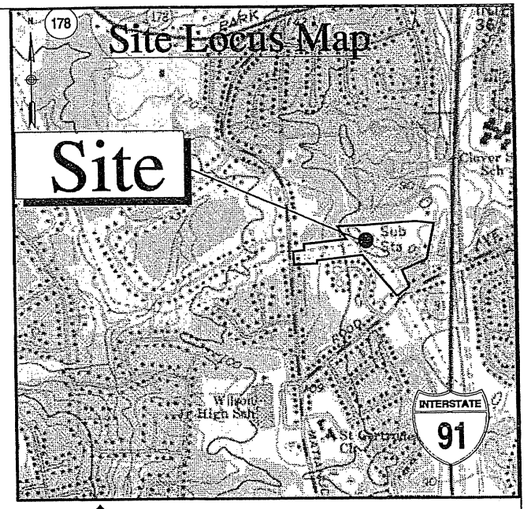
6. LAND TO BE PURCHASED FROM CECELIA KOLODZIEJ, ET AL WINDSOR CONNECTICUT THE HARTFORD ELECTRIC CO. GENERAL ENGINEERING DEPARTMENT DRAWN BY SLICER APPROVED BY R.C.F. SCALE 1" = 100' DATE APRIL, 1966 NO. B201T08R.

7. HARTFORD TO BLOOMFIELD R/W MAP OF LAND TO BE PURCHASED FROM IRVING P. CLARKE WINDSOR CONN. THE HARTFORD ELECTRIC CO. GENERAL ENGINEERING DEPARTMENT DRAWN BY SLICER APPROVED BY R.C.F. SCALE 1" = 100' DATE MAY, 1967 NO. B201L17R.

8. THE CONNECTICUT LIGHT AND POWER CO. BERLIN, CONN. PLAN SHOWING LAND TO BE CONVEYED TO WILLIAM PETROSKE, ET AL IN THE TOWN OF WINDSOR, CONN. SCALE:1"=40' DATE:MARCH 16, 1988 NO. 50908 PREPARED BY NORTHEAST UTILITIES SERVICE COMPANY SYSTEM REAL ESTATE DEPARTMENT DRAWN BY: J.M. CHECKED BY:E.F.F. PROJECT: WINDSOR SUBSTATION PROJ.NO. 164–3.629 DWG. NO. 50908.

PROPERTY LINE INFORMATION WAS COMPILED FROM OTHER MAPS, RECORD RESEARCH OR OTHER SOURCES OF INFORMATION. PROPERTY LINE INFORMATION SHOWN IS NOT TO BE CONSTRUED AS HAVING BEEN OBTAINED AS THE RESULT OF A FIELD SURVEY BY THE SURVEYOR, AND IS SUBJECT TO SUCH CHANGE AS AN ACCURATE FIELD SURVEY MAY DISCLOSE.

Site Locus Map



Connecticut Light & Power

The Northeast Utilities System

Existing Conditions Information

1. BASE PLAN: PROPERTY LINE INFORMATION SHOWN IS NOT TO BE CONSTRUED AS HAVING BEEN OBTAINED AS A RESULT OF A FIELD SURVEY BY A SURVEYPR, AND IS SUBJECT TO SUCH CHANGE AS AN ACCURATE FIELD SURVEY MAY DISCLOSE.
   A. DELINEATION OF THE WETLANDS AND PLACEMENT OF THE FLAGS WAS PERFORMED BY: VHB, INC.
   B. FLAGS MARKING THE WETLANDS WERE LOCATED BY: VHB, INC.
   C. ALL WETLANDS BOUNDARY NOT ASSOCIATED WITH WETLAND FLAGS WERE DELINEATED BY OTHERS AND REVIEWED BY VHB.
2. TOPOGRAPHY: ELEVATIONS ARE BASED ON CT NAD 83.

PLANS AND SPECIFICATIONS ARE SUBJECT TO REVISIONS PENDING FINAL SITING COUNCIL APPROVAL

PRELIMINARY

CAD GENERATED DWG

MF	NO.	DATE	REVISIONS	BY	CHK	APP	APP

NORTHEAST UTILITIES SERVICE CO.

FOR THE CONNECTICUT LIGHT & POWER COMPANY

TITLE

Existing Conditions Plan
Rood Avenue Substation
Windsor, Connecticut

BY	VHB	CHKD		APP	APP
DATE	08/29/07	DATE		DATE	DATE
SCALE	1"=100'		DWG. NO.	Ex-1	

Exhibit 4 - Environmental Assessment Report

Environmental Assessment Report

Rood Avenue Substation

25 Shelley Avenue

264 Rood Avenue

Windsor, Connecticut

Prepared for

Connecticut
Light & Power

The Northeast Utilities System

Prepared by

/Vanasse Hangen Brustlin, Inc.
54 Tuttle Place
Middletown, Connecticut 06457
(860) 632-1500

July 2007

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I. Introduction 1

II. General Site Description 1

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B. Geology 3
C. Soil Description 3

III. Vegetative Communities 3

IV. Wildlife Assessment 5

V. Discussion and Conclusions 5

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2	Existing Conditions	4

List of Appendices

Appendix	Description
Appendix A	**Maguire Group, Inc., October 2006.** ***Vegetation and Wildlife Survey Habitat Report for the NU Rood Avenue – Windsor, CT Location***
Appendix B	**VHB/Vanasse Hangen Brustlin, Inc.; July 2007.** ***Wetland Report***

I. Introduction

The Connecticut Light and Power Company ("CL&P") is evaluating the feasibility of developing a new bulk power substation (to be known as the Rood Avenue Substation, hereto in referred to as the "Substation") on a portion of its ±20-acre property adjacent to Rood Avenue and Shelly Avenue in the Town of Windsor (the "Property"). The Substation is proposed to be located in the central portion of the Property in the vicinity of an existing transmission line right-of-way (ROW). Figure 1 depicts the location of the Property.

A detailed analysis of wildlife habitat on the Property was performed by Maguire Group, Inc. ("Maguire") in accordance with the requirements for a Certificate of Environmental Compatibility and Public Need from the Connecticut Siting Council ("CSC") for the construction of an electric substation facility as defined in General Statues *§ 16-50l (a) (1).* The overall goal of the survey conducted by Maguire was to identify and document the existing wildlife and vegetation on the Property and to determine potential environmental impacts of the proposed Substation Facility development. A copy of the *Vegetation and Wildlife Survey/Habitat Report for the NU Rood Avenue – Windsor, CT Location* report prepared by Maguire is included in Appendix A. The report was peer reviewed by Vanasse Hangen Brustlin, Inc. ("VHB") environmental scientists and found to substantially correct.

This Environmental Assessment Report provides a general description of the Property, a summary of the various wildlife habitats occupying the Property as well as a discussion and conclusions section. Information provided in this report generally represents a compilation of data and insight obtained from the Vegetation and Wildlife Survey/Habitat Report generated by Maguire as well as information gathered by VHB during their various field inspections and delineation of wetlands in the vicinity of the proposed Substation. Detailed information regarding the wetland inspection and delineation conducted by VHB is provided in Appendix B (*Wetland Report*).

II. General Site Description

The Property in its entirety encompasses approximately 20 acres of land. The majority of the property is undeveloped and forested with the exception of a switching station, overhead transmission and distribution lines, associated electrical line structures and respective maintained corridor, which are confined to the western portion of the Property. The majority of vegetation is common to post agricultural mid-successional forest growth and early sucessional scrub-shrub growth associated with the maintained electrical line corridor.

A. Topography

Topographical gradients on the Property range from gently sloping to nearly level with elevations generally between 90 and 100 feet above mean sea level (NGVD 1929).

Figure 1: Site Location Map, USGS

Source: U.S.G.S. Quad: Hartford North, CT (1992)

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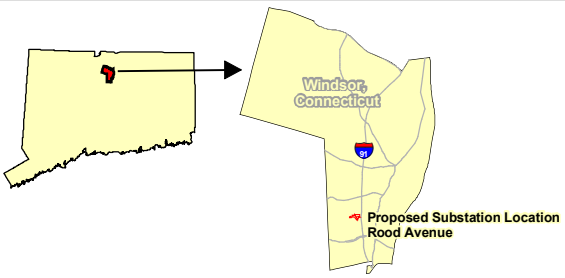

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B. Geology

According to the Bedrock Geological Map of Connecticut (Connecticut Geological and Natural History Survey, 1985), the bedrock underlying the Property is of the Portland Arkose formation, which consists of a reddish-brown arkose (brownstone).

The Surficial Materials Map of Connecticut indicates that most of the Property is underlain by fines and sands over fines. On the Property, Glacial Lake Hitchcock lacustrine (lake bed) deposits of finely stratified sand, silt and clay are overlain by windblown deposits of fine sandy loam and silt loam.

C. Soil Description

Wetlands in the vicinity of the proposed Substation were inspected and delineated in the field by Jeff Peterson and Dean Gustafson, professional soil scientists of VHB, during the first and second weeks of April 2007. VHB wetland scientists identified wetland boundaries based on both Federal criteria (defined at 33 CFR 328-329) and on criteria set forth within the Connecticut Inland Wetlands and Watercourses Act (sections 22a-36 through 22a-45 of the CT General Statutes). Wetland areas not in proximity to the proposed Substation footprint were previously delineated in 2006, reviewed by VHB and found to be substantially correct. Details of the wetland delineation and identified soils can be found in Appendix B: *Wetland Report*, prepared by VHB, July 2007.

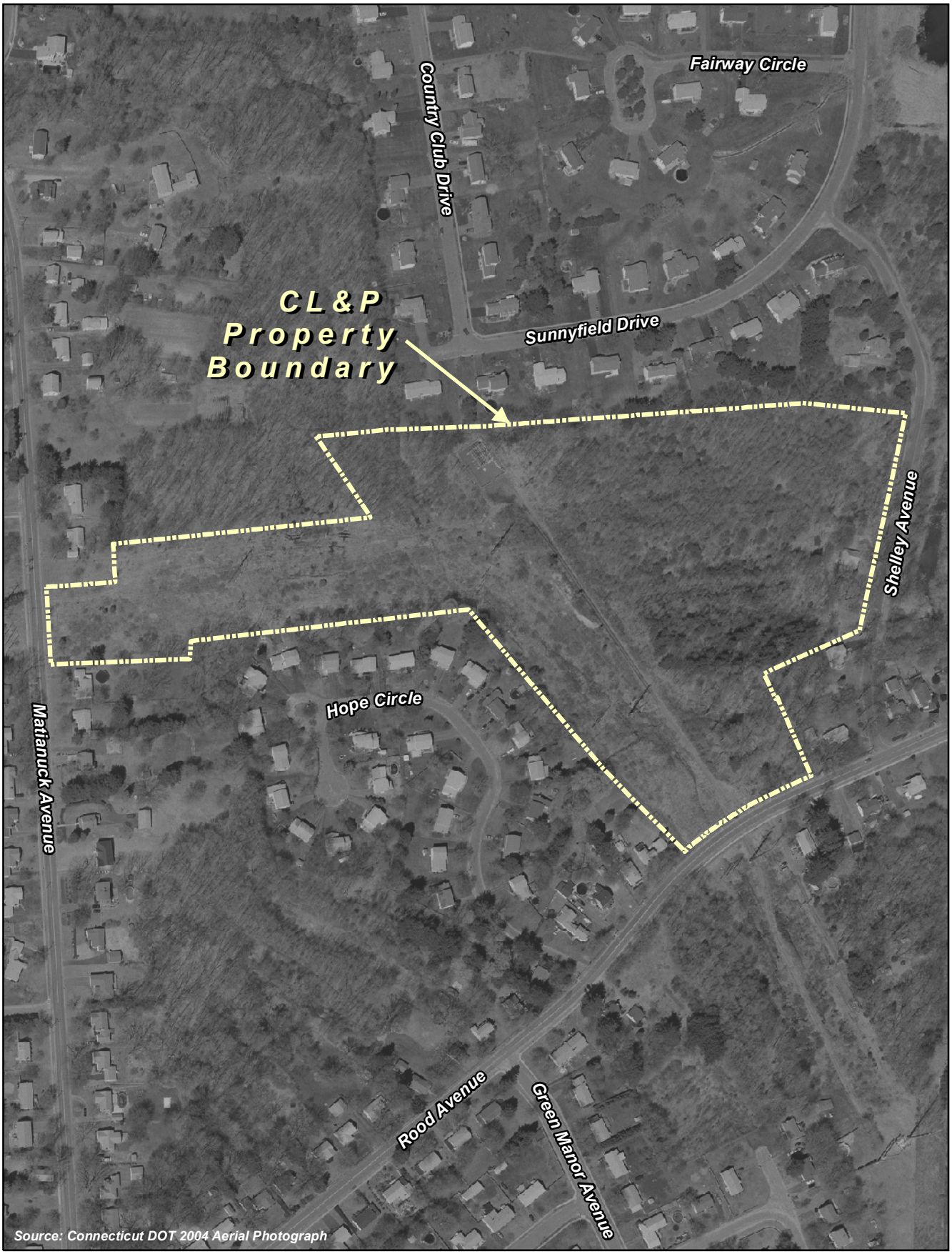
Wetland soils on the site consist of the poorly drained Walpole, Shaker and Scitico series. Upland soil types consist of the excessively drained Windsor series and moderately well drained Elmridge series. Soils that have been altered by land grading, excavation, or fill deposition are classified as Udorthents (e.g., the existing access drive and wetland crossing to the switching station).

III. Vegetative Communities

The vegetation communities on the Property are common to post agricultural mid-successional growth with areas controlled for maintenance of the existing electrical transmission lines. The following vegetative communities have been identified on the Property: early successional upland shrubland, interspersed emergent and scrub-shrub wetland, forested wetland, riparian corridor, mixed mesic forest, coniferous forest, red maple hardwood forest, woodland/shrubland ecotone, remnant sand dune community, and maintained transmission and distribution line corridor and distribution line switching station (developed area). The location(s) of the vegetative communities on the Property are illustrated in Figure 2 (Existing Conditions). Appendix A of Maguire's report offers a comprehensive list of plant species observed on the Property as well as the location(s) in which they each occur.

The survey conducted by Maguire found that the vegetative communities present on the Property are generally not considered rare or unique habitat types in Connecticut with the possible exception of a small (± 2,000 square feet) remnant sand dune located west of the existing access road. Sara Fusco of VHB contacted Ken Metzler of the Connecticut Department of Environmental Protection ("CTDEP")

Figure 2: Site Location Map, Aerial Photograph



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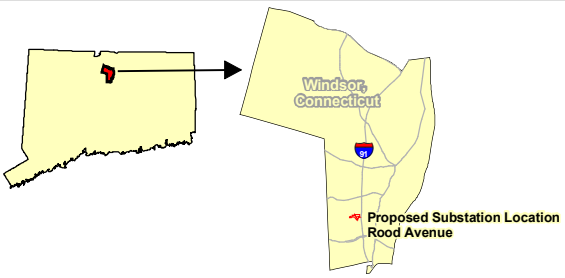

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on July 6, 2007 and found that the State of Connecticut does not have a legal definition of "Significant Natural Community." Mr. Metzler indicated that habitats encountered by the CTDEP are evaluated on a case-by-case basis to determine their conservation need. Mr. Metzler noted that the CTDEP Natural Diversity Data Base ("NDDB") may designate a specific area as a "significant natural community" if it is found to contain unusual and/or exemplary wildlife habitat. Based on these criteria, it does not appear that the small sand dune would be considered a significant natural community.

IV. Wildlife Assessment

Vegetative communities on the property provide suitable habitat conditions for various wildlife species. Appendix B of Maguire's report provides a detailed herpetofauna list of species identified on the Property, each species preferred habitat and special habitat requirements of each species provided on the Property. Wildlife species identified on the Property by Maguire are generally considered to be common and expected to be encountered in nearby areas with similar habitat features.

The Substation would be situated within a forested portion of the Property. Forested areas in proximity to the Substation were found to typically provide habitat for common bird species and small mammals. Activities associated with installation of connective structures between the transmission lines and the Substation would generally occur within areas occupied by emergent and scrub shrub wetland and scrub shrub uplands. These vegetative communities generally occur within the maintained utility corridor, which was determined to be the most valuable wildlife feature on the Property by Maguire due to its function as a wildlife corridor. The wildlife corridor and the adjacent forest and shrubland areas provide suitable nesting and foraging habitat for a variety of migratory birds and bats.

VHB reviewed the CTDEP NDDB geographic information system (GIS) data layer (dated June 2007), and found that the Property is not located within a buffered area of concern. Based on current NDDB review criteria, the proposed Substation project does not present a potential conflict with a listed species or significant natural community. In addition, Northeast Utilities Service Company (NUSCO) on behalf of CL&P corresponded directly with the CTDEP and was provided a letter of "No Effect" on August 22, 2006. Copies of the NDDB information and correspondence from the CTDEP are provided as Figure 4 (Environmental Resources Map) and Appendix B (CTDEP Correspondence) within Attachment B (*Wetland Report*) of this report.

V. Discussion and Conclusions

The proposed Rood Avenue Substation development location is occupied by forest habitat. The proposed access drive will generally follow an existing gravel access drive, thereby minimizing disturbances. Although the proposed Substation development will affect the forest habitat, the majority of this habitat cover type will remain intact in the future as no additional development is proposed on the ±20-acre Property beyond the utility usage.

No state or federally endangered, threatened or special concern species were found to occur on Site during the various inspections of the Property or through correspondence between NUSCO and the CTDEP. The small sand dune west of the existing access drive may experience a certain level of

disturbance due to grading activities associated with connecting the Substation to the existing transmission lines. The sand dune exists as a small remnant patch of habitat and is not likely considered a significant natural community.

Construction of the Substation would not have significant adverse effects on vegetation, wildlife or habitat values. The majority of the Rood Avenue Substation site would occupy what is currently upland forest habitat with small portions of the Substation footprint occurring in forested wetland. The Substation is located within close proximity to existing and similar habitats both on and off of the Property which will allow for natural relocation of potential wildlife during construction. Activities associated with connections and improvements to the existing transmission line corridor (i.e., installation and removal of poles and upgrading of existing access road with associated culvert crossing) occur primarily within emergent and scrub-shrub wetland and upland areas. The most significant wildlife attribute of the Property, the maintained utility corridor (which functions as a wildlife corridor) will be maintained post-construction. Therefore, the Project would not have an adverse effect on wildlife.

Appendix A
Vegetation and Wildlife Survey/Habitat Report for the NU Rood Avenue – Windsor, CT Location

Mr. Scott A. Marotta
Environmental Scientist
Northeast Utilities Service Co.
Transmission Siting and Permitting
P.O. Box 270
Hartford, CT 06141- 0270

RE: Rood Avenue Vegetation and Wildlife Survey/Habitat Report
Maguire Project 18005

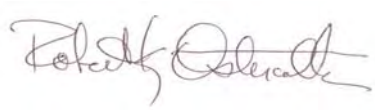
Dear Mr. Marotta:

Please find enclosed our Vegetation and Wildlife Survey/Habitat Report for the property at Rood Avenue in Windsor, CT. The habitat assessment was conducted by Mr. Anthony Zemba, Senior Ecologist, and Mr. Daniel Hageman, Professional Soil and Wetland Scientist.

Should you have any questions or comments, please call me at (860) 224-9141.

Sincerely,

MAGUIRE GROUP INC.



Robert K. Ostermueller
Senior Project Manager

AJZ
Encl.

Vegetation and Wildlife Survey/Habitat Report for the NU Rood Avenue – Windsor, CT Location

A Report to: Northeast Utilities
October 2006

Prepared by: Maguire Group, Inc.
One Court Street
New Britain, CT 06051

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MAGUIRE GROUP INC. was founded in 1938, and since that time has grown to become one of the nation's leading Architectural, Engineering, Planning and Construction Management firms. Over 330 professionals and support staff, located in 12 offices throughout the Northeast and the U.S. Virgin Islands, provide a full complement of services. For more information about Maguire, please visit our Web site at www.maguiregroup.com. For more information about this report, please contact: Anthony J. Zemba, Senior Ecologist.

Vegetation and Wildlife Survey/Habitat Report

A vegetation and wildlife survey and habitat assessment was conducted at the approximately 20-acre proposed substation location on Rood Avenue in Windsor, CT (**See Figure 1**). The purpose of the survey was to identify vegetation communities and plant and animal resources and their habitat attributes at the site.

1.0 Survey Area Description

1.1 Physiography

The Rood Avenue site lies within Hartford County, primarily within the Southeast Hills Ecoregion of the Southern Hills-Central Hardwoods Zone of Connecticut (Dowhan and Craig 1976). This ecoregion is a near-coastal upland, the northern border of which lies within 48 kilometers (km) (30 miles) of Long Island Sound. It is characterized by low rolling hills, moderately broad and level upland and valley bottoms, and local areas of steep and rugged topography. The site is relatively level across much of its area with localized variations ranging from 90-100 feet (ft) above mean sea level (NGVD 1929). The greatest relief is found near the north and central portions of the corridor. The topography of the site generally reflects that of the surrounding terrain.

1.2 Climate

Climate plays an important role in shaping the biological and ecological character of the area. The mean annual temperature is approximately 50°F. The average winter temperature is 28°F, and the monthly mean minimum temperature for the coldest month is 18.5°F. The average length of the frost-free season is variable over the region, typically 180 days. Average seasonal snowfall accumulation is about 50 inches (in). The average summer temperature is 71°F. The average annual precipitation is approximately 43 in (Dowhan & Craig, 1976).

Figure 1. Site Location Map

1.3 Surficial Geology

Surficial geology in the survey area is characterized by both lacustrine deposits of silts and clays and windblown sand deposits. The lacustrine deposits are associated with the former Lake Hitchcock of the central Connecticut River valley which existed during the last glacial period. Soils within the survey area vary with location. A major portion of the soils on the site consist of udorthents, primarily along the southern portion of the transmission line corridor. Udorthents are soils which have been previously disturbed in some way, such as removal of top soil or addition of fill materials. Native soils include silt loams and find sandy loams dominated by the Elmridge, Ninigret/Tisbury, Wilbraham and Windsor Soil Series. Additional soils information is provided in the associated *Wetland and Vernal Pool Delineation/Evaluation Report.*

1.4 Land Use

The site currently serves as a 345 & 115 kV transmission line right of way (ROW) and electrical switching station. In the past, the site served as a substation.

2.0 Vegetation Characterization and Survey

2.1 Methods

Vegetation was characterized by visually identifying the various communities and associations that occurred onsite. Transects were then walked through the major community types by Maguire field scientists, Anthony J. Zemba and Daniel A. Hageman, who identified the dominant plant species and common associates. With the help of botanical keys and the use of hand lens, plants were identified to the lowest taxonomic category. No plant specimens were collected as part of this vegetation characterization; see **Appendix A** for a listing of all vegetative species observed onsite.

2.2 Results

2.2.1 Upland Vegetation Communities

Forest

The upland forest is dominated primarily by various oak species such as northern red, and white oaks. Red maple, white pine, American beech, gray birch, white birch, hickory and an occasional American elm was also present. In addition, a conifer inclusion of previously planted Norway spruce, white spruce and Scotch pine was also noted on the site.

Shrublands

Shrubs observed included: northern spicebush, silky dogwood, northern bayberry, red cedar, honeysuckle, hazelnut, witch-hazel, maple leaf viburnum and creeping dewberry. In many areas, a sapling layer consisting of ironwood, black cherry, red maple and American beech.

Forbs/Grasses

Forbs and grasses consisted predominantly of the following: daisy fleabane, partridge-berry, hay-scented fern, Canada mayflower, bedstraw, goldenrods, black-eyed susan, ragweed, switch grass, common mullein and long spine sandbur. Field milkweed, hawkweed, curly dock, strawberry clover, common milkweed, saint-john's wort and yarrow were also noted as common associate's onsite. Bird vetch, and bird's foot trefoil were the abundant onsite legumes.

2.2.2 Wetland Vegetation Communities

Forest

Red maple was the dominant tree species with an occasional American elm, or ash intermittently dispersed.

Scrub/Shrub

The scrub/shrub community consisted mostly of the following plants: buttonbush, highbush blueberry, silky dogwood, alder, elderberry, northern arrowwood and spicebush.

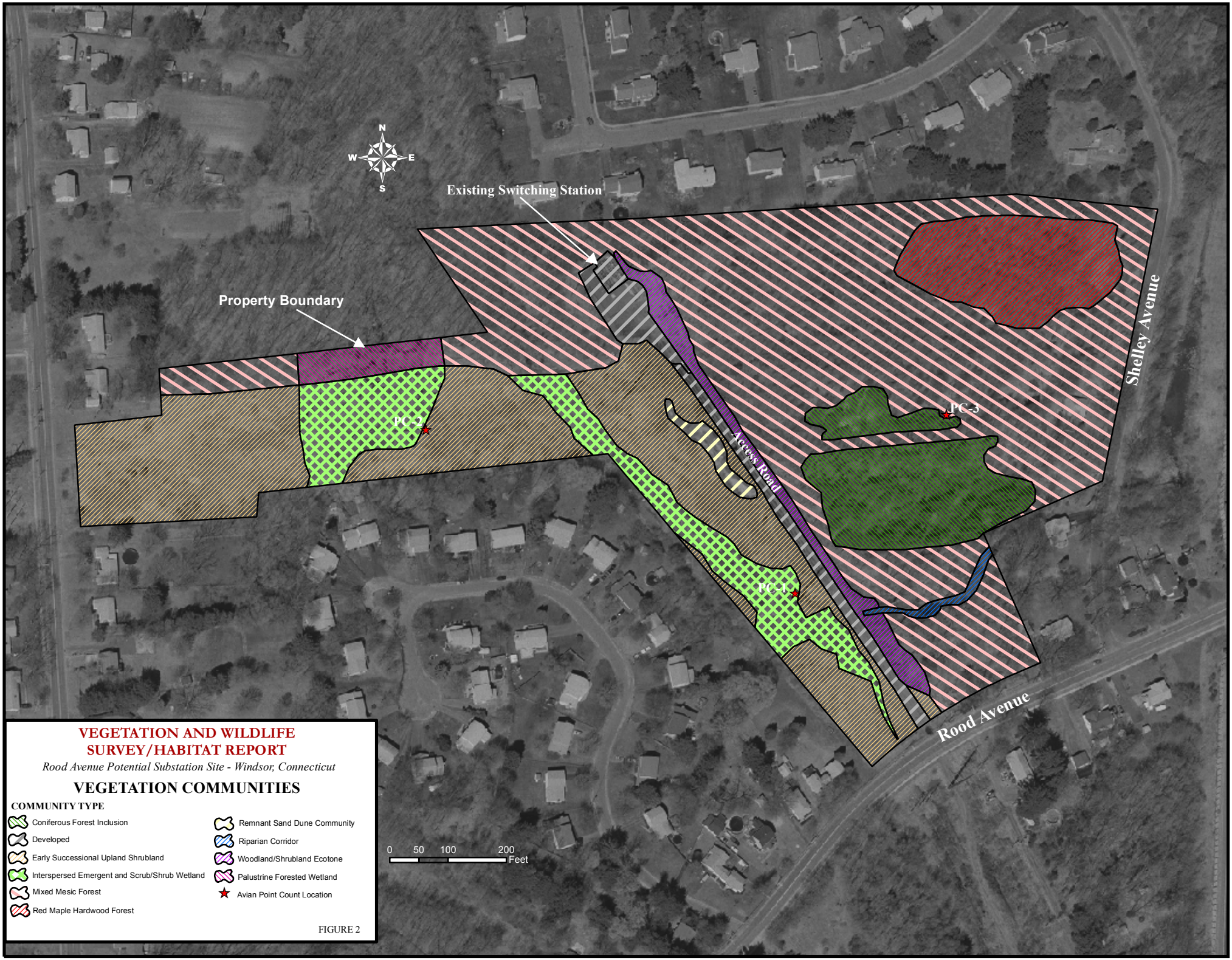
Emergent

The emergent group consisted mainly of: skunk cabbage, cattail, jewelweed, purple loosestrife, soft rush, sedges, woolgrass, goldenrod, boneset, arrow-leaved tear-thumb, joe pye-weed, deer tongue grass, and eastern marsh fern.

2.2.3 Vegetation Characterization and Survey Summary

The vegetation communities present within the area of the proposed substation are not considered rare or unique habitat types in Connecticut, with the exception of the small sand dune area which exists as a small remnant patch of habitat, and therefore is not exemplary. See **Figure 2** for a map depicting the site's vegetative community types.

After a thorough vegetation characterization and survey, no state or federally endangered, threatened or special concern flora was identified onsite. Additionally, a review of the most recent Connecticut Department of Environmental Protection (CTDEP) Natural Diversity Database (NDDB) Geographic Information System (GIS) layer revealed no known stations of Connecticut listed flora on, adjacent or proximal to the site that would indicate any known potential conflict between the states's protected flora and the substation construction (D. McKay, CTDEP Correspondence to Scott A. Marotta dated August 22, 2006).



VEGETATION AND WILDLIFE SURVEY/HABITAT REPORT

Rood Avenue Potential Substation Site - Windsor, Connecticut

VEGETATION COMMUNITIES

COMMUNITY TYPE

- Coniferous Forest Inclusion
- Developed
- Early Successional Upland Shrubland
- Interspersed Emergent and Scrub/Shrub Wetland
- Mixed Mesic Forest
- Red Maple Hardwood Forest
- Remnant Sand Dune Community
- Riparian Corridor
- Woodland/Shrubland Ecotone
- Palustrine Forested Wetland
- Avian Point Count Location

FIGURE 2

3.0 Wildlife Habitat Assessment

3.1 Methods

The wildlife habitat assessment served to identify the attributes valuable to site-specific wildlife observed. "Observed" species are those species identified either by direct observation or via observation of their tracks, scat, or other signs. Once special habitat attributes were denoted, this information, along with available information about the distribution of the various wildlife taxa within the state or region, was used to ascertain the importance of the site to various faunal groups.

Avian surveys were conducted, during weather favorable for detecting birds, between one-half hour after sunrise to 10:00 a.m. Ten-minute visual and auditory point surveys were conducted at three locations spaced a minimum of 100 m (328 ft) apart. Visual observations were aided by 8x magnification binoculars. Birds were identified by both visual and auditory recognition. Please see **Figure 2** for the avian survey point count locations.

A summary of the major wildlife taxa observed onsite is provided in **Appendices B through D**. In addition, a checklist of special habitat attributes noted onsite, and their importance to various species is provided in **Appendix E & F**.

3.2 Results

3.2.1 Invertebrates

No specific protocol was used to sample for invertebrate species within this system. Observations were based on visual encounters in the field and an assessment of habitat attributes during multiple site visits. The large variety of flowering shrubs, grasses, and other vegetation attracts numerous pollinators such as Hymenoptera (ants, wasps, bees), Lepidoptera (butterflies and moths), and Diptera (flies). Aquatic insects, both adult and larval forms, and larvae of many terrestrial flying insects favoring rich organic muck substrates and leaf litter are expected to be present within wetter substrates.

3.2.2 Herpetofauna

The project area contains various habitats and attributes conducive to the sustainability of various herpetofauna. Wooded areas with fallen woody debris and litter accumulation

provide cover for snakes, turtles, salamanders, and toads. Sandy barren areas with loose soils provide media amenable to burrowing or fossorial species of herpetofauna, and the various wetland habitats provide cover for turtles, frogs, aquatic snakes, and salamanders. The various herpetofauna observed within the project area are denoted in **Appendix B**.

3.2.3 Avifauna

Observed avifauna are listed in **Appendix C**. Common year-round residents at the site are dominated by the generalist species common within residential areas and other human-influenced landscapes. The woodland habitat within the project area supports hawks, woodpeckers, vireos, warblers, tanagers, orioles, thrushes, and other avifauna which occur on the site as breeding, summer, or winter residents; autumn or spring migrants; or a combination thereof.

3.2.4 Mammals

The various debris piles, dense vegetated cover, and abundance of both hard and soft mast producing plants in the undeveloped areas of the site attract a variety of small mammalian prey and their larger predators. The ROW likely provides a suitable wildlife corridor in an otherwise suburban landscape. The mammal species detected onsite, (either by direct observation or observations of their tracks and signs), their requisite habitat, and the special habitat attributes provided by the site, are listed in **Appendix D**.

3.2.5 Wildlife Habitat Summary

The faunal community of the site was ascertained by numerous onsite observations and an assessment of the site's habitats and habitat attributes. Results indicate that no state or federally endangered, threatened or special concern fauna species occur onsite. Additionally, a review of the most recent CTDEP NDDB GIS information revealed no known stations of Connecticut listed fauna on, adjacent or proximal to the site that would indicate any known potential conflict between the states's protected fauna and the substation construction (D. McKay, CTDEP Correspondence to Scott A. Marotta dated August 22, 2006).

The proposed substation would be constructed primarily within the forested portion of the site. Therefore, the greatest wildlife impact would likely be to a small subset of breeding birds, namely those favoring forested habitat. Within the site's forest patch, woodpeckers, vireos, chickadees, kinglets, wrens, thrushes, warblers, tanagers, sparrows, cardinals, orioles, and finches typically can be found as breeding, summer, winter or permanent residents; as spring or fall migrants; or as a combination thereof.

Considering the small size of the forest patch and the suspected high rate of Brown–headed cowbird parasitism within the forest interior, the small forest patch on the potential substation site is likely too small to support robust, self-sustaining populations of forest interior species. Therefore, construction of the proposed substation is not expected to have a significant impact to regional populations of these birds.

Other faunal groups that may be impacted by the substation construction are small mammals: however, no small mammals of conservation concern were noted or are expected to occur onsite. Those species that are expected to occur onsite are commonly encountered in other forest patches in the surrounding, largely suburban landscape of the Greater Hartford region.

The small, onsite forest patch is also likely to have some habitat value for bats. The combination of the open powerline ROW adjacent to mature forest, with both deciduous and coniferous components, is likely to offer roosting options suitable to some of Connecticut's more common bat species. However, small forest blocks, such as this one, generally do not have the greatest habitat value for species of conservation concern. Large contiguous tracts of forests, covering a variety of landforms, vegetative cover, soil types, slopes, and aspects – which are not present on the proposed substation site - would be expected to have greater vegetational diversity and, therefore have the greatest habitat value for species of conservation concern.

4.0 Conclusion and Recommendations

No state or federally endangered, threatened or special concern species were observed onsite and are known to occur onsite or within or proximal to the project area (D. McKay, CTDEP Correspondence to Scott A. Marotta dated August 22, 2006).

Impact to onsite vegetation and vegetation communities associated with the construction of the proposed substation would be offset and addressed by an appropriate planting plan, and the implementation of the collective conservation measures provided below. A planting plan containing a mixture of native shrubs and smaller trees with high wildlife and aesthetic value should be implemented where appropriate to replace non-native invasive plant species. Small trees that provide wildlife food and cover and that would not grow tall enough to interfere with the transmission lines would serve to provide a visual buffer to surrounding neighborhoods, help to control the proliferation and establishment/re-establishment of non-native invasive species, and mitigate wildlife habitat impacts.

The most valuable assets of the site to wildlife are undoubtedly its function as a wildlife corridor and as a stopover site for migratory birds and bats, conditions which will remain after construction of the substation. Both the shrubland and forest patch are used by wildlife traveling along the ROW. The various vegetation heights provide suitable nesting and foraging sites for different species with differing nesting and foraging height requirements. Therefore, during construction of the substation, retention of as much onsite vegetative cover as construction conditions permit, is recommended.

A variety of conservation and creative vegetation management measures can help to avoid, minimize, or mitigate the impact of the loss of a portion of the forest patch as a result of substation construction. These measures include the following:

- Avoid impact to onsite wetlands, the riparian corridor, and upland buffers associated with these resources
- Avoid complete removal of the conifer inclusion or, alternatively, replace lost inclusion with new planted conifers
- Retain mature trees wherever possible
- Retain mast producing trees wherever possible
- Mitigate the loss of vegetation associated with substation construction with the removal or control of invasive plant species elsewhere onsite and the planting of native species that provide high wildlife value

- Keep sparse vegetation areas to a minimum, or plant with low, creeping groundcover
- Consider alternatives to the use of herbicides for control of vegetation growth within the ROW and around the substation. Control vegetation height via other means such as planting low growing vegetation or via brush hogging, selective cutting, or a combination of techniques implemented on a rotational basis to avoid large expanse of even-aged growth
- Maintain "soft edge" ecotones (low-contrast, mosaic, undulating, feathered, or irregular configurations where the ROW meets the forest edge)
- Keep access roads unpaved
- Retain standing dead wood and trees with columnar decay as safety and forest health permits
- Control access to the site to prevent disturbance to wildlife by humans and their pets
- Retain onsite slash, wood chips, wood piles, rock piles, and other native materials generated during construction, to be used for wildlife cover
- Provide artificial nest/roost boxes for cavity nesting/roosting fauna
- Create deeper temporary or seasonal pools onsite, create open water basin and other cover types within or adjacent to emergent marsh, and
- Implement and enforce the use of best management practices for the protection of onsite resources during construction.

Through the use of a combination of these conservation measures following construction of the proposed substation, the important wildlife attributes and natural communities would be retained, thereby maintaining the existing overall value of the site to resident wildlife.

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Appendix Section

Appendix A - List of Vegetation Species Observed Onsite

Scientific Name	Common Name	Powerline ROW		Forest		Notes
		Wetlands	Uplands	Wetlands	Uplands	
Herbaceous						
Achillea millefolia	Yarrow		X			
Agastache nepetoides	Yellow Giant Hyssop		X			Sand Dune
Ambrosia artemisiifolia	Common ragweed		X			
Ambrosia trifida	Giant ragweed		X			
Anaphalis margaritacea	Pearly everlasting		X			
Andropogon gerardii	Big bluestem		X			
Arisaema triphyllum	Jack-in-the-pulpit	X		X	X	
Aristida dicotoma	Three-awned grass		X			Sand Dune
Asclepias syriaca	Common milkweed		X			
Asclepias incarnata	Swamp milkweed	X				
Aster novae-anglea	New England aster		X			
Athyrium filix-femina	Lady's fern				X	
Bidens sp.	Beggar's ticks	X				
Carex crinita	Sedge	X				
Carex intumescens	Sedge	X				
Carex lurida	Lurid Sedge	X				
Carex scoparia	Broom sedge	X				
Carex vulpinoidea	Fox sedge	X				
Cenchrus longispinus	Sandbur		X			Sand Dune
Chimophila maculata	Spotted wintergreen				X	
Cichorium intybus	Chickory		X			
Commelina communis	Asiatic dayflower		X			
Cyperinus esculentus	Nut sedge					
Cypripedium acaule	Pink lady's slipper				X	
Daucus carota	Queen Anne's lace		X			
Dennstaedtia punctilobula	hay-scented fern		X			

Scientific Name	Common Name	Powerline ROW		Forest		Notes
		Wetlands	Uplands	Wetlands	Uplands	
Desmodium perplexum	Tick trefoil		X			
Dichanthelium clandestinum	Deer tongue grass	X				
Diodia teres	Buttonweed		X			Access Road Entrance
Dryopteris cristata	Crested fern					
Echinochloa crus-gali	Barnyard grass		X			
Eleocharis obtusa	Spike rush	X				
Elytrigia repens	quackgrass		X			
Epilobium sp.	Willow herb					
Equisetum sp.	Horsetail	X		X		
Eragrostis spectabilis	Love grass		X			
Erigeron sp.	daisy fleabane		X			
Euphorbia maculata	Spotted spurge		X			Also in minimally vegetated areas
Eupatorium maculatum	Spotted Joe-pye-weed	X				
Eupatorium perfoliatum	Boneset		X			
Eupatorium pubescens	Hairy boneset		X			
Euthamia graminifolia	Grass-leaved goldenrod		X			
Dianthus armeria	Deptford pink		X			
Galium verum	Yellow bedstraw		X			
Gnaphalium uliginosum	Low cudweed					
Hieracium sp.	Hawkweed					
Hypericum perforatum	Common St. John's-wort		X			
Impatiens capensis	jewelweed	X				
Juncus effusus	Soft rush	X				
Juncus tenuous	Path rush		X			Access Road
Lactuca sp.	Wild lettuce		X			
Leersia oryzoides	Rice cutgrass	X				
Lespedeeza capitata	Round-headed bush clover		X			
Linaria canadensis	Blue toadflax		X			Sand Dune
Linaria vulgaris	Butter and Eggs		X			Sand Dune
Lotus corniculatus	Bird's foot trefoil		X			

Scientific Name	Common Name	Powerline ROW		Forest		Notes
		Wetlands	Uplands	Wetlands	Uplands	
Lycopodium sp.						
Lycopus americanus	Water horehound					
Lycopus uniflorus	Northern bugleweed					
Lysimachia quadrifolia	Whorled Loosestrife		X			Sand Dune
Lythrum salicaria	Purple loosestrife	X	X			
Maianthemum canadense	Canada mayflower				X	
Melilotus alba	White Sweet Clover		X			
Melilotus officinalis	Yellow Sweet Clover		X			
Monotropa sp.	Indian pipe		X			Along Access Road
Mimulus sp.	Monkeyflower			X		
Onoclea sensibilis	Sensitive fern					
Onothera biennis	Evening primrose					
Osmunda cinnamomea	Cinnamon Fern					
Osmunda claytoniana	Interrupted Fern				X	Woodland Ecotone
Osmunda regalis	Royal Fern	X		X		
Oxalis sp.	Wood Sorrel					
Panicum sp.						
Panicum virgatum	Switchgrass		X			
Phragmites australis	Common Reed	X				
Phytolacca americana	Pokeweed		X			
Plantago aristata	Buckthorn plantain		X			
Plantago lanceolata	English plantain		X			
Plantago major	Common Plantain		X			
Polygonum cuspidatum	Japanese knotweed	X	X			
Polygonum persicaria	Lady's thumb					
Polygonum sagittatum	arrow-leaved tear-thumb	X				
Prunella vulgaris	Selfheal; Healall		X			
Pteridium aquilinum	Bracken Fern					
Pycnanthemum tenuifolium	Narrow-leaved mountain mint	X	X			
Pycnanthemum incanum	Hoary Mountain Mint	X	X			

Scientific Name	Common Name	Powerline ROW		Forest		Notes
		Wetlands	Uplands	Wetlands	Uplands	
Rudbeckia hirta	Black-eyed Susan		X			
Rumex acetosella	Sheep sorrel		X			
Rumex crispus	Curly dock		X			
Rhynchospora sp.	Beaked rush		X			Sand Dune
Scirpus atrovirens	Woolgrass	X				
Scirpus cyperinus	Woolgrass	X				
Setaria glauca	Foxtail grass		X			
Silene vulgaris	Bladder campion		X			
Solidago rugosa	Rough-stemmed Goldenrod		X			
Spiranthes cernua	Nodding ladies' tresses		X			
Spirea latifolia	Steeplebush		X			
Spirea tomentosa	Meadowsweet		X			
Symplocarpus foetidus	Skunk cabbage	X				
Thalictrum sp.	Meadow Rue	X		X		
Thelypteris noveboracensis	New York Fern					
Thelypteris palustris	Marsh Fern	X		X		
Trifolium arvense	Rabbitfoot clover		X			
Trifolium pratense	Red clover		X			
Trifolium repens	White clover		X			
Trichostoma dichotomum	Blue curls		X			
Triodanis [Specularia] perfoliata	Round-leaved Triodanis, common venus' looking glass		X			
Triodia flava	purpletop		X			
Typha latifolia	Broad-leaved cattail	X				
Urtica procera	Tall nettle	X				
Veratum viride	Green false hellebore			X		
Verbascum thapsus	Common mullein		X			
Verbena hastata	Blue vervain	X	X			
Vernonia noveboracensis	New York Ironweed	X				

Scientific Name	Common Name	Powerline ROW		Forest		Notes
		Wetlands	Uplands	Wetlands	Uplands	
Shrub						
Apocynum androseamifolium	Spreading dogbane		X			
Barberis thunbergii	Japanese barberry		X			
Cephalanthus occidentalis	Buttonbush	X				
Comptonia peregrina	Sweetfern		X			At western end
Cornus amomum	Silky dogwood		X			
Corylus americana	hazelnut		X			
Elaeagnus umbellata	Autumn Olive		X			
Euonymus alatus	winged euonymous		X		X	
Hamemelis virginianus	Witch-Hazel		X			
Ilex verticillata	Winterberry	X				
Leucothoe racemosa	Swamp leucothoë			X	X	At northeastern border
Ligustrum vulgare	Common privet		X			
Lindera benzoin	Spicebush	X		X		
Lonicera sp.	Honeysuckle	X	X			
Myrica pensylvanica	Bayberry		X			Dune area
Rosa multiflora	Multiflora rose		X			
Rhus typhina	Staghorn Sumac		X			
Rhubus idaeus	Red raspberry		X			
Rubus c.f. *flagellarus*	Creeping dewberry		X			Dune area
Sambucus canadensis	elderberry	X				
Vaccinium corymbosum	Highbush blueberry	X	X	X		
Viburnum dentatum	Northern arrowwood	X				
Viburnum acerifolium	Mapleleaf viburnum				X	
Tree						
Acer rubrum	Red Maple	X	X	X	X	
Acer saccharum	Sugar Maple				X	At vacant house
Betula lenta	Black birch		X		X	
Betula papyrifera	White birch				X	

Scientific Name	Common Name	Powerline ROW		Forest		Notes
		Wetlands	Uplands	Wetlands	Uplands	
Betula populifolia	Gray birch		X			
Carpinus caroliniana	Ironwood		X		X	
Carya ovata	Shagbark hickory				X	
Cornus florida	Flowering dogwood					
Fagus grandifolia	American beech				X	
Fraxinus americana	White ash			X	X	
Juniperus virginiana	Red cedar		X			
Malus sp.	Crabapple		X		X	
Picea abies	Norway spruce				X	
Picea glauca	White spruce					
Pinus sylvestris	Scotch pine				X	
Pinus strobus	White pine		X		X	
Populus tremuloides	Quaking aspen		X			
Prunus serotina	Black Cherry					
Quercus alba	White Oak				X	
Quercus rubra	No. Red Oak				X	
Salix sp.	Willow					
Sassafras albidum	Sassafras		X		X	
Tilia americana	Basswood				X	At vacant house
Ulmus americana	American elm				X	
Liana						
Calystegia sepium	Hedge bindweed	X				
Celastrus orbiculatus	Oriental bittersweet		X		X	
Cuscuta sp.	Dodder	X				
Lonicera japonica	Japanese honeysuckle	X	X			
Parthenocissus quinquefolia	Virginia creeper		X		X	
Polygonum scandens	Climbing false buckwheat		X			
Smilax rotundifolia	Roundleaf Green briar		X			
Solanum dulcamara	Bittersweet Nightshade	X				

Scientific Name	Common Name	Powerline ROW		Forest		Notes
		Wetlands	Uplands	Wetlands	Uplands	
Toxicodendron radicans	Poison Ivy	X	X		X	
Vicia cracca	Bird vetch		X			
Vitis riparia	Frost grape		X			
Wisteria floribunda	Japanese wisteria		X			

Appendix B - Herpetofauna Species Observed Onsite

Common Name	Scientific Name	Habitat[1]	Special Habitat Requirements provided onsite
ORDER ANURA			
FAMILY BUFONIDAE			
Eastern American toad	*Bufo a. americanus*	Variety of habitats including gardens, woods, and yards, especially moist upland woodlands	Shallow water, typically in sandy areas, for breeding
FAMILY HYLIDAE			
Gray treefrog	*Hyla versicolor*	Moist woodlands. Breeds in temp. pools or permanent water, swamps, bogs, ponds, weedy lakes and other surface waters	Aquatic sites for breeding; trees with hollows, loose bark, lichens, moss; rotted logs, and root masses for hibernacula
FAMILY RANIDAE			
Green frog	*Rana clamitans melanota*	Margins or various surface water bodies including lakes, ponds, semi permanent and permanent pools, creeks, streams, springs, vernal and autumnal pools, moist woodlands near water, fens, and bogs	Riparian habitat
ORDER SQUAMATA (SUBORDER SERPENTES)			
FAMILY COLUBRIDAE			
Garter snake	*Thamnophis sirtalis*	Variety of terrestrial habitats preferring moist areas or woodlands, vacant lots, overgrown yards, etc. hibernates in holes, rock crevices, mud, anthills, rotted wood, uprooted trees, house foundations	

[1] from DeGraaf and Yamasaki (2001)

Appendix C - Avifauna Observed Onsite

Species name	***Scientific name***	**Connecticut Status** [1]	**Likely status at/Use of Site**
Red-tailed Hawk	*Buteo jamaicensis*		Resident; foraging and roosting
Mourning Dove	*Zenaida macroura*	Common spring and fall migrant; uncommon resident	Potential Breeding Resident; Potential migration stopover site
Ruby-throated Hummingbird	*Archilochus colubris*	Fairly common spring and fall migrant; fairly common breeder	Potential migration stopover site
Downy Woodpecker	*Picoides pubescens*	Common breeder and year round resident	Permanent resident
Red-bellied Woodpecker	*Melanerpes carolinus*	Fairly common breeder and year round resident	Potential Permanent Resident
Northern Flicker	*Colaptes auratus*	Fairly common spring and fall migrant; fairly common breeder; uncommon winter resident	Potential Permanent Resident; Potential migration stopover site
Eastern Kingbird	*Tyrannus tyrannus*	Fairly common spring migrant and summer resident; fairly common breeder	Breeding and summer Resident
Blue Jay	*Cyanocitta cristata*	common year round resident and breeder	Permanent resident
American Crow	*Corvus brachyrhyncos*	Common year round resident and breeder	Permanent resident
Black-capped Chickadee	*Poecile atricapillus*	Common year round resident and breeder	Permanent resident
Tufted Titmouse	*Beolophus bicolor*	Common year round resident and breeder	Resident
White-breasted Nuthatch	*Sitta carolinensis*	Fairly common year round resident and breeder	Permanent resident
Carolina Wren	*Thyryothorus ludovicianus*	Fairly common year round resident and breeder	Resident breeder
House Wren	*Troglodytes aedon*	Common spring migrant; common breeder; fairly common summer resident	Resident breeder
Wood Thrush	*Hylocichla mustilena*	Common breeder and summer resident	Potential Breeding resident; Potential migration stopover site;

Species name	***Scientific name***	**Connecticut Status [1]**	**Likely status at/Use of Site**
American Robin	*Turdus migratorius*	Abundant spring migrant and breeder; common summer resident; fairly common to abundant fall migrant; fairly common winter resident	Breeding resident
Northern Mockingbird	*Mimus polyglottus*	Fairly common breeder and year round resident	Permanent resident
Gray Catbird	*Dumetella carolinensis*	Common breeder and summer resident	Breeding and Summer Resident
Cedar waxwing	*Bombycilla cedrorum*	Fairly common spring migrant; fairly common breeder and summer resident; common fall migrant	Potential breeding resident; Potential migration stopover site;
European Starling	*Sturnus vulgaris*	Abundant permanent resident	Permanent resident
Red-eyed Vireo	*Vireo olivaceus*	Common spring migrant, common breeder; fairly common summer resident; uncommon to rare fall migrant	Potential breeding resident; Potential migration stopover site;
Yellow Warbler	*Dendroica petechia*	Fairly common to common spring migrant; common breeder and summer resident; fairly common to uncommon fall migrant	Breeding and Summer Resident; Potential migration stopover site;
Prairie Warbler	*Dendroica discolor*	Uncommon to fairly common spring migrant; fairly common breeder and summer resident; fairly common to uncommon fall migrant	Potential migration stopover site;
Black-and-white Warbler	*Mniotita varia*	Common spring migrant; fairly common breeder and summer resident; uncommon to rare fall migrant	Potential breeding resident; Potential migration stopover site;
Common Yellowthroat	*Geothlypis trichas*	Fairly common to common spring migrant; fairly common breeder and summer resident; fairly common to uncommon fall migrant	Breeding and Summer Resident
American Redstart	*Setophaga ruticilla*	Fairly common to common spring migrant; fairly common breeder and summer resident; fairly common to uncommon fall migrant	Potential migration stopover site;
Northern Cardinal	*Cardinalis cardinalis*	Common permanent resident	Permanent Breeding resident
Indigo Bunting	*Passerina cyanea*	Uncommon to fairly common spring migrant; fairly common breeder and summer resident;	Breeding and Summer Resident; Potential migration stopover site;

Species name	***Scientific name***	**Connecticut Status** [1]	**Likely status at/Use of Site**
Eastern Towhee	*Pipilo erythrophthalmus*	Uncommon to fairly common spring; fairly common breeder and summer resident; common to uncommon fall migrant; uncommon winter resident	Breeding and Summer Resident; Potential migration stopover site;
Chipping Sparrow	*Spizella passerina*	Fairly common to common spring migrant; fairly common breeder and summer resident; fairly common to uncommon fall migrant	Breeding and Summer Resident; Potential migration stopover site;
Swamp Sparrow	*Melospiza georgiana*	Uncommon winter resident; fairly common spring migrant, breeder; and summer resident; common to fairly common fall migrant	Potential breeding resident; Potential migration stopover site;
Song Sparrow	*Melospiza melodia*	Common spring and fall migrant, breeder and summer resident, uncommon winter resident	Breeding and Summer Resident; Potential migration stopover site; Potential Permanent Resident
Red-Winged Blackbird	*Agelatus phoeniceous*	Uncommon winter resident; fairly common to abundant spring migrant; abundant breeder; and summer resident; fairly common to abundant fall migrant	Breeding and Summer Resident
Common Grackle	*Quiscalus quiscula*	Uncommon winter resident; fairly common to abundant spring migrant; abundant breeder; and summer resident; fairly common to abundant fall migrant	Potential Breeding and Summer Resident; Potential migration stopover site;
Brown-headed Cowbird	*Molothrus ater*	Uncommon winter resident; fairly common to common spring migrant; common breeder; and summer resident; fairly common to common fall migrant	Breeding and Summer Resident; Potential migration stopover site;
Northern Oriole	*Icterus galbula*	Rare winter resident; uncommon to fairly common spring migrant, breeder, and summer resident; uncommon to common fall migrant	Breeding resident; Potential migration stopover site;
House Finch	*Carpodacus mexicanus*	Common permanent resident	Permanent Breeding Resident
American Goldfinch	*Carduelis tristis*	Fairly common permanent resident; common fall migrant	Permanent Breeding Resident

Species name	***Scientific name***	**Connecticut Status [1]**	**Likely status at/Use of Site**
House Sparrow	*Passer domesticus*	Common permanent resident	Permanent Breeding Resident

[1] Adapted from Haniseck (2005)

Appendix D - Mammal Species Observed Onsite

Species Name	Scientific Name	Habitat [1]	Special Habitat Requirements provided by Site
LAGOMORPHA: Leporidae (Hares and Rabbits)			
Eastern Cottontail	*Sylvilagus floridanus*	Farmlands, pastures, fallow fields, open woodlands, thickets, fence rows and stone walls, edges of forests, swamps, and marshes, dense woods and suburban areas with adequate food and cover	Brush piles, stone walls, dens or burrows; herbaceous and shrubby cover
RODENTIA: Sciuridae (Tree Squirrels and Marmots)			
Eastern Chipmunk	*Tamias striatus*	Deciduous forests and brush areas	Tree or shrub cover; elevated perches, decaying stumps/logs, stone walls
Eastern Gray Squirrel	*Sciurus carolinensis*	Mature deciduous and mixed forests with hard mast-producing tree species; also found in forested bottomlands, towns, suburban woodlots, and city parks	Mast-producing trees; tall trees for dens and leaf nests
Red Squirrel	*Tamiasciurus hudsonicus*	Coniferous, mixed and occasionally deciduous forests, rural woodlots	Woodlands with mature trees; conifers preferred
CARNIVORA: Canidae (Dogs, Foxes, and Wolves)			
Red Fox	*Vulpes vulpes*	Variety of habitats types with forest, field, and agricultural land occurring as a mosaic	Well-drained den sites. Hunts more open or semi-open habitats
Coyote	*Canis latrans*	Variety of forest and field habitats, esp. areas of second growth and edge habitat	Well-drained secluded den sites
CARNIVORA: Procyonidae (Raccoons, Coatis, and Ringtails)			
Common Raccoon	*Procyon lotor*	Wooded areas interspersed with fields and water courses	Hollow trees, dens usually >10 ft (3m) above the ground
ARTIODACTYLA: Cervidae (Deer, Elk, and Moose)			
White-tailed Deer	*Odocoileus virginianus*	Forests and forest edges, swamp borders, areas interspersed with fields and woodland openings	Adequate winter browse; summer herbaceous forage and mast

[1] from DeGraaf and Yamasaki (2001)

Appendix E – Qualitative Habitat Assessment

Special Habitat Features Checklist - Rood Avenue in Windsor, CT
(Adapted from: DeGraaf and Yamasaki, 2001)

Site Location: Windsor, CT	**Site ID No:** NU - Rood Ave Property	**Date:** August 1, 2006
Time: 0723 hrs	**Investigators:** Anthony J. Zemba	**Weather:** Hazy, Hot, Humid
Major New England Community Type:		**Access Restrictions:** None

Habitat Attribute	Explanation of Attribute (where applicable)	√	Comments
Check (√) here if attribute is present →			
FOREST COMPONENTS			
Canopy Closure:			
<15%	Very open canopy	√	However tall trees line the limits of the ROW
15 – 30 %	Open canopy		
31 – 70%	Intermediate canopy		
>70%	Closed canopy		
Perch Types:			
High exposed	Supracanopy nesting and exposed hunting sites	√	Power lines and towers used by Red-tailed hawk
Low exposed	Exposed hawking sites low to the ground	√	Dead lower limbs and snags
Overstory Inclusions:			N/A = no overstory in ROW
Deciduous	One tree or group of deciduous trees in a coniferous stand		N/A
Coniferous	One tree or group of coniferous trees		

Habitat Attribute	Explanation of Attribute (where applicable)	√	Comments
Check (√) here if attribute is present →			
	in a deciduous stand		
Tree Boles:			N/A = No tree layer in ROW
Dead ≥6 in dbh – adjacent to water			
Live ≥12 in dbh – adjacent to water			
Live ≥18 in dbh – adjacent to water			
Dead and soft < 6 in dbh – general forest			
Dead and hard, 6 to 12 in dbh – general forest			
Dead and hard, 12 to 18 in dbh – general forest			
Live, columnar decay, 8 to 12 in dbh – general forest			
Live, broken top, 12 to 18 in dbh – general forest			
Live, broken top/large limb, >18 in dbh – general forest			
Live, hollow > 20 to 24 in dbh – general forest			
Midstory Layer:	Woody vegetation 10 to 30 ft in height	√	*Juniperus virginiana*, *Cornus amomum*, *Lonicera* sp., *Viburnum dentatum* (Dominants)
Shrub Layer:	Deciduous seedlings, saplings, shrubs 2-10 ft in height	√	*Hamemelis virginianus*, *Viburnum dentatum, Viburnum acerifolium*
	Coniferous seedlings, saplings, shrubs 2-10 ft in height		
	Mixed deciduous and coniferous seedlings, saplings, shrubs 2-10 ft in height	√	*Juniperus virginianus, with above*
	Ericaceous shrubs 2-10 ft in height	√	*Vaccinium corymbosum*
	Wetland shrubs	√	*V. corymbosum; Sambucus Canadensis, C. amomum*

Habitat Attribute	Explanation of Attribute (where applicable)	√	Comments
Check (√) here if attribute is present →			
Ground Cover:	<30 % Upland herbaceous ground cover 0 to 2 ft – sparse		
	30 to 75 % Upland herbaceous ground cover 0 to 2 ft – intermediate		
	>75% Upland herbaceous ground cover 0 to 2 ft – abundant	√	*Solidago* spp., *Daucus carota*, *Rhudbekia*, *Trifolium* spp., *Melilotus* spp., *Asclepias syriaca, Rynchospora*; Various grasses, See separate list
	Wetland vegetation	√	*Osmunda cinnamomea, Impatiens capensis, symplocarpus feotidus*
Duff and Ground Layer:	Forest litter and moss		
	Exposed soil	√	Remnant dune habitat
	Rocky forest floor		No rocks noted
	Dead and down woody debris – trees, larger limbs and branches		
	Waterside decaying logs – basking sites adjacent to water		
Subterranean Habitats:			
Boulder fields	Rapid permeability		
Cobbles	Rapid soil permeability		
Sand and Gravel	Rapid soil permeability	√	
Loams	Moderate soil permeability	√	
Silts	Slow soil permeability		
Clays	Slow soil permeability		
Mast and Fruit:			
Hard Mast	Nut Bearing Trees	√	*Corylus americana*

Habitat Attribute	Explanation of Attribute (where applicable)	√	Comments
Check (√) here if attribute is present →			
Soft Mast	Fleshy fruit producing trees and shrubs	√	*V. dentatum, V. corymbosum, Sambucus canadensis, Lonicera* spp.*; Juniperus, Rubus flagellarus, Cornus amomum,*
Miscellaneous Features:	Seeps		
	Vernal/autumnal temp. pools		
	Woods roads (unpaved)		
	Slash piles	√	Piles produced from previous cuts; esp. at woodland edge
	Gravel pits or exposed soil sites	√	Remnant dune
	Log landings		
UPLAND NON-FOREST COMPONENTS			
Opening Type:	Lawns, golf courses, etc.	√	Lawns at @ adjacent residential parcels to north, east, and south
	Cultivated cropland		
	Fallow Field		
	Pasture		
	Blueberry field		
	Gravel Pit		
	Log landing		
	Other_____	√	Unpaved access road
WETLAND AND AQUATIC COMPONENT			
System:	Palustrine	√	*Typha latifolia/ Lythrum salicaria* emergent
	Lacustrine		
	Riverine		
	Esturarine		
	Marine		

Habitat Attribute	**Explanation of Attribute (where applicable)**	√	**Comments**
Check (√) here if attribute is present →			
Water Depth:			
Open Water	Limetic zone >6.5 ft		
Aquatic Bed	Littoral zone <6.5ft – w/*Ceratophylum*, *Nuphar*, and *Nymphaea* present		
Emergent Wetland	Littoral zone <6.5 ft *Typha* or *Scirpus* present	√	
Scrub-shrub wetland	Littoral zone <1.5 ft		
Seasonally wet/flooded			
Intermittent drainage		√	Intermittent watercourse traverses site along the eastern side; also fed by stormwater discharge from Rood Avenue via a 12-in Reinforced Concrete Pipe (RCP)
Bottom Composition:	Bedrock		
	Boulder-Cobble		
	Gravel-Sand	√	
	Silt-Organic		
pH:	Low <5.6	√	
	Moderate 6.9 to 5.6		
	Neutral 7.0		
	Moderately high 7.1 to 8.4		
	High >8.4		
Water Temperature	32 to 50 ^{o}F (0 to 10 ^{o}C)		
	51 to 70 ^{o}F (11 to 21 ^{o}C)		

Habitat Attribute	Explanation of Attribute (where applicable)	√	Comments
Check (√) here if attribute is present →			
	71 to 80 °F (22 to 27 °C)		
	>81 °F (> 27 °C)		
Adjacent Riparian Vegetation	Aquatic Bed		
	Unconsolidated Shore		
	Emergent Wetland		
	Moss-Lichen wetland		
	Scrub-shrub wetland		
	Forested wetland		
	Upland non-forest		
Other Attributes Noted			**Factors Compromising Habitat Quality:**
Site is a wildlife corridor			Invasive plant species have become established and are proliferating
Restricted access to public; little evidence of repeated disturbance			Habitat patch surrounded by residential parcels
Mosaic of habitat types onsite; all vegetative layers represented			Expected predation from neighborhood pets
Abundance of food (nectar, hard and soft mast, other vegetative; insects, rodents)			Herbicide application has impacted onsite vegetation
Nectar sources: *Rhudbekia, Lotus corniculatus, Trifolium* spp., *Vicia crecca, Solidago* spp., *Daucus carota*			
Abundance of cover			

Appendix F - Qualitative Habitat Assessment – Special Habitat Features Checklist

(Adapted from: DeGraaf and Yamasaki, 2001)

Site Location: Windsor, CT	**Site ID No:** NU - Rood Ave Property	**Date:** August 1, 2006
Time: 0803 hrs	**Investigators:** Anthony J. Zemba	**Weather:** Hazy, Hot, Humid
Major New England Community Type:		**Access Restrictions:** None

Habitat Attribute	**Explanation of Attribute (where applicable)**	√	**Comments**
Check (√) here if attribute is present →			
FOREST COMPONENTS			
Canopy Closure:			
<15%	Very open canopy		
15 – 30 %	Open canopy		
31 – 70%	Intermediate canopy		
>70%	Closed canopy	√	Few gaps noted
Perch Types:			
High exposed	Supracanopy nesting and exposed hunting sites	√	Tall trees
Low exposed	Exposed hawking sites low to the ground	√	Dead lower limbs and snags
Overstory Inclusions:			
Deciduous	One tree or group of deciduous trees in a coniferous stand		
Coniferous	One tree or group of coniferous trees in a deciduous stand	√	Scotch pine inclusion at woodland center

Habitat Attribute	**Explanation of Attribute (where applicable)**	√	**Comments**
Check (√) here if attribute is present →			
Tree Boles:			
Dead ≥6 in dbh – adjacent to water			
Live ≥12 in dbh – adjacent to water		√	
Live ≥18 in dbh – adjacent to water			
Dead and soft < 6 in dbh – general forest			
Dead and hard, 6 to 12 in dbh – general forest			
Dead and hard, 12 to 18 in dbh – general forest			
Live, columnar decay, 8 to 12 in dbh – general forest			
Live, broken top, 12 to 18 in dbh – general forest			
Live, broken top/large limb, >18 in dbh – general forest			
Live, hollow > 20 to 24 in dbh – general forest			
Midstory Layer:	Woody vegetation 10 to 30 ft in height	√	*Carpinus caroliniana*, *Betula populifolia*,
Shrub Layer:	Deciduous seedlings, saplings, shrubs 2-10 ft in height	√	*Hamemelis virginianus*, *Viburnum dentatum, Viburnum acerifolium*
	Coniferous seedlings, saplings, shrubs 2-10 ft in height	√	*Pinus strobus*
	Mixed deciduous and coniferous seedlings, saplings, shrubs 2-10 ft in height	√	
	Ericaceous shrubs 2-10 ft in height	√	*Vaccinium corymbosum*
	Wetland shrubs	√	*V. dentatum, V. corymbosum*
Ground Cover:	<30 % Upland herbaceous ground cover 0 to 2 ft – sparse	√	*Pipsissiwa, Osmunda cinnamomea, Mianthemum canadensis, Toxicodendron radicans, Denstaedia punctilobia*

Habitat Attribute	Explanation of Attribute (where applicable)	√	Comments
Check (√) here if attribute is present →			
	30 to 75 % Upland herbaceous ground cover 0 to 2 ft – intermediate		
	>75% Upland herbaceous ground cover 0 to 2 ft – abundant		
	Wetland vegetation	√	*Osmunda cinnamomea, Impatiens capensis, symplocarpus feotidus*
Duff and Ground Layer:	Forest litter and moss	√	Lycopdia, upland moss
	Exposed soil	√	Undercut streambank
	Rocky forest floor		No rocks noted
	Dead and down woody debris – trees, larger limbs and branches	√	Down limbs along watercourse
	Waterside decaying logs – basking sites adjacent to water	√	Windfalls along watercourse
Subterranean Habitats:			
Boulder fields	Rapid permeability		
Cobbles	Rapid soil permeability		
Sand and Gravel	Rapid soil permeability		
Loams	Moderate soil permeability	√	
Silts	Slow soil permeability		
Clays	Slow soil permeability		
Mast and Fruit:			
Hard Mast	Nut Bearing Trees	√	*Corylus americana, Quercus rubra, Fagus grandifolia, Carya* sp.
Soft Mast	Fleshy fruit producing trees and shrubs	√	*Prunus serotina*, *V. dentatum, V. corymbosum*

Habitat Attribute	Explanation of Attribute (where applicable)	√	Comments
Check (√) here if attribute is present →			
Miscellaneous Features:	Seeps		
	Vernal/autumnal temp. pools	√	Dry during site visit and previous visit in July. Very shallow; likely short hydroperiod;
	Woods roads (unpaved)		
	Slash piles	√	Piles produced from previous cuts; especially at woodland edge
	Gravel pits or exposed soil sites	√	At adjacent access road and powerline ROW
	Log landings		
UPLAND NON-FOREST COMPONENTS			
Opening Type:	Lawns, golf courses, etc.	√	Lawns at adjacent residential parcels to north, east, and south
	Cultivated cropland		
	Fallow Field		
	Pasture		
	Blueberry field		
	Gravel Pit		
	Log landing		
	Other_____		
WETLAND AND AQUATIC COMPONENT			
System:	Palustrine	√	*Acer rubrum/Symplocarpus feotidus* association
	Lacustrine		
	Riverine		
	Esturarine		
	Marine		
Water Depth:			

Habitat Attribute	**Explanation of Attribute (where applicable)**	√	**Comments**
Check (√) here if attribute is present →			
Open Water	Limetic zone >6.5 ft		
Aquatic Bed	Littoral zone <6.5 ft – w/*Ceratophylum*, *Nuphar*, and *Nymphaea* present		
Emergent Wetland	Littoral zone <6.5 ft *Typha* or *Scirpus* present		
Scrub-shrub wetland	Littoral zone <1.5 ft		
Seasonally wet/flooded			
Intermittent drainage		√	Intermittent watercourse traverses site along the southern end
Bottom Composition:	Bedrock		
	Boulder-Cobble		
	Gravel-Sand		
	Silt-Organic	√	
pH:	Low <5.6	√	
	Moderate 6.9 to 5.6		
	Neutral 7.0		
	Moderately high 7.1 to 8.4		
	High >8.4		
Water Temperature	32 to 50 ^{o}F (0 to 10 ^{o}C)		
	51 to 70 ^{o}F (11 to 21 ^{o}C)		
	71 to 80 ^{o}F (22 to 27 ^{o}C)		
	>81 ^{o}F (> 27 ^{o}C)		
Adjacent Riparian	Aquatic Bed		

Habitat Attribute	**Explanation of Attribute (where applicable)**	√	**Comments**
Check (√) here if attribute is present →			
Vegetation	Unconsolidated Shore		
	Emergent Wetland		
	Moss-Lichen wetland		
	Scrub-shrub wetland		
	Forested wetland		
	Upland non-forest		
Other Attributes Not listed:			

Appendix B
Wetland Report

Wetland Report

Rood Avenue Substation

264 Rood Avenue
25 Shelley Avenue
Windsor, Connecticut

Prepared for

Connecticut
Light & Power
The Northeast Utilities System

Prepared by

/Vanasse Hangen Brustlin, Inc.
54 Tuttle Place
Middletown, Connecticut 06457-1847

July 2007

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1 Introduction

Vanasse Hangen Brustlin, Inc (VHB) conducted a wetland inspection and delineation in the vicinity of a proposed Substation planned for development on two contiguous parcels of land owned by the CT Light & Power Company (CL&P), collectively referred to herein as the "Property" on various dates in April and May 2007. Wetland areas not in proximity to the proposed Substation footprint were delineated previously in 2006, reviewed by VHB and found to be substantially correct. Wetland habitats on the Property include forested, scrub-shrub and emergent marsh wetland areas. Evidence of historic disturbance to wetland soils (e.g., former agricultural use) was encountered in several wetland areas. As a result, "normal conditions" were typically not encountered. Details of identified wetland areas are included in the following sections.

2

Project Description

Location Description

State: Connecticut

County: Hartford

Town: Windsor

Latitude/Longitude Coordinates: N41˚ 49′ 44.01″ W72˚ 40′ 06.45″

Address: 264 Rood Avenue and 25 Shelley Avenue

Size of Property: ±20.2 acres

Watershed: Connecticut River

Site Location Maps are provided as Figure 1 (topographic base) and Figure 2 (aerial photo base).

Site Vicinity Characteristics

The Property is abutted by Rood Avenue to the south and Shelley Avenue to the east. Interstate 91 is immediately east of Shelley Avenue. An existing transmission line corridor crosses through the Property and extends southeast across Rood Avenue and west across Matianuck Avenue. Land use in the vicinity of the Property is primarily residential.

Mapped Soil Types

The latest Natural Resources Conservation Service (NRCS) digital map (Version 4, March 22, 2007) of the area depicts the following soil mapping units on the Property:

- Wilbraham silt loam *
- Windsor loamy sand
- Ninigret/Tisbury soils
- Elmridge fine sandy loam
- Udorthents

* It appears as though the Wilbraham soil unit (red glacial till parent material) was mislabeled and should have been identified as Walpole sandy loam. Field observations reveal that the surface texture of the soils range from sand to silt loam. Sand and loamy sand textured surfaces represent materials deposited by glacial melt waters, possibly reworked by the wind to create dunes. These outwash deposits include parent materials with inherent red colors. Fine sandy loam and silt loam surfaces usually represent a windblown mantle (loess). Within the Property, these surface materials were deposited above glaciolacustrine deposits consisting of finely stratified sand, silt and clay.

Typical soil profiles in consist of a loamy sand cap underlain by very fine sand, silt and clay material (lakebed deposit) generally within 2 to 3 feet. Excessively drained Windsor and poorly drained Walpole series occur where the thickness of the sandy surface materials are three feet or greater. When the surface is a silt loam or fine sandy loam overlying lakebed materials the moderately well drained Elmridge and poorly drained Shaker and Scitico series occur. Soils that have been altered by land grading, excavation, or fill deposition are classified as Udorthents (e.g., the existing access drive and wetland crossing to the switching station). A Soils Map is provided as Figure 3.

Rare Species Habitat

According to the latest digital information obtained from the Connecticut Department of Environmental Protection (CTDEP) Natural Diversity Database (NDDB) no threatened, endangered, or species of special concern or significant natural communities are identified on the Site or within a half-mile radius of the Property. In addition, Northeast Utilities Service Company (NUSCO), for CL&P corresponded directly with the CTDEP and was provided a letter of "No Effect" on August 22, 2006. An Environmental Resources Screen is provided as Figure 4. A copy of the CTDEP correspondence is provided in Appendix A.

3

Wetland Delineation Methodology

Selection of Delineation Method

VHB wetland scientists identified wetland boundaries based on both Federal criteria (defined at 33 CFR 328-329) and on criteria set forth within the Connecticut Inland Wetlands and Watercourses Act (sections 22a-36 through 22a-45 of the CT General Statutes). These delineated wetland boundaries did not deviate substantially. Federal wetland boundaries were delineated in accordance with the *Corps Wetlands Delineation Manual*[1] U.S. Army Corps of Engineering ("Corps"). To verify a site is wetland, three technical criteria are examined and documented. A combination of the hydric soil, hydrophytic vegetation, and hydrology criteria defines wetlands as described in the Corps Wetlands Delineation Manual. Therefore an area that meets the hydric soil criteria must also meet the hydrophytic vegetation and wetland hydrology criteria in order for it to be classified as a jurisdictional wetland.

Based on the level of detail required for this investigation, the *Routine On-Site Determination Method*, as described in the Corps Wetlands Delineation Manual, was selected as the appropriate technique to satisfy the requirements of this delineation. In addition, wetland boundaries were delineated in accordance with subsequent Corps Headquarters and New England District guidance including: *Field Indicators for*

Identifying Hydric Soils in New England, Version 3 and New England District wetland delineation datasheet. This wetland delineation technique involved the collection and review of background information followed by an on-site survey and delineation.

Background Research

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

- Hartford North, Connecticut, United States Geologic Survey (USGS) 7.5-minute series topographic quadrangle map (USGS 1964; photorevised 1992);
- NRCS digital soil information;
- CTDEP digital wetland information (Web Soil Survey);
- U.S. Fish and Wildlife Service (USFWS) Region 1, National Wetland Inventory (NWI) digital information;
- CTDEP Natural Diversity Database digital listed species information;
- FEMA Flood Insurance Rate Map (FIRM) digital information; and,
- Aerial photographs (1928, 1951, 1957, 1970, 1986, and 2004).

On-Site Field Determination

An initial systematic field survey of the project area was conducted on April 18, 2007. The survey of the project area was initiated with a walk-over inspection of the proposed Substation location and immediately adjoining areas to identify soil topo-drainage sequences, drainage features, and plant associations that would indicate the potential for jurisdictional wetland classification.

[1] Environmental Laboratory. (1987). "Corps of Engineers Wetlands Delineation Manual." Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.

The wetland delineation was completed by evaluating the indicator status of dominant plant species in each stratum to determine whether a hydrophytic plant association was present. Soils profiles were sampled using a Dutch auger and/or a tile spade to determine if any hydric soil indicators were present. Indicators of wetland hydrology were also observed. Once the delineation was completed, the soils, vegetation, and hydrology were documented at representative transect locations along the wetland edge. At each transect, the first plot was placed in an area that met the criteria of a jurisdictional wetland. Subsequent plots were placed upslope until jurisdictional wetland criteria were not met. Sampling locations within hydric/non-hydric soil units and distinct plant communities were then investigated using the *Routine On-Site Wetland Determination Method*. This method involved a detailed examination of the soils, vegetation, and hydrophytic indicators identified within the project area. Wetland delineation datasheets were completed for wetlands anticipated to be altered by or in proximity to the proposed Substation. Specific methods for characterizing and evaluating soil, vegetation, and hydrologic indicators are described below.

Soils

Soil profile observations were collected at each sampling location to a depth of at least 20 inches. Typically, a 12-inch diameter soil pit was dug with a tile spade (sharpshooter) to provide a soil profile for examination. A slice was taken from the pit face for detailed description. Soils profiles were described by identifying horizons and recording the depths to each horizon boundary. For each horizon the soil texture, structure, and moist color (matrix and redoximorphic features) were recorded. Matrix and redoximorphic feature soil colors were identified using a *Munsell® Soil Color Chart* (Munsell® Color 2000). In addition to color, the kind, size, quantity and contrast of redoximorphic features were evaluated and recorded. Hydric soil indicators were field

identified using the *Field Indicators for Identifying Hydric Soils in New England*[2] and *Field Indicators of Hydric Soils in the United States*[3].

Common indicators used to identify hydric soil on the property included sandy with redox (X.B.), Any Texture (XI. A.), and Red Parent Material test indicator TF2.

Disturbed soils were encountered in a portion of the site formerly used for agriculture, particularly Wetland 3. These areas included partially buried hydric soils that were capped with 12 to 18 inches of native soil material that may have been intentionally placed to improve arability or were slowly deposited as a result of slope wash sediment deposition. In these disturbed soils that did not meet a hydric field indicator, generally, the presence of redoximorphic features high in the sediment cap was relied on as an indicator of ongoing hydric soil development.

Vegetation

Dominant vegetation species in each vegetation stratum (herbaceous, shrub, sapling, tree, and liana) within the general vicinity of each sampling location were identified. Hydrophytic vegetation is defined as the sum total of macrophytic plant life that occurs in areas where the frequency and duration of inundation or soil saturation produce permanently or periodically saturated soils of sufficient duration to exert a controlling influence on the plant species present[4]. Plant species within the wetland/upland ecotone were recorded as to their percent cover and wetland indicator status according to the USFWS *National List of Plant Species That Occur in Wetlands,*

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[2] New England Hydric Soils Technical Committee. 2004. 3rd ed., *Field Indicators for Identifying Hydric Soils in New England.* New England Interstate Water Pollution Control Commission, Lowell, MA.

[3] United States Department of Agriculture, Natural Resources Conservation Service. 2006. *Field Indicators of Hydric Soils in the United States*, Version 6.0. G.W. Hurt and L.M. Vasilas (eds.) USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

[4] Environmental Laboratory. (1987). "Corps of Engineers Wetlands Delineation Manual." Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS

Region 1 (Reed 1988) and the NRCS Plants Database[5] . At each plot, visual estimates of plant species cover was recorded in a 15-foot radius for sapling and shrub layers and a 5-foot radius for the herbaceous layer. The basal area[6] for all trees was determined by measuring and recording the diameter of each individual at breast height (DBH) within a 30 foot diameter plot. Dominance in the tree layer was determined by summing the basal area contributed by all individuals of a species and dividing by the basal area of all species within the plot. Lianas were counted in the same 30-foot radius used for trees. Total vegetation dominance for all strata was determined using the "50/20 rule" (Corps Delineation Manual, 1987).

Hydrology

The term wetland hydrology encompasses all hydrologic characteristics for areas that are periodically inundated or have soils saturated to the surface at some time during the growing season. Corps hydrology criteria consist of inundation, saturation to the surface, or the upper part of the soil for a long or very long duration. The Corps Wetlands Delineation Manual[7] suggests that this saturation must persist for at least five percent of the growing season in most years. The growing season in Hartford County is approximately 184 days[8] which would provide a minimum duration of 9.2 days.

Areas with evident characteristics for wetland hydrology are those where the presence of water has an overriding influence on the characteristics of vegetation and soils. Indicators of wetland hydrology include vegetated hummocks, water marks on tree trunks and other vegetation, evidence of inundation or ponding (e.g., water stained

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

[6] Basal area for individual trees was determined by measuring diameter at breast height (dbh) and converting diameter to basal area using the formula A = B d /4 (where A = basal area, B = 3.1416, and d = dbh).

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

Real Time – Differential GPS Mapping

Wetland boundary flags and transect data point locations were located using a Trimble Pro XR Global Positioning System (GPS) receiver and mapped using a Computer Aided Design (CAD) program. Real time differentially corrected positions (from Coast Guard beacon) data points were recorded using a portable ruggedized Windows CE data logger. A minimum of 10 static measurements with a Precision Dilution of Position (PDOP) no greater than 6.0 were also collected at each survey point to enhance a sub-meter level of accuracy. Real time positions were then post-processed for additional accuracy using static data available at public continuously operating reference stations (CORS) and referenced to the Connecticut State Plane Coordinate System NAD 83.

[7] Environmental Laboratory. (1987). "Corps of Engineers Wetlands Delineation Manual." Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS
[8] Soil Data Mart: http://soildatamart.nrcs.usda.gov/

4

Wetland Delineation Results

Site Description

CL&P's Property is currently occupied by a switching station (converted from a former Substation) with access provided by a dirt drive from Rood Avenue, and 115-kV and 345-kV transmission lines. The three transmission lines parallel the west side of this access drive then turn west eventually crossing Matianuck Avenue. The transmission corridor consists of upland and wetland scrub-shrub and meadow/marsh communities maintained by standard vegetation management practices. The location of the proposed substation mostly consists of early successional forest. More mature trees are present along the northern Property boundary and south and west of the proposed substation. Plant communities and existing site features are depicted in Figure 5 Existing Conditions.

Review of Background Information

Changes in the Property's historic uses are revealed by a review of aerial photographs from 1928, 1951, 1957, 1970, 1986, and 2004, provided in Appendix B. Based on accounts from CL&P and the earliest aerial photographs, the Property was historically used for agricultural purposes and during more recent history (prior to the surrounding residential development) the adjoining property to the north was a golf course. To

evaluate changes to wetlands over time the approximate Property boundary and delineated wetland boundaries have been superimposed on the aerial photographs. A chronological analysis of these aerial photos reveals that most of the present day wetland areas were once cultivated fields with the exception of Wetland 5. An east-west oriented linear feature within the interior of Wetlands 3 and 4 visible in the 1957 and 1970 aerials appears to be a drainage ditch. Evidence of past soil disturbances (e.g., partially filled original soil profiles and mechanical mixing of upper horizons) was noted in several of the wetland areas but particularly in Wetlands 3 and 4.

Results of Field Delineation

VHB professional soil scientists Jeffrey Peterson and Dean Gustafson delineated wetlands on the Property in proximity to the proposed new Substation footprint on various dates during the first and second weeks of April 2007. Delineation of wetlands on the Property not in proximity to the Substation was previously conducted in 2006. These boundaries were field verified and found to be substantially correct. Six wetland areas, totaling ±4.9 acres, were identified on the Property as described in detail below.

Factors Affecting the Identification of Jurisdictional Wetlands

Portions of Wetlands 3 and 4 were disturbed by ditching and soil filling associated with historic farm management such that "normal conditions" were not present. The influence of red parent materials on soil colors was noted in parts of Wetlands 3 and 4. In addition to these human influenced soils, the effect of red parent materials, considered a "problem soil area", was observed in these wetlands.

The delineation was further complicated by antecedent weather conditions when over four inches of rainfall fell between April 15 and 16 as recorded at nearby Windsor

Locks, CT[9]. The wetland boundary was reviewed on May 3, 2007 after some of the effects of the rainfall event had passed. Weather data for April and May 2007 are provided in Appendix C. During May 3, 2007 site visit, data transects were established and plots were recorded to document the federal wetland boundary for Wetlands 2, 3, and 4 where impacts from the proposed Substation are anticipated. Please refer to the Existing Conditions Figure for the location of each wetland area.

Photographs of wetland areas are provided in Appendix D. Federal wetland boundary datasheets and accompanying photographs are provided in Appendix E.

Wetland Descriptions

Wetland 1

Wetland 1 (±1.4 acres) is a linear system that discharges throughflow held above a slowly permeable lakebed deposit. This wetland is surrounded by development including the existing transmission line, residential subdivisions to the north and west, the switching station to the north and the access road from Rood Avenue that crosses the wetland. The hydrologic regime of this wetland is characterized by seasonal saturation with small areas of shallow inundation. Surface flows driven by precipitation and reflow travel southward through an intermittent watercourse consisting of braided channels. Flows within this watercourse are conveyed under the existing access drive via a 32-inch reinforced concrete pipe (RCP) east to Wetland 5. This intermittent watercourse is a tributary to Deckers Brook located approximately 700 feet east of the Property and east of Interstate-91. The far northern component of this wetland discharges surface runoff and reflow to the east in a swale north of the switching station to Wetland 2. A narrow strip of fill material placed across this swale

[9] National Weather Service Forecast Office. Preliminary Climate Data. Station: Windsor Locks, CT. April 2007.

separates Wetland 1 from Wetland 2. This flow passes through the fill material (possibly in a stone drain or buried pipe) and into Wetland 2.

Cover types in Wetland 1 included forest, scrub-shrub and emergent marsh. Remnant forested areas are dominated by red maple, pin oak, American elm, arrowwood and ironwood. Scrub-shrub areas are dominated by silky dogwood, Bebb willow, sensitive fern, skunk cabbage, jewelweed and purple loosestrife. Emergent marsh areas are commonly consist of skunk cabbage, cattail, purple loosestrife, soft rush, sedges, woolgrass, goldenrod, boneset, arrow-leaved tear-thumb, Joe Pye-weed, deer tongue grass and eastern marsh fern.

Wetland 2

Wetland 2 (±0.2 acre) is primarily a groundwater/surface water depression (southeast end is a groundwater discharge area) that has been disturbed by land grading associated with the residential development to the north and the switching station to the west.

The western part of the wetland contains a small potential vernal pool that is seasonally inundated. Water depths in this pool were approximately 8 to 12 inches on April 9, 2007. No egg masses were found, though three adult wood frogs were present in the pool on this date. No wood frogs or other obligate vernal pool species were observed during follow up inspections conducted later in April and May. Despite heavy spring rainfall, the pool was nearly dry by May 3, 2007. Due to the absence of obligate vernal pool species and apparent short hydroperiod, it was concluded that

Wetland 2 is not a vernal pool or special wetland as defined in the Connecticut Programmatic General Permit[10].

The western portion of the wetland is forested and the eastern portion supports scrub-shrub vegetation. The wetland drains north through a ditch into a lawn and culvert under Sunnyfield Drive.

Forested areas are occupied by swamp white oak, red maple, American elm, serviceberry, arrowwood, Bebb willow, highbush blueberry, silky dogwood and skunk cabbage. Scrub-shrub areas are dominated by silky dogwood, elderberry, arrowwood, highbush blueberry, sensitive fern, jewelweed, and skunk cabbage. A Federal wetland delineation transect and data plots were established centrally along the south wetland boundary near wetland flag W 2-16.

Wetland 3

Wetland 3 (±0.8 acre) occurs in a forested area of the Property east of the access drive. The wetland had been farmed and portions of the wetland have been partially buried by native soil materials that were either deposited as sediment or graded over the original soil surface (refer to 1957 and 1970 aerials). Typically, the thickness of this sediment/human transported material (HTM) was approximately 12 inches to 18 inches thick and with textures ranging from loamy sand to fine sandy loam.. Evidence of mechanical mixing of A and B horizon materials (mottles) were also observed in some pits. Some of these "disturbed" soils did not meet an established indicator for hydric soils. These soils were determined to be hydric when recognizable redoximorphic features were present in the upper part of the sediment/HTM layer. In many instances

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[10] Department of the Army Programmatic General Permit State of Connecticut, May 31, 2006.

this judgment was further supported by saturation of the upper soil profile and a positive reaction to presence of ferrous iron by alpha-alpha dipyridal dye.

The early successional forest in this wetland is dominated by red maple, red oak, apple, arrowwood and silky dogwood. The wetland gently slopes to the east where it drains into a culvert that flows under Shelley Avenue. The hydrology of this wetland is driven by surface runoff and throughflow held above slowly permeable lakebed deposits. The hydroperiod of this wetland may have been altered by drainage ditches and the capping by sediment/HTM so a series of early growing season observations soil saturation were collected.

Two Federal wetland delineation transects and data plots were established at the western point and along the south wetland boundary near wetland flags W 3-17 and W 3-7, respectively. Transect T3-17 was established in a wetland area proposed to be affected by the Substation.

Wetland 4

Forested Wetland 4 (±1.4 acres) is located east of the existing switching station access drive and north of Wetland 5. It is separated from Wetland 5 by a deposit of HTM that is also forested. Flows from Wetland 4 enter Wetland 5 at the extreme eastern end of the Property. Wetland 4 has also been disturbed by historic agricultural activities and other development and contains areas of buried wetland soils (refer to 1957 and 1970 aerials). The hydrology of this depressional wetland is supported by throughflow held above the slowly permeable lakebed deposit and surface runoff.

A small shallow pool (< 6 inches) was present at the eastern part of this wetland above its confluence with Wetland 5. No vernal pool species were identified within the area

during various inspections in April. This pool had dried by May 4, 2007. Based on this evidence it was determined that Wetland 4 does not include a vernal pool.

Dominant plant species within the wetland include red maple, gray birch, spruce, American elm, cottonwood, winterberry, black cherry, spicebush, highbush blueberry, arrowwood, sensitive fern, skunk cabbage, cinnamon fern and Canada may flower. A Federal wetland delineation transect and data plots were established along the north wetland boundary near the northwest wetland corner near wetland flag W 4-16. Transect T4-16 was established in a wetland area proposed to be affected by the Substation.

Wetland 5

Wetland 5 (±0.4 acre) is a riparian corridor consisting of an incised watercourse and narrow bordering forested wetland. Seasonally, the watercourse receives flows from Wetland 1 and Wetland 4 and reflow emerging from its steeply cut banks and conveys this flow east to a culvert located off of the Property. This watercourse is depicted as an intermittent stream on the USGS quadrangle map of the area. The small upstream watershed and field observations of limited flow suggest that the stream periodically dries in the summer. At this time the applicant is not aware of direct observations to confirm this stream is intermittent.

Forested portions of the wetland are dominantly occupied by red maple, silky dogwood, arrowwood, cinnamon fern and skunk cabbage.

Wetland 6

Wetland 6 (±0.7 acre) occurs in the western end of the Property. Cover types beneath the transmission line are emergent marsh and scrub-shrub, maintained by vegetation

management to protect the electric conductors. Northern portions of this wetland beyond the transmission corridor are forested. Emergent vegetation consisted mainly of skunk cabbage, cattail, jewelweed, purple loosestrife, soft rush, sedges, woolgrass, goldenrod, boneset, arrow-leaved tear-thumb, Joe Pye-weed, deer tongue grass, and eastern marsh fern. Areas occupied by scrub-shrub habitat are dominated by buttonbush, highbush blueberry, silky dogwood, alder, elderberry, northern arrowwood and spicebush. The forested area is dominated by red maple.

Figures

Figure 1: Site Location Map, USGS

Source: U.S.G.S. Quad: Hartford North, CT (1992)

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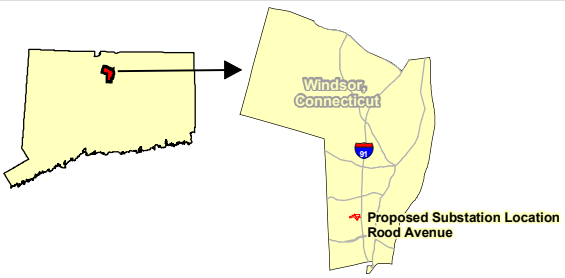
VHB Vanasse Hangen Brustlin, Inc.
Transportation Land Development Environmental Services



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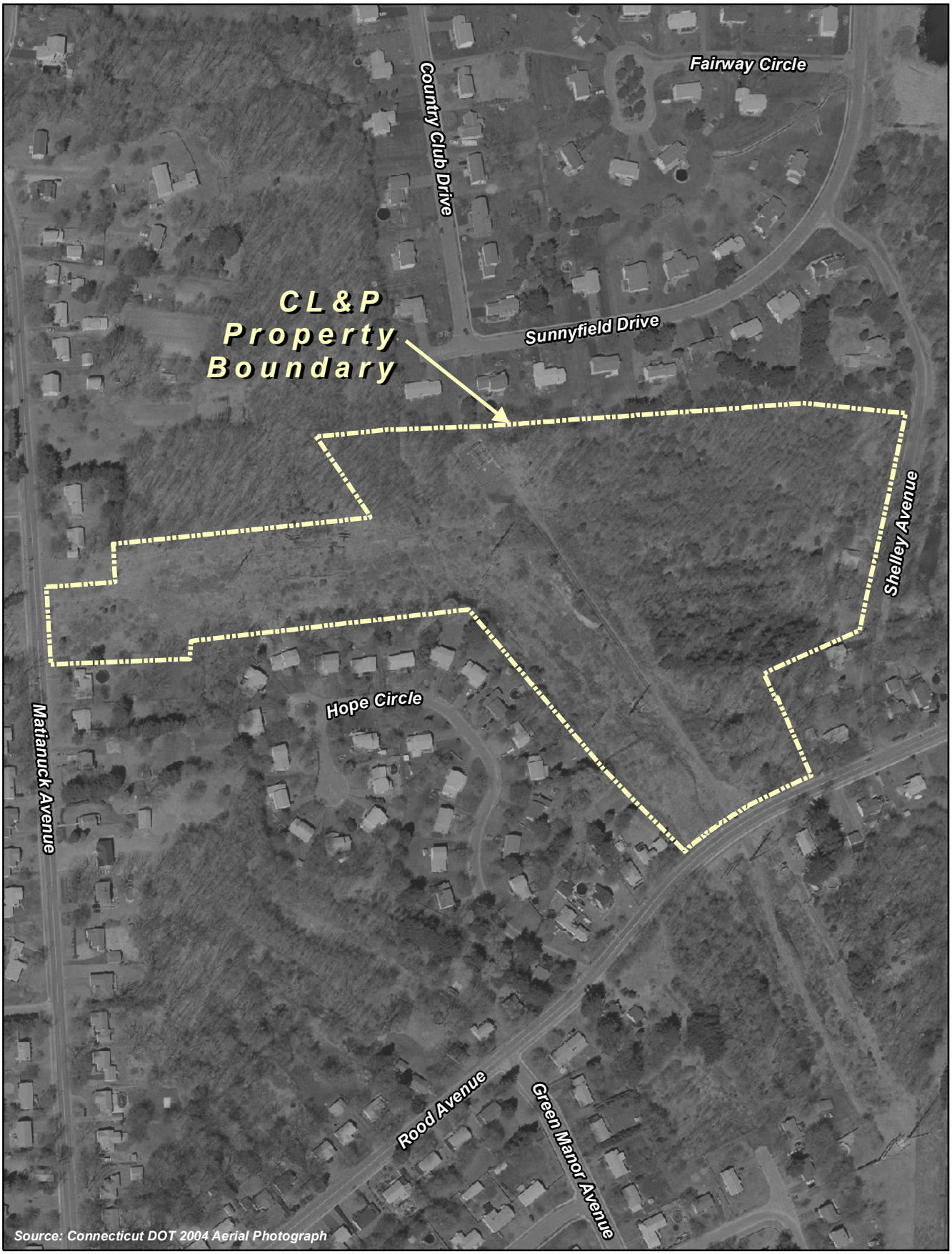
Connecticut Light & Power
The Northeast Utilities System

Figure 2: Site Location Map, Aerial Photograph



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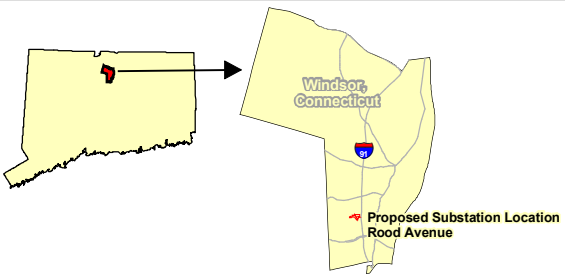
Transportation Land Development Environmental Services



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150 75 0 150
Feet

Connecticut Light & Power
The Northeast Utilities System

\\ctmiddat\projects\41260.00\graphics\figures\Dean_Figures\Fig_3_Soils_Map.pdf

Legend

- CL&P Property Boundary
- Soil Type Boundary

150 75 0 150 Feet

Vanasse Hangen Brustlin, Inc.

Figure 3
Soils Map
NUSCO Proposed
24J Rood Avenue Substation
Windsor, Connecticut

\\ctmiddat\projects\41260.00\graphics\figures\Dean_Figures\Fig_3_ev_screen.pdf

Legend

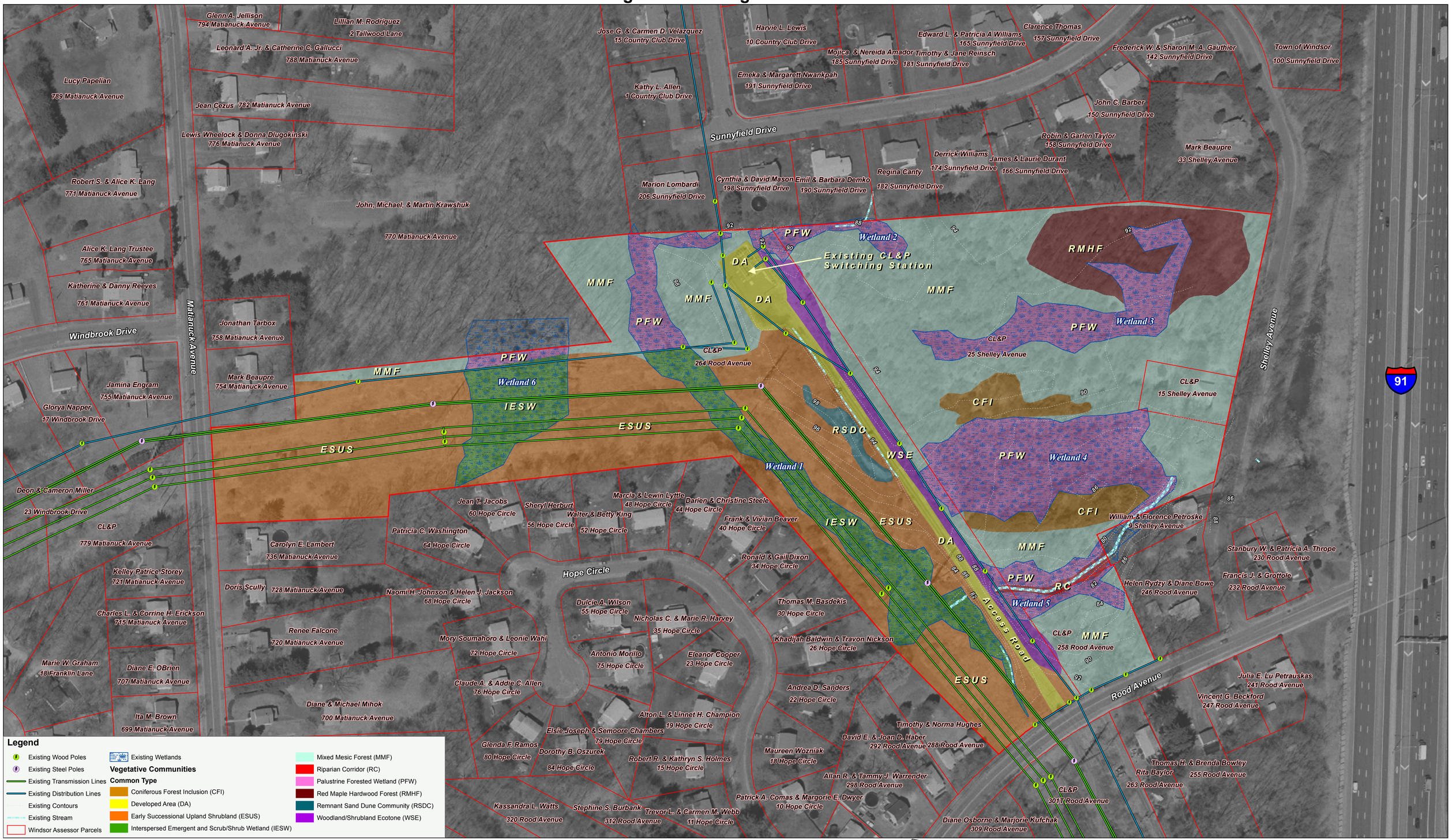
- National Wetland Inventory
  PEM1E - Palustrine Emergent Wetland
- Connecticut DEP Wetlands
- Natural Diversity Database Areas (buffered; last updated June 2007; none in project area)
- Open Water
- 100 Year Floodplain
- 500 Year Floodplain
- Floodway

500 250 0 500 Feet

Vanasse Hangen Brustlin, Inc.

Figure 4
Environmental Resources Screen
NUSCO Proposed
24J Rood Avenue Substation
Windsor, Connecticut

Figure 5: Existing Conditions



Legend

- Existing Wood Poles
- Existing Steel Poles
- Existing Transmission Lines
- Existing Distribution Lines
- Existing Contours
- Existing Stream
- Windsor Assessor Parcels
- Existing Wetlands

Vegetative Communities

Common Type

- Coniferous Forest Inclusion (CFI)
- Developed Area (DA)
- Early Successional Upland Shrubland (ESUS)
- Interspersed Emergent and Scrub/Shrub Wetland (IESW)
- Mixed Mesic Forest (MMF)
- Riparian Corridor (RC)
- Palustrine Forested Wetland (PFW)
- Red Maple Hardwood Forest (RMHF)
- Remnant Sand Dune Community (RSDC)
- Woodland/Shrubland Ecotone (WSE)

05/23/07

Vanasse Hangen Brustlin, Inc.
Transportation Land Development Environmental Services

N W E S

100 50 0 100 Feet

Proposed Substation Location
Rood Avenue

Connecticut Light & Power
The Northeast Utilities System

Appendix A
CTDEP Correspondence

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

August 22, 2006

Mr. Scott A. Marotta
Northeast Utilities Service Company
P.O. Box 270
Hartford, CT 06141-0270

Re: Proposed Construction of New Substation on Rood Avenue and I-91, Windsor

Dear Mr. Marotta:

I have reviewed Natural Diversity Data Base maps and files regarding the area delineated on the map you provided for the proposed construction of a new substation on company owned land west of Rood Avenue and Interstate 91 Junction in Windsor, Connecticut. According to our information there are no known extant populations of Federal or State Endangered, Threatened or Special Concern Species that occur at the site in question.

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 Natural Resources Center's Geological and Natural History Survey and cooperating units of DEP, 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 ibecomes available.

Please contact me if you have further questions at 424-3592. Thank you for consulting the Natural Diversity Data Base. Also be advised thatthis is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEP for the proposed site.

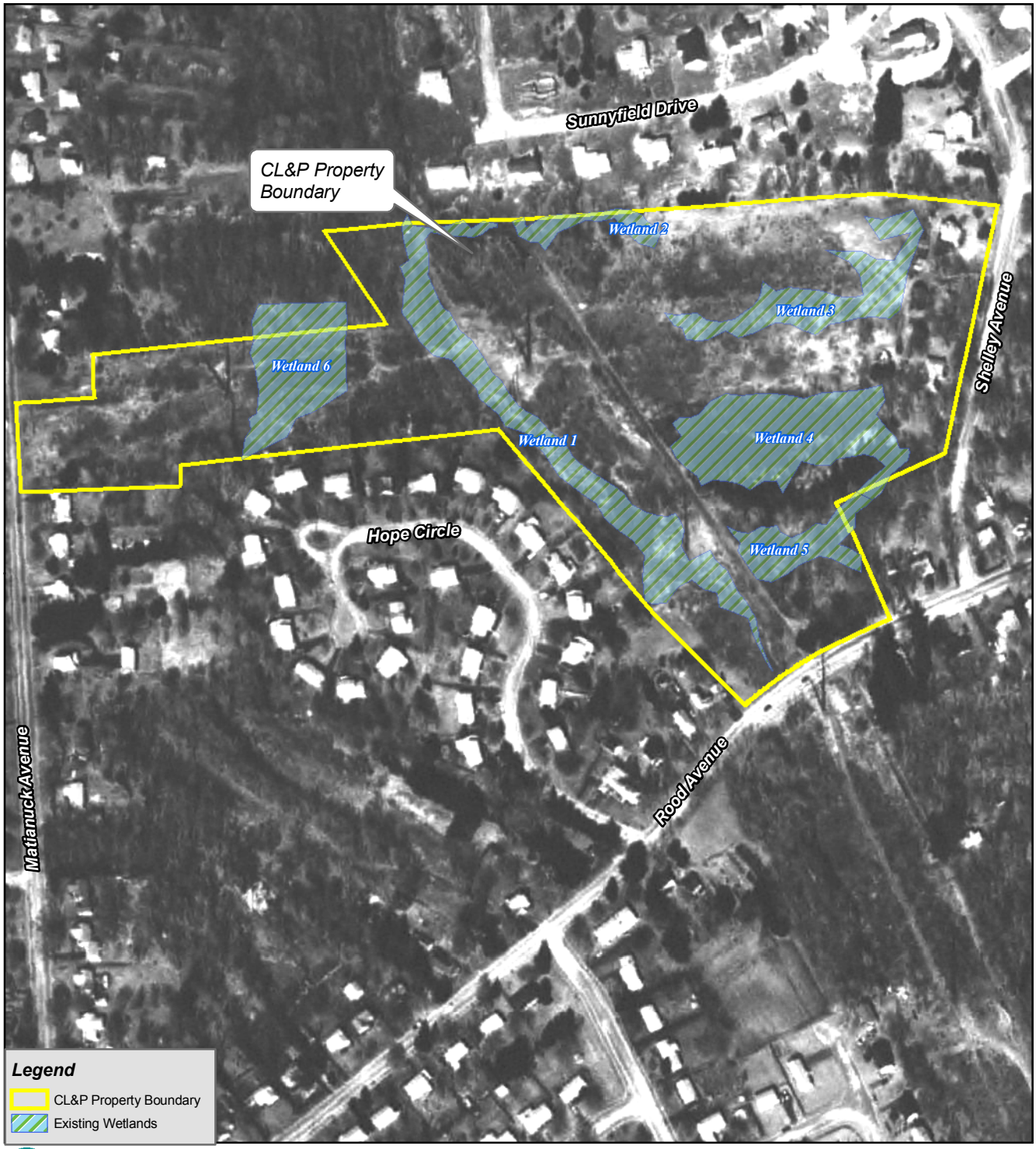
Sincerely,

Dawn M. McKay
Biologist/Environmental Analyst

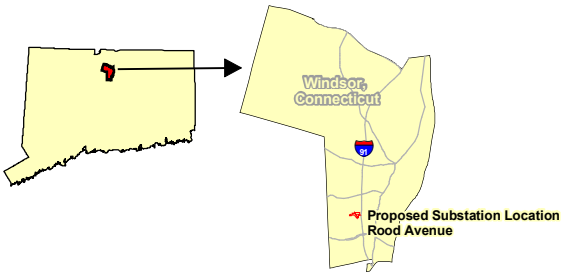
DMM/blm

Appendix B
Historic Aerial Photographs

1986 Aerial Photograph



VHB Vanasse Hangen Brustlin, Inc.
Transportation Land Development Environmental Services



N
W E
S

150 75 0 150 Feet

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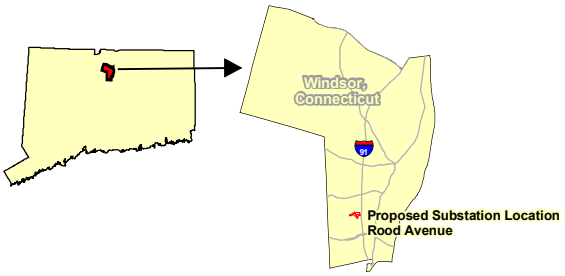
The Northeast Utilities System

1970 Aerial Photograph

VHB Vanasse Hangen Brustlin, Inc.
Transportation Land Development Environmental Services



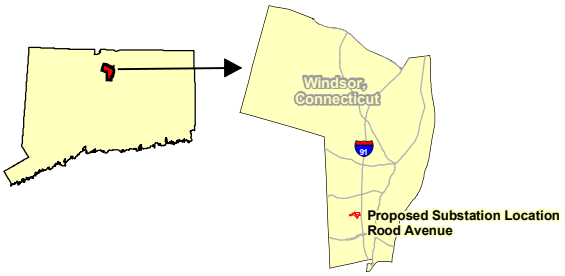
N
W E
S

200 100 0 200
Feet

Connecticut Light & Power
The Northeast Utilities System

1957 Aerial Photograph

VHB Vanasse Hangen Brustlin, Inc.
Transportation Land Development Environmental Services

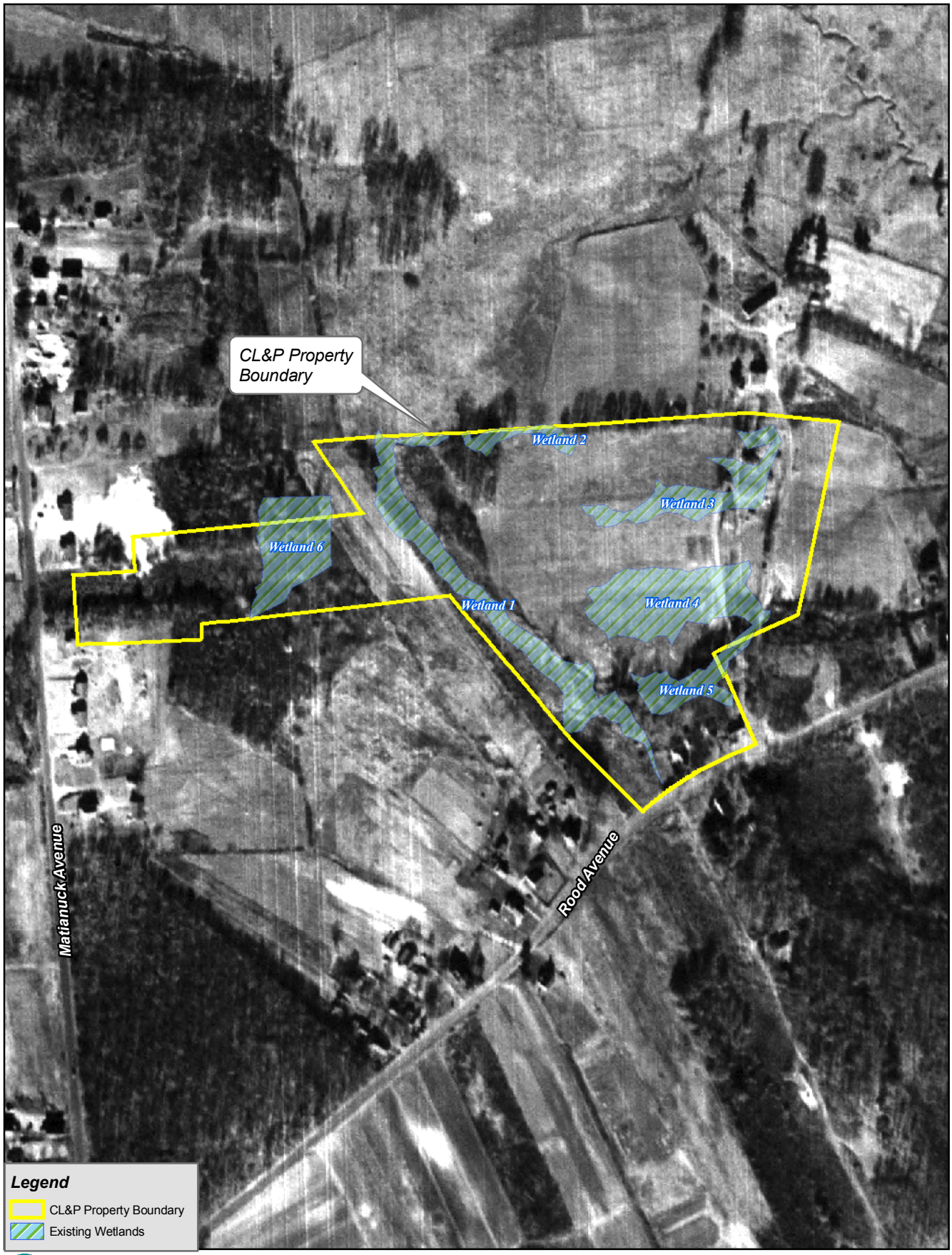


N
W E
S

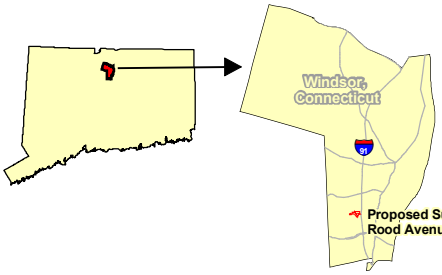
200 100 0 200 Feet

Connecticut Light & Power
The Northeast Utilities System

1951 Aerial Photograph



VHB Vanasse Hangen Brustlin, Inc.
Transportation Land Development Environmental Services

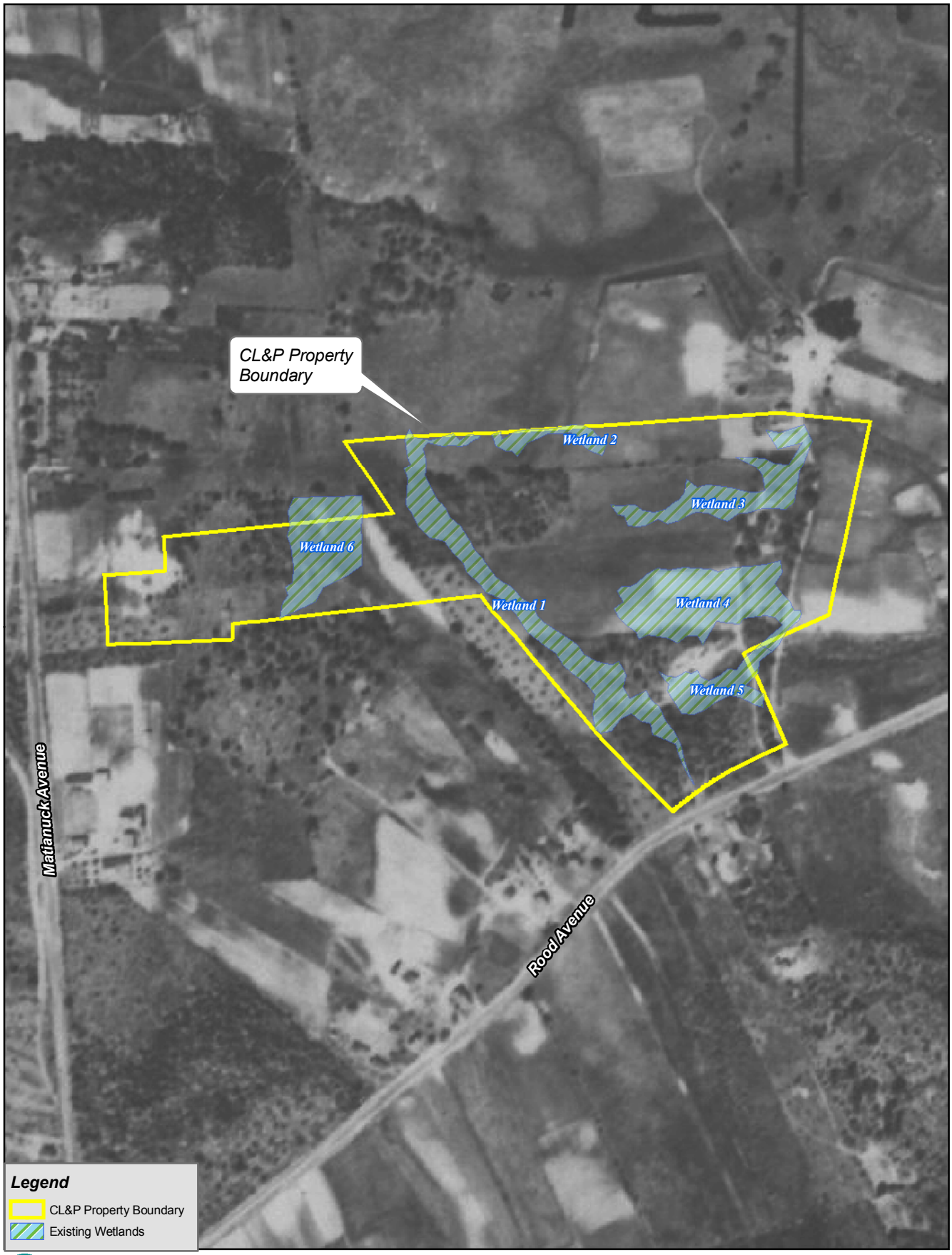


N
W E
S

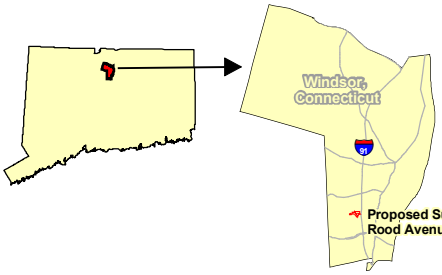
200 100 0 200
Feet

Connecticut Light & Power
The Northeast Utilities System

1934 Aerial Photograph



VHB Vanasse Hangen Brustlin, Inc.
Transportation Land Development Environmental Services

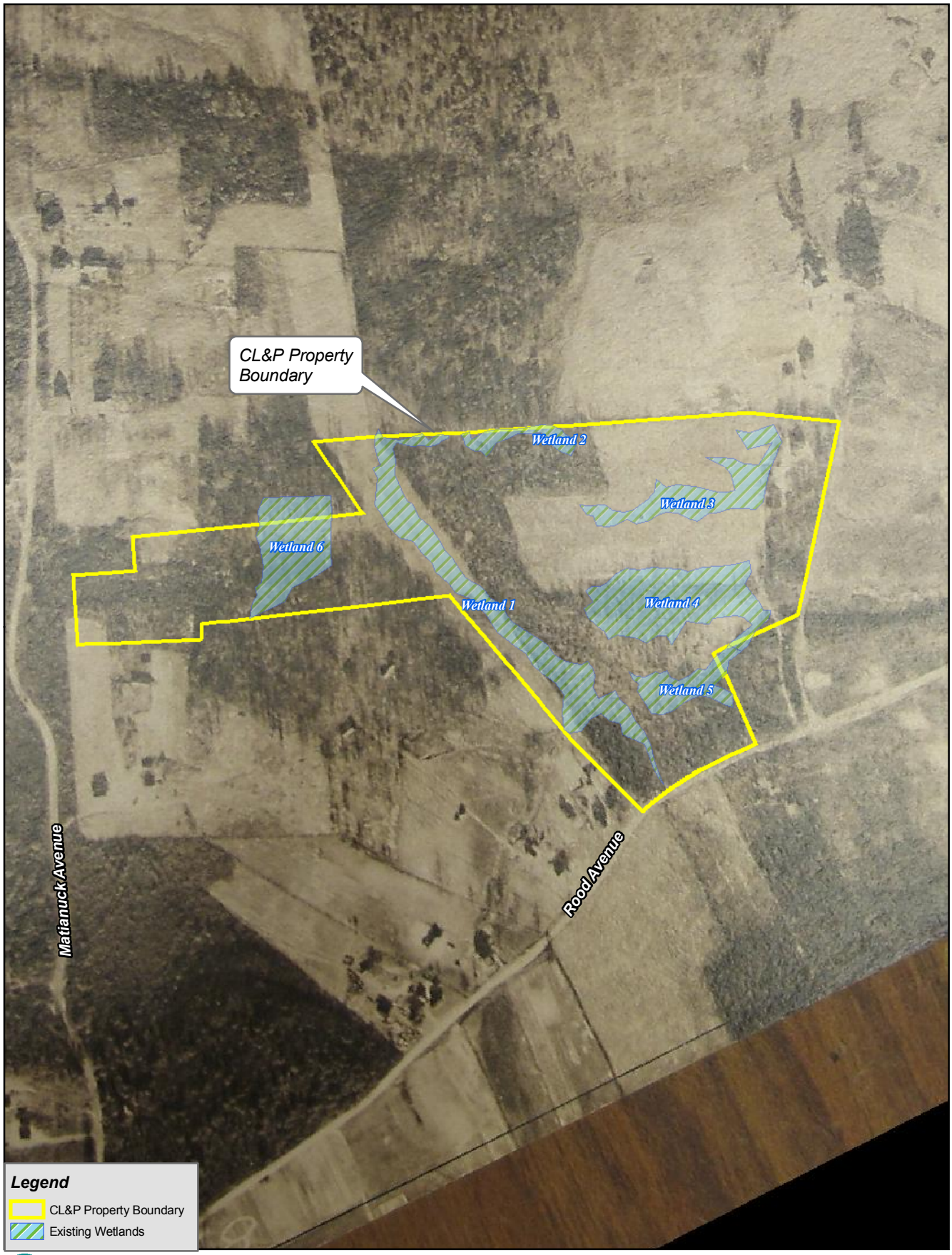


N
W E
S

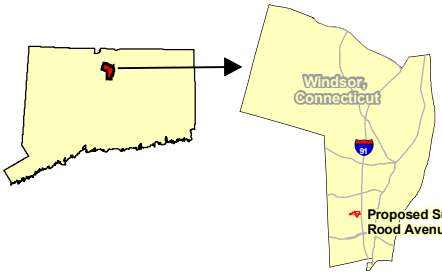
210 105 0 210
Feet

Connecticut Light & Power
The Northeast Utilities System

1928 Aerial Photograph



VHB Vanasse Hangen Brustlin, Inc.
Transportation Land Development Environmental Services



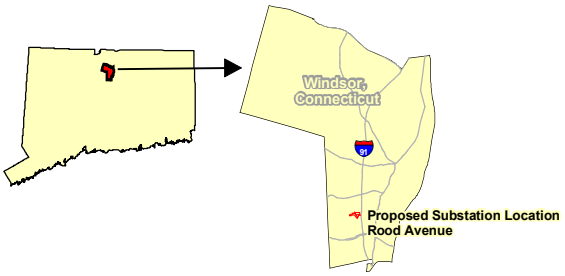
N
W E
S

200 100 0 200 Feet

Connecticut Light & Power
The Northeast Utilities System

2004 Aerial Photograph

VHB Vanasse Hangen Brustlin, Inc.
Transportation Land Development Environmental Services



N
W E
S

200 100 0 200 Feet

Connecticut Light & Power
The Northeast Utilities System

Appendix C
Climate Data

Explanation of the Preliminary Climate Data (F6) Product

Please note this information is preliminary and subject to revision. Official and certified climatic data can be accessed at the National Climatic Data Center (NCDC) (http://www.ncdc.noaa.gov/oa/ncdc.html).

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: WINDSOR LOCKS, CT
MONTH: APRIL
YEAR: 2007
LATITUDE: 41 56 N
LONGITUDE: 72 41 W

	TEMPERATURE IN F:							:PCPN:	SNOW:	WIND			:SUNSHINE:		SKY	:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	AVG SPD	MX SPD	2MIN DIR	MIN	PSBL	S-S	WX	SPD	DR
1	58	26	42	M	23	0	0.21	M	M	5.6	18	210	M	M	M	NA	24	210
2	46	39	43	M	22	0	0.01	M	M	7.2	12	30	M	M	M	NA	14	30
3	55	38	47	M	18	0	0.00	M	M	7.1	15	70	M	M	M	NA	20	40
4	39	34	37	M	28	0	1.00	M	M	9.1	14	20	M	M	M	NA	18	140
5	45	28	37	M	28	0	T	M	M	10.8	26	310	M	M	M	NA	35	300
6	38	25	32	M	33	0	0.00	M	M	9.7	22	300	M	M	M	NA	25	300
7	42	24	33	M	32	0	0.00	M	M	8.0	17	10	M	M	M	NA	28	10
8	43	25	34	M	31	0	0.00	M	M	11.7	23	300	M	M	M	NA	31	270
9	49	32	41	M	24	0	0.00	M	M	11.4	21	310	M	M	M	NA	26	320
10	48	30	39	M	26	0	0.00	M	M	9.5	20	310	M	M	M	NA	41	80
11	54	25	40	M	25	0	0.00	M	M	4.9	15	180	M	M	M	NA	18	200
12	43	34	39	M	26	0	1.12	M	M	8.5	17	360	M	M	M	NA	22	100
13	50	34	42	M	23	0	0.00	M	M	13.3	30	290	M	M	6	NA	38	300
14	53	38	46	M	19	0	0.00	M	M	11.7	25	290	M	M	7	NA	31	290
*15	45	36	41	M	24	0	3.21	M	M	8.2	18	10	M	M	10	NA	23	10
*16	56	41	49	M	16	0	0.80	M	M	15.2	31	100	M	M	10	NA	41	100
17	46	38	42	M	23	0	0.18	M	M	16.9	28	360	M	M	10	NA	36	10
18	48	40	44	M	21	0	T	M	M	12.7	24	30	M	M	10	NA	30	40
19	66	43	55	M	10	0	T	M	M	10.2	22	30	M	M	6	NA	28	30
20	73	35	54	M	11	0	0.00	M	M	7.0	21	360	M	M	2	NA	29	20
21	78	33	56	M	9	0	0.00	M	M	4.3	22	320	M	M	5	NA	31	310
22	79	40	60	M	5	0	0.00	M	M	7.2	21	170	M	M	4	NA	29	30
23	88	48	68	M	0	3	0.00	M	M	11.8	25	190	M	M	3	NA	35	240
24	72	50	61	M	4	0	0.00	M	M	11.0	23	310	M	M	5	NA	30	310
25	62	42	52	M	13	0	0.21	M	M	5.1	24	360	M	M	7	NA	29	360
26	64	35	50	M	15	0	0.00	M	M	7.4	20	200	M	M	7	NA	24	200
27	53	45	49	M	16	0	0.59	M	M	3.8	14	150	M	M	10	NA	17	150
28	69	51	60	M	5	0	0.20	M	M	4.2	14	200	M	M	8	NA	16	200
29	64	47	56	M	9	0	T	M	M	7.6	17	300	M	M	8	NA	22	320
30	75	43	59	M	6	0	0.01	M	M	12.2	33	310	M	M	6	NA	43	300
SM	1701	1099		545		3	7.54		0.0	273.3			M		130			
AV	56.7	36.6								9.1	FASTST		PSBL		7		MAX(MPH)	
								MISC ---->		33	310						43	300

NOTES:
LAST OF SEVERAL OCCURRENCES

* nor'easter storm

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

STATION: WINDSOR LOCKS, CT
MONTH: APRIL
YEAR: 2007
LATITUDE: 41 56 N
LONGITUDE: 72 41 W

[TEMPERATURE DATA]

AVERAGE MONTHLY: 46.7
DPTR FM NORMAL: M
HIGHEST: 88 ON 23
LOWEST: 24 ON 7

[PRECIPITATION DATA]

TOTAL FOR MONTH: 7.54
DPTR FM NORMAL: M
GRTST 24HR M ON M

SNOW, ICE PELLETS, HAIL
TOTAL MONTH: 0.0 INCH
GRTST 24HR M
GRTST DEPTH: M

SYMBOLS USED IN COLUMN 16

1 = FOG OR MIST
2 = FOG REDUCING VISIBILITY TO 1/4 MILE OR LESS
3 = THUNDER
4 = ICE PELLETS
5 = HAIL
6 = FREEZING RAIN OR DRIZZLE
7 = DUSTSTORM OR SANDSTORM: VSBY 1/2 MILE OR LESS
8 = SMOKE OR HAZE
9 = BLOWING SNOW
X = TORNADO

Explanation of the Preliminary Climate Data (F6) Product

Please note this information is preliminary and subject to revision. Official and certified climatic data can be accessed at the National Climatic Data Center (NCDC) (http://www.ncdc.noaa.gov/oa/ncdc.html).

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: WINDSOR LOCKS, CT
MONTH: MAY
YEAR: 2007
LATITUDE: 41 56 N
LONGITUDE: 72 41 W

TEMPERATURE IN F:							:PCPN:		SNOW:	WIND			:SUNSHINE:			SKY	:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	AVG SPD	MX SPD	2MIN DIR	MIN	PSBL	S-S	WX	SPD	DR
1	70	45	58	M	7	0	T	M	M	7.5	16	290	M	M	7	NA	21	270
2	69	47	58	M	7	0	0.21	M	M	8.3	18	300	M	M	6	NA	26	310
3	69	39	54	M	11	0	0.00	M	M	7.2	20	280	M	M	2	NA	26	310
5	67	37	52	M	13	0	0.00	M	M	8.7	26	30	M	M	6	NA	32	20
6	63	43	53	M	12	0	0.00	M	M	10.7	20	40	M	M	6	NA	40	340
7	70	33	52	M	13	0	0.00	M	M	4.9	14	190	M	M	5	NA	16	200
8	78	41	60	M	5	0	0.00	M	M	10.6	23	170	M	M	2	NA	28	190
9	87	51	69	M	0	4	0.00	M	M	9.6	20	180	M	M	4	NA	26	180
10	86	64	75	M	0	10	0.00	M	M	9.6	21	190	M	M	6	NA	28	190
11	73	61	67	M	0	2	1.84	M	M	5.3	12	160	M	M	8	NA	15	160
12	75	53	64	M	1	0	T	M	M	8.9	18	170	M	M	7	NA	23	360
13	68	44	56	M	9	0	0.00	M	M	8.8	22	320	M	M	2	NA	30	320
14	73	37	55	M	10	0	0.00	M	M	7.3	20	230	M	M	3	NA	25	200
15	86	50	68	M	0	3	0.02	M	M	8.9	21	200	M	M	6	NA	26	200
16	86	51	69	M	0	4	0.76	M	M	8.5	36	290	M	M	5	NA	49	290
17	69	48	59	M	6	0	0.05	M	M	5.7	16	60	M	M	6	NA	21	70
18	48	45	47	M	18	0	0.12	M	M	9.5	17	10	M	M	10	NA	23	40
21	67	47	57	M	8	0	T	M	M	8.9	20	310	M	M	5	NA	26	330
22	73	42	58	M	7	0	0.00	M	M	4.9	10	200	M	M	4	NA	14	200
23	76	49	63	M	2	0	0.00	M	M	9.6	22	170	M	M	3	NA	26	170
28	85	58	72	M	0	7	T	M	M	7.1	17	310	M	M	6	NA	22	330
29	79	51	65	M	0	0	0.00	M	M	5.1	15	310	M	M	5	NA	22	10
SM	1617	1036		129	30	3.00		0.0	175.6				M		124			
AV	73.5	47.1							8.0	FASTST			PSBL		5		MAX(MPH)	
							MISC ---->		36	290							49	290

NOTES:
LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

STATION: WINDSOR LOCKS, CT
MONTH: MAY
YEAR: 2007
LATITUDE: 41 56 N
LONGITUDE: 72 41 W

[TEMPERATURE DATA]

AVERAGE MONTHLY: 60.3
DPTR FM NORMAL: M
HIGHEST: 87 ON 9
LOWEST: 33 ON 7

[PRECIPITATION DATA]

TOTAL FOR MONTH: 3.00
DPTR FM NORMAL: M
GRTST 24HR M ON M

SNOW, ICE PELLETS, HAIL
TOTAL MONTH: 0.0 INCH
GRTST 24HR M
GRTST DEPTH: M

SYMBOLS USED IN COLUMN 16

1 = FOG OR MIST
2 = FOG REDUCING VISIBILITY TO 1/4 MILE OR LESS
3 = THUNDER
4 = ICE PELLETS
5 = HAIL
6 = FREEZING RAIN OR DRIZZLE
7 = DUSTSTORM OR SANDSTORM: VSBY 1/2 MILE OR LESS
8 = SMOKE OR HAZE
9 = BLOWING SNOW
X = TORNADO

Understanding the Preliminary Climate Data (WS Form F-6)

The preliminary climate data pages consist of 3 parts.
Part1 is the site information including the station location, the month and year of the report, and the latitude and longitude of the station.
Part 2 is the daily information which consists of 18 columns of data, with one row of data for each day of the month. The day runs from 0000 to 2359 Local Standard Time (0100 to 0059 Daylight Savings Time).
Part 3 of the report (noted as Page 2) is the monthly section which consists of various averages and totals for the month.

An excerpt of a WS Form F6 is shown below. An explanation of each column of the data can be found below the example.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: WASHINGTON NATIONAL
MONTH: MARCH
YEAR: 2003
LATITUDE: 38 50 N
LONGITUDE: 77 2 W

	TEMPERATURE IN F:							:PCPN:	SNOW:	WIND				:SUNSHINE:	SKY		:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
										AVG	MX	2MIN						
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	DPTH	SPD	SPD	DIR	MIN	PSBL	S-S	WX	SPD	DR
1	40	33	37	-5	28	0	0.01	0.1	3	5.7	14	190	M	M	10	18	15	190
2	52	36	44	2	21	0	0.41	0.0	1	9.2	21	320	M	M	9	1	28	320
3	42	20	31	-11	34	0	T	T	0	13.3	28	340	M	M	2		35	340

Fire Weather
Discussions
Marine
Tides
Climate
Local
National
More
Digital
Bufkit Model
Calculators
Digital Forecast
MOS Data
Weather Maps
New England Maps
Hourly Data Plot
Snow Maps
NOAA Weather Radio
Broadcast Info
Descriptive
Hurricane
Weather Photos
Educational
Sources
Weather Glossary
Warning Criteria
Wind Chill Table
Papers and Studies
Weather Safety
Storm Ready
Lightning Safety
General Information
Skywarn Program
Skywarn Training
Program
Miscellaneous
Web Weather Links
Weather News
Air and UVI
The Sun and Moon
About Our Office
What We Do
Verification
Outreach
Contact Us
Ask Questions

```
 4  46  23  35  -8  30    0 0.00  0.0     0  6.0 10 180    M    M   7         M  M
 5  68  38  53  10  12    0 0.07  0.0     0  5.8 16 350    M    M   9 18     18 360
 6  49  30  40  -3  25    0 0.22  0.0     0 13.6 26  20    M    M   9 1      29  10
 7  89  69  79   3   0   14 0.14  0.0     0  6.3 25 240    M    M   6 13     33 250
 8  87  71  79   3   0   14 0.00  0.0     0  6.8 25 280    M    M   7        32 260
 9  91  72  82   6   0   17 0.28  0.0     0  7.5 23 250    M    M   8 13     31 260
10  76  69  73  -3   0    8 0.23  0.0     0  9.2 16  50    M    M  10 138    18  60
11  86  67  77   1   0   12 0.04  0.0     0  6.3 20 280    M    M   7 138    25 280
12  85  61  73  -4   0    8 0.34  0.0     0  7.0 23 220    M    M   5 138    30 220
13  83  62  73  -4   0    8    T  0.0     0  3.7 13 360    M    M   6        18 350
14  79  67  73  -4   0    8    T  0.0     0  6.3 16  90    M    M   7 1      21  50
31  45  31  38 -13  27    0    T    T     0 12.7 31 300    M    M   4 8      39 320
================================================================================
SM 1767 1152        549    0  4.20      0.1 276.6           M       205
================================================================================
AV 57.0 37.2                                    8.9 FASTST  PSBL  %   7    MAX(MPH)
                                    MISC ---->     37 330                    44  330
================================================================================
NOTES:
# LAST OF SEVERAL OCCURRENCES
```

Note: An "M" in any column means the data are Missing for that element.

Column		
1	DY	The **day** of the month.
2	MAX	The **highest** temperature for the day in degrees Fahrenheit (F).
3	MIN	The **lowest** temperature for the day in degrees Fahrenheit (F).
4	AVG	The **average** temperature for the day, computed by finding the average of the values in columns 2 and 3, then rounding (if necessary). Example; 55.5 rounds up to 56, 55.4 rounds down to 55 degrees.
5	DEP	**Departure** from normal. The difference between column 4 and the 30 year normal temperature for this date. A minus (-) is number of degrees below normal. A zero (0) indicates that the average for that day was the Normal.
6a & 6b	HDD & CDD	**Degree Day:** A gauge of the amount of heating or cooling needed for a building using 65 degrees as a baseline. To compute heating/cooling degree-days, take the average temperature for a day and subtract the reference temperature of 65 degrees. If the difference is positive, it is called a "**Cooling Degree Day**". If the difference is negative, it is called a "**Heating Degree Day**". The magnitude of the difference is the number of days. For example, if your average temperature for a day is 50 degrees in September, the difference of the average temperature for that day and the reference temperature of 65 degrees would yield a minus 15. Therefore, you have 15 Heating Degree Days that day. If the average temperature is 77 degrees for a day, you would have 12 Cooling Degree Days (77-65). If the average temperature

		for the day is 65 degrees, there are no Heating or Cooling degree days. Electrical, natural gas, power, and heating, and air conditioning industries utilize heating and cooling degree information to calculate their energy needs. The Heating season runs from July 1st through June 30th. The Cooling season runs from Jan 1st through Dec 31st.
7	WTR	Total **precipitation** for the day to the nearest hundredth of an inch. This includes all forms of precipitation, both liquid and water equivalent of any snow or ice that occurred (T = Trace, some precipitation fell but not enough to measure).
8	SNW	Total **snowfall** for the day to the nearest tenth of an inch.
9	DPTH	Snow **depth** on the ground to the nearest inch at 1200UTC. 7am EST., 6am CST, 5am MST, 4am PST, 3am AST, etc.
10	AVG SPD	**Average wind speed** for the day in miles per hour (mph).
11	MX SPD	The **highest wind speed** in mph averaged over a 2 minute period.
12	2MIN DIR	The **direction** (in compass degrees divided by 10) from which the wind speed in column 11 came from. (N=36 S=18 W=27 E=09, etc.)
13	MIN	The number of **minutes** of sunshine received at the station. Not reported at all locations.
14	PSBL	The percentage of **possible** sunshine. Computed by dividing the minutes of sunshine in column 13 by the total possible minutes. Not reported at all locations.
15	S-S	The average sky cover between sunrise and sunset in tenths of sky covered. The minimum of "0" means no clouds observed, "10" means clouds covered the entire sky for that day.
16	WX	A coded number representing certain types of **weather** observed during the day. 1 = Fog 2 = Fog reducing visibility to 1/4 mile or less 3 = Thunder 4 = Ice pellets 5 = Hail 6 = Glaze or rime 7 = Blowing dust or sand: visibility 1/2 mile or less 8 = Smoke or haze 9 = Blowing snow X = Tornado In the example above on the 12th, you see "138" coded for the day. That means Fog, Thunder and Smoke or Haze were observed at some time during that day.
17	SPD	Peak wind **speed** for the day in mph. The highest wind speed observed at the station.
18	DR	The compass **direction** from which the peak wind speed came.

SM is the Sum of that column. Note; these MAY not line up exactly under the column! Using the example shown above, the monthly snowfall (0.1)inch is offset slightly to the right.
AV is the Average for that column

* An excerpt from the third part of a WS Form F6 (Page 2) is shown below. An explanation of each column of data can be found below the example.

[TEMPERATURE DATA]

AVERAGE MONTHLY: 42.7
DPTR FM NORMAL: 3.0
HIGHEST: 80 ON 30
LOWEST: 13 ON 4

[PRECIPITATION DATA]

TOTAL FOR MONTH: 5.97
DPTR FM NORMAL: 1.95
GRTST 24HR 2.05 ON 19-20

SNOW, ICE PELLETS, HAIL
TOTAL MONTH: 10.8 INCHES
GRTST 24HR 6.5 ON 3- 3
GRTST DEPTH: 9 ON 4

SYMBOLS USED IN COLUMN 16

1 = FOG
2 = FOG REDUCING VISIBILITY TO 1/4 MILE OR LESS
3 = THUNDER
4 = ICE PELLETS
5 = HAIL
6 = GLAZE OR RIME
7 = BLOWING DUST OR SAND: VSBY 1/2 MILE OR LESS
8 = SMOKE OR HAZE
9 = BLOWING SNOW
X = TORNADO

NO. OF DAYS WITH

MAX 32 OR BELOW: 2
MAX 90 OR ABOVE: 0
MIN 32 OR BELOW: 22
MIN 0 OR BELOW: 0

WEATHER - DAYS WITH

0.01 INCH OR MORE: 11
0.10 INCH OR MORE: 9
0.50 INCH OR MORE: 4
1.00 INCH OR MORE: 2

HDD (BASE 65)

TOTAL THIS MO. 687
DPTR FM NORMAL -122
SEASONAL TOTAL 1767
DPTR FM NORMAL -348

CLEAR (SCALE 0-3) 10
PTCLDY (SCALE 4-7) 15
CLOUDY (SCALE 8-10) 6

CDD (BASE 65)

TOTAL THIS MO. 4
DPTR FM NORMAL 4
SEASONAL TOTAL 4
DPTR FM NORMAL 4

PRESSURE DATA

HIGHEST SLP 30.45 ON 22
LOWEST SLP 29.50 ON 6

REMARKS

TEMPERATURE DATA	Cumulative temperature information for the month including averages, departure from normal, and the highest/lowest temperatures observed and

	on what day they occurred.
NO. OF DAYS WITH	Number of days during the month that meet the criteria shown.
HDD (BASE 65)	Heating degree day information based on an average temperature of 65 degrees. Included are the Total this Month, Departure from Normal for the Month, the Seasonal Total and the Seasonal Departure from Normal. The Heating season runs from July 1st through June 30th.
CDD (BASE 65)	Cooling degree day information based on an average temperature of 65 degrees. Included are the Total this Month, Departure from Normal for the Month, the Seasonal Total and the Seasonal Departure from Normal. The Cooling season runs from Jan 1st through Dec 31st.
REMARKS	Additive remarks made by observer.
PRECIPITATION DATA	Cumulative precipitation (for both rain and frozen precipitation) information, for the month including total for the month, departure from normal for that month, greatest 24 hour amount not necessarily midnight to midnight, and greatest snow depth at 1200UTC.
WEATHER - DAYS WITH	Number of days during the month that meet the temperature, precipitation and sky cover criteria shown.
PRESSURE DATA	Magnitude of highest and lowest sea level pressure (in inches) and the day on which it occurred.
SYMBOLS USED IN COLUMN 16	A coded number representing certain types of weather observed during the day. 1 = Fog 2 = Fog reducing visibility to 1/4 mile or less 3 = Thunder 4 = Ice pellets 5 = Hail 6 = Glaze or rime 7 = Blowing dust or sand: visibility 1/2 mile or less 8 = Smoke or haze 9 = Blowing snow X = Tornado

Close Window

Boston Weather Forecast Office
445 Myles Standish Blvd
Taunton, MA 02780
Tel:
Ask Questions/Webmaster
Page last modified: 21-Jul-2006 2:40 AM

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Appendix D
Wetland Photographs

Vanasse Hangen Brustlin, Inc.
PHOTOLOG DOCUMENTATION
Rood Avenue Substation – Wetland Photographs
264 Rood Avenue and 25 Shelley Avenue, Windsor, Connecticut

Photo 1: View of Wetland 1 behind existing switching station

Photo 2: View of potential vernal pool within Wetland 2 east of existing switching station

Vanasse Hangen Brustlin, Inc.
PHOTOLOG DOCUMENTATION
Rood Avenue Substation – Wetland Photographs
264 Rood Avenue and 25 Shelley Avenue, Windsor, Connecticut

Photo 3: View central portion of Wetland 3 (typical view)

Photo 4: View northern portion of Wetland 4

Vanasse Hangen Brustlin, Inc.
PHOTOLOG DOCUMENTATION
Rood Avenue Substation – Wetland Photographs
264 Rood Avenue and 25 Shelley Avenue, Windsor, Connecticut

Photo 6: View of southern end of Wetland 4

Appendix E
Federal Wetland Boundary Datasheets and Photographs

PROJECT TITLE: NU - Rood Ave Substation | TRANSECT: T4-16 | PLOT: A

Location: Wetland 4

DELINEATOR(S): J. Peterson, D. Gustafson | DATE: 5/3/07

VEGETATION Stratum and Species	Dominance Ratio	Percent Dominance	D O M	NWI Status
Seedlings & Herbs				
Black Cherry (*Prunus serotina*)	10.5/10.5	100	X	FACU
Shrubs				
Arrowwood (*Viburnum recognitum*)	10.5/31.5	33	X	FACW-
Black Cherry (*Prunus serotina*)	10.5/31.5	33	X	FACU
White pine (*Pinus strobus*)	10.5/31.5	33	X	FACU
Saplings				
Apple (*Malus pumila*)	20.5/51.5	40	X	UPL
Black Cherry (*Prunus serotina*)	20.5/51/5	40	X	FACU
White pine (*Pinus strobus*)	10.5/51.5	20	X	FACU
Red maple (*Acer rubrum*)	T	---		FAC
Trees				
White pine (*Pinus strobus*): 10", 11, 8, 5	276/718	38	X	FACU
Gray birch (*Betula populifolia*): 5", 6, 7, 5, 8	160/718	22	X	FAC
Red maple (*Acer rubrum*): 6", 6, 8, 6, 5	139/718	19		FAC
White oak (*Quercus alba*): 10"	71/718	10		FACU-
Black Cherry (*Prunus serotina*): 5", 6	48/718	7		FACU
Apple (*Malus pumila*): 5"	24/718	3		UPL
Vines				
Fox grape (*Vitis labrusca*)	3/3	100	X	FACU

HYDROPHYTES

0	1	1	0
OBL	FACW	FAC	*OTHER

NON-HYDROPHYTES

0	7	1
FAC-	FACU	UPL

Hydrophytes Subtotal (A): 2

Non-hydrophytes Subtotal (B): 8

PERCENT HYDROPHYTES (100 A/A+B): 20

HYDROLOGY

☐ RECORDED DATA

Stream, lake or tidal gage — Identification:

Aerial photography — Identification: 1928, 1951, 1057, 1970, 1986, 2004 Aerial Photographs

Other — Identification:

☐ NO RECORDED DATA

☒ OBSERVATIONS

Depth to Free Water: 16"

Depth to Saturation (including capillary fringe):

Altered Hydrology (explain):

☐ Inundated ☐ Saturated in upper 12" ☐ Water Marks ☐ Drift Lines ☐ Sediment Deposits ☐ Drainage Patterns within Wetland

☐ OTHER (explain):

SOIL Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.

Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
0-3″	A	10YR 3/2	None	Horizon forming at top of Ap fine sandy loam, many medium fine roots
3-6″	Ap	10YR 3/3	None	loamy fine sand
6-16″	A/B	10YR 4/6 / 10YR 3/2	None	loamy fine sand, mechanically mixed material
16-24″	Ab	10YR 3/2	common medium (10YR 3/4) concentrations	fine sandy loam, massive, friable
24-28″	Bw	10YR 4/4	many, coarse, faint (10YR 4/3) depletions; common, few-many, faint (7.5YR 4/4) concentrations	loamy fine sand; loose single grain

HYDRIC SOIL INDICATOR(S): no hydric indicators met

REFERENCE(S): New England Hydric Soils Technical Committee. 2004. 3rd ed., *Field Indicators for Identifying Hydric Soils in New England.* New England Interstate Water Pollution Control Commission, Lowell, MA.

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:

Soil drainage class:

Depth to active water table:

NTCHS hydric soil criterion:

CONCLUSIONS

	YES	NO
Hydrophytic vegetation criterion met?	☐	☒
Hydric soils criterion met?	☐	☒
Wetland hydrology criterion met?	☐	☒
IS THIS DATAPOINT IN A WETLAND?	☐	☒

REMARKS: upland soil underlies area partially filled during former agricultural operations

PROJECT TITLE: NU - Rood Ave Substation | TRANSECT: T3-17 | PLOT: B

Location: Wetland 3 (west)

DELINEATOR(S): J. Peterson, D. Gustafson | DATE: 5/3/07

VEGETATION Stratum and Species	Dominance Ratio	Percent Dominance	D O M	NWI Status
Seedlings & Herbs				
Sensitive fern (*Onoclea sensibilis*)	10.5/10.5	100	X	FACW
Shrubs				
Arrowwood (*Viburnum recognitum*)	63/73.5	86	X	FACW-
Silky dogwood (*Cornus amomum*)	10.5/73.5	14		FACW
Saplings				
Red maple (*Acer rubrum*)	38.5/48.5	78	X	FAC
Apple (*Malus pumila*):	10.55/48.5	22	X	UPL
Trees				
Red maple (*Acer rubrum*): 5", 6, 7, 6, 6, 6, 6, 7, 6, 5, 10	350/350	100	X	FAC
Vines				
None	---	---		---

HYDROPHYTES

0	2	2	0
OBL	FACW	FAC	*OTHER

NON-HYDROPHYTES

0	0	1
FAC-	FACU	UPL

Hydrophytes Subtotal (A): 4

Non-hydrophytes Subtotal (B): 1

PERCENT HYDROPHYTES (100 A/A+B): 80

HYDROLOGY

☐ RECORDED DATA

Stream, lake or tidal gage — Identification:

Aerial photography — Identification:

Other — Identification:

☐ NO RECORDED DATA

☒ OBSERVATIONS

Depth to Free Water: 4"

Depth to wetness (including capillary fringe):

Altered Hydrology (explain):

☐ Inundated ☒ Saturated in upper 12" ☒ Water Marks ☐ Drift Lines ☐ Sediment Deposits ☒ Drainage Patterns within Wetland

☒ OTHER (explain): High Groundwater conditions (precipitation); leaf bud just expanding

SOIL Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.

Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
0-8″	Ap1	10YR 2/2	7.5YR 3/3 concentrations	fine sandy loam, friable, weak medium granular; many medium fine roots
8-11″	Ab	10YR 2/1	common, faint, coarse 10YR 3/3 and 10YR 3/1 masses	fine sandy loam, weak medium subangular blocky, friable; common medium roots
11-15″	Bw	7.5YR 4/6	common, coarse 5YR 3/3 and 5YR 3/4 concentrations	fine sandy loam; weak medium subangular blocky; common fine roots
15-23″	C	7.5YR 4/6	common, coarse 5YR 3/4 concentrations; 5YR 3/4 nodules; Fe/Mn nodules	fine sandy loam, weak medium subangular blocky; few medium roots

HYDRIC SOIL INDICATOR(S): Does not meet hydric indicator, but prominent features and observed hydrology suggest soil is hydric; XIII

REFERENCE(S): New England Hydric Soils Technical Committee. 2004. 3rd ed., *Field Indicators for Identifying Hydric Soils in New England.* New England Interstate Water Pollution Control Commission, Lowell, MA.

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:

Soil drainage class:

Depth to active water table:

NTCHS hydric soil criterion:

CONCLUSIONS

	YES	NO	REMARKS:
Hydrophytic vegetation criterion met?	☒	☐	
Hydric soils criterion met?	☐	☒	
Wetland hydrology criterion met?	☒	☐	
IS THIS DATAPOINT IN A WETLAND?	☒	☐	

PROJECT TITLE: NU - Rood Ave Substation | TRANSECT: T3-17 | PLOT: A

Location: Wetland 3 (west)

DELINEATOR(S): J. Peterson, D. Gustafson | DATE: 5/3/07

VEGETATION Stratum and Species	Dominance Ratio	Percent Dominance	D O M	NWI Status
Seedlings & Herbs				
Canada mayflower (*Maianthemum canadense*)	3/9	33	X	FAC -
Morrow honeysuckle (*Lonicera morrowii*)	3/9	33	X	NI
Red-panicle dogwood (*Cornus racemosa*)	3/9	33	X	FAC
Shrubs				
Arrowwood (*Viburnum recognitum*)	20.5/40	51	X	FACW-
Apple (*Malus pumila*):	10.5/40	26	X	UPL
Black Cherry (*Prunus serotina*)	3/40	8		FACU
Silky dogwood (*Cornus amomum*)	3/40	8		FACW
Morrow honeysuckle (*lonicera morrowii*)	3/40	8		NI
Saplings				
Red maple (*Acer rubrum*)	10.5/10.5	100	X	FAC
Trees				
Red maple (*Acer rubrum*): 8", 6, 6, 5, 6, 5, 6, 7, 5, 6, 8, 5, 5, 6, 7, 5, 5, 9, 6, 8, 7, 8	714/714	100	X	FAC
Vines				
None	-	-	-	-

HYDROPHYTES

0	1	3	0
OBL	FACW	FAC	*OTHER

NON-HYDROPHYTES

1	0	1
FAC-	FACU	UPL

Hydrophytes Subtotal (A): 4

Non-hydrophytes Subtotal (B): 2

PERCENT HYDROPHYTES (100 A/A+B): 67

HYDROLOGY

☐ RECORDED DATA

Stream, lake or tidal gage Identification:

Aerial photography Identification:

Other Identification:

☐ NO RECORDED DATA

☒ OBSERVATIONS

Depth to Free Water: 7"

Depth to Saturation (including capillary fringe):

Altered Hydrology (explain):

☐ Inundated ☒ Saturated in upper 12" ☒ Water Marks ☐ Drift Lines ☐ Sediment Deposits ☐ Drainage Patterns within Wetland

☐ OTHER (explain):

SOIL Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.

Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
0-6″	Ap1	10YR 2/2	None	fine sandy loam, friable, moderate granular; many medium fine roots
6-11″	Ap2	10YR 3/2	common faint coarse (10YR 3/3 and 10YR 3/1) masses	fine sandy loam, weak medium subangular blocky, friable; common medium roots
11-15″	A/B	10YR 2/1 10 YR 4/4		fine sandy loam; A/Bw mechanically mixed
15-24″	Bw1	7.5YR 4/6		fine sandy loam, weak medium subangular blocky; few medium roots

HYDRIC SOIL INDICATOR(S):
No indicators met

REFERENCE(S): New England Hydric Soils Technical Committee. 2004. 3rd ed., *Field Indicators for Identifying Hydric Soils in New England.* New England Interstate Water Pollution Control Commission, Lowell, MA.

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:
Soil drainage class:
Depth to active water table:
NTCHS hydric soil criterion:

CONCLUSIONS

	YES	NO
Hydrophytic vegetation criterion met?	☒	☐
Hydric soils criterion met?	☐	☒
Wetland hydrology criterion met?	☒	☐
IS THIS DATAPOINT IN A WETLAND?	☐	☒

REMARKS: exceptional rainfall prior to site investigation (>4" 4/15 – 4/16)

PROJECT TITLE: NU - Rood Ave Substation

TRANSECT: T3-7 PLOT: B

Location: Wetland 3 (east)

DELINEATOR(S): J. Peterson, D. Gustafson

DATE: 5/3/07

VEGETATION Stratum and Species	Dominance Ratio	Percent Dominance	D O M	NWI Status
Seedlings & Herbs				
Arrowwood (*Viburnum recognitum*)	10.5/24	44	X	FACW-
Silky dogwood (*Cornus amomum*)	10.5/24	44	X	FACW
Sedge sp.	3/24	12		---
Shrubs				
Arrowwood (*Viburnum recognitum*)	20.5/51.5	40	X	FACW-
Silky dogwood (*Cornus amomum*)	20.5/51.5	40	X	FACW
Morrow honeysuckle (*Lonicera morrowii*)	10.5/51.5	20	X	NI
Saplings				
Apple (*Malus pumila*)	38/61.5	62	X	UPL
Red maple (*Acer rubrum*)	20.5/61.5	33	X	FAC
Red oak (*Quercus rubra*)	3/61.5	5		FACU-
Trees				
Red maple (*Acer rubrum*): 8", 6, 5, 7, 5, 5, 5, 9, 6	302/350	86	X	FAC
Red oak (*Quercus rubra*): 6"	24/350	7		FACU-
Apple (*Malus pumila*): 5"	24/350	7		UPL
Vines				
None	-	-	-	-

HYDROPHYTES

0	4	2	0
OBL	FACW	FAC	*OTHER

NON-HYDROPHYTES

0	1	0
FAC-	FACU	UPL

Hydrophytes Subtotal (A): 6

Non-hydrophytes Subtotal (B): 1

PERCENT HYDROPHYTES (100 A/A+B): 86

HYDROLOGY

☐ RECORDED DATA

Stream, lake or tidal gage Identification:

Aerial photography Identification:

Other Identification:

☐ NO RECORDED DATA

☒ OBSERVATIONS

Depth to Free Water: 6"

Depth to Saturation (including capillary fringe):

Altered Hydrology (explain):

☐ Inundated ☒ Saturated in upper 12" ☒ Water Marks ☐ Drift Lines ☒ Sediment Deposits ☒ Drainage Patterns within Wetland

☐ OTHER (explain):

SOIL Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.

Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
0-3″	A	10YR 2/2	None	sandy loam; many fine roots
3-7″	Ap	10YR 3/2	many, medium 10YR 4/2 depletions; (7.5YR 3/3) soft masses	sandy loam; common fine roots
7-13″	Bw	10YR 4/3	common, medium 7.5YR 4/4 concentrations; Fe/Mn concretions	sandy loam; few fine roots
13-15″	Bn	10YR 3/2	very coarse Fe/Mn concretions (1-inch diameter)	sandy loam; common medium/fine roots
15-18″	BC	10YR 4/3		sandy loam; massive

HYDRIC SOIL INDICATOR(S): Bw may meet TF2 due to red parent material influence

REFERENCE(S): New England Hydric Soils Technical Committee. 2004. 3rd ed., *Field Indicators for Identifying Hydric Soils in New England.* New England Interstate Water Pollution Control Commission, Lowell, MA.

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:

Soil drainage class:

Depth to active water table:

NTCHS hydric soil criterion:

CONCLUSIONS

	YES	NO
Hydrophytic vegetation criterion met?	☒	☐
Hydric soils criterion met?	☒	☐
Wetland hydrology criterion met?	☒	☐
IS THIS DATAPOINT IN A WETLAND?	☒	☐

REMARKS: Bn is apparent hydromorphic feature

PROJECT TITLE: NU - Rood Ave Substation

TRANSECT: T3-7 PLOT: A

Location: Wetland 3 (east)

DELINEATOR(S): J. Peterson, D. Gustafson

DATE: 5/3/07

VEGETATION Stratum and Species	Dominance Ratio	Percent Dominance	D O M	NWI Status
Seedlings & Herbs				
Canada mayflower (*Maianthemum canadense*)	38/58.5	65	X	FAC -
Morrow honeysuckle (*Lonicera morrowii*)	20.5/58.5	35	X	NI
Shrubs				
Arrowwood (*Viburnum recognitum*)	38/72.5	52	X	FACW-
Morrow honeysuckle (*Lonicera morrowii*)	10.5/72.5	14		NI
Silky dogwood (*Cornus amomum*)	10.5/72.5	14		FACW
Red maple (*Acer rubrum*)	10.5/72.5	14		FAC
White pine (*Pinus strobus*)	3/72.5	5		FACU
Saplings				
Red maple (*Acer rubrum*)	10.5/10.5	100	X	FAC
Trees				
Red maple (*Acer rubrum*): 7″	44/92	48	X	FAC
Red Oak (*Quercus rubra*): 6″	24/92	26	X	FACU-
Apple (*Malus pumila*): 5″	24/93	26	X	UPL
Vines				
None	---	---		---

HYDROPHYTES

0	1	2	0
OBL	FACW	FAC	*OTHER

NON-HYDROPHYTES

1	1	1
FAC-	FACU	UPL

Hydrophytes Subtotal (A): 3

Non-hydrophytes Subtotal (B): 3

PERCENT HYDROPHYTES (100 A/A+B): 50

HYDROLOGY

☐ RECORDED DATA

Stream, lake or tidal gage Identification:

Aerial photography Identification: 1928, 1951, 1057, 1970, 1986, 2004 Aerial Photographs

Other Identification:

☐ NO RECORDED DATA

☒ OBSERVATIONS

Depth to Free Water: 13″

Depth to Saturation (including capillary fringe):

Altered Hydrology (explain):

☐ Inundated ☐ Saturated in upper 12" ☐ Water Marks ☐ Drift Lines ☐ Sediment Deposits ☐ Drainage Patterns within Wetland

☐ OTHER (explain):

SOIL Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.

Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
0-5″	Ap1	10YR 2/2	---	fine sandy loam, friable, granular; many medium fine roots
5-12″	Ap2	10YR 3/2	common, coarse, faint (10YR 3/3 and 10YR 3/1) masses	fine sandy loam, massive, friable; common medium roots
12-16″	Ab	10YR 2/1 10YR 2/2	common medium (7.5YR 4/4) pore linings, nodules and concretions	fine sandy loam, weak subangular blocky; common medium roots
16-22″	Bw1	7.5YR 4/6	many, medium (7.5YR 4/4) concentrations; (10YR 3/4) masses; (7.5YR 4/3) depletions	fine sandy loam, weak subangular blocky; common medium roots

HYDRIC SOIL INDICATOR(S): No hydric indicators met

REFERENCE(S): New England Hydric Soils Technical Committee. 2004. 3rd ed., *Field Indicators for Identifying Hydric Soils in New England.* New England Interstate Water Pollution Control Commission, Lowell, MA.

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:

Soil drainage class:

Depth to active water table:

NTCHS hydric soil criterion:

CONCLUSIONS

	YES	NO	REMARKS: thickened agricultural A horizon (slope wash) over an upland soil
Hydrophytic vegetation criterion met?	☒	☐	
Hydric soils criterion met?	☐	☒	
Wetland hydrology criterion met?	☐	☒	
IS THIS DATAPOINT IN A WETLAND?	☐	☒	

PROJECT TITLE: NU - Rood Ave Substation | TRANSECT: T2-16 | PLOT: B

Location: Wetland 2

DELINEATOR(S): J. Peterson, D. Gustafson | DATE: 5/3/07

VEGETATION Stratum and Species	Dominance Ratio	Percent Dominance	D O M	NWI Status
Seedlings & Herbs				
Canada mayflower (*Maianthemum canadense*)	3/3	100	X	FAC -
Shrubs				
Swamp white oak (*Quercus bicolor*)	10.5/19.5	55	X	FACW+
Arrowwood (*Viburnum recognitum*)	3/19.5	15		FACW-
Highbush blueberry (*Vaccinium corymbosum*)	3/19.5	15		FACW-
Shadblow (*Amelanchier canadensis*)	3/19.5	15		FAC
Saplings				
None	---	---		---
Trees				
Red Oak (*Quercus rubra*): 16", 25, 19, 16, 9, 23	1691/3330	51	X	FACU-
Swamp white oak (*Quercus bicolor*): 42", 10, 6	1480/3330	44	X	FACW+
Red maple (*Acer rubrum*): 7", 10, 8	159/3330	5		FAC
Vines				
None	---	---		---

HYDROPHYTES

0	2	1	0
OBL	FACW	FAC	*OTHER

NON-HYDROPHYTES

1	1	0
FAC-	FACU	UPL

Hydrophytes Subtotal (A): 3

Non-hydrophytes Subtotal (B): 2

PERCENT HYDROPHYTES (100 A/A+B): 60

HYDROLOGY

☐ RECORDED DATA

Stream, lake or tidal gage — Identification:

Aerial photography — Identification:

Other — Identification:

☐ NO RECORDED DATA

☒ OBSERVATIONS

Depth to Free Water: 3"

Depth to Saturation (including capillary fringe):

Altered Hydrology (explain):

☐ Inundated ☒ Saturated in upper 12" ☒ Water Marks ☐ Drift Lines ☐ Sediment Deposits ☒ Drainage Patterns within Wetland

☐ OTHER (explain):

SOIL Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.

Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
0-2″	A1	Black	None	mucky silt loam
2-6″	A2	10YR 2/2	None	silt loam
6-12″	Bw	10YR 4/3	many, medium 10YR 4/4 concentrations; common, fine 10YR 3/4 concentrations and common, medium 10YR 5/2 depletions	subangular block fine sandy loam
12-17″	Cg	10YR 5/2	many, coarse 10YR 4/4 concentrations; common, fine 7.5YR 4/4 concentrations	silt loam

HYDRIC SOIL INDICATOR(S): XI.A.

REFERENCE(S): New England Hydric Soils Technical Committee. 2004. 3rd ed., *Field Indicators for Identifying Hydric Soils in New England.* New England Interstate Water Pollution Control Commission, Lowell, MA.

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:

Soil drainage class:

Depth to active water table:

NTCHS hydric soil criterion:

CONCLUSIONS

	YES	NO	REMARKS:
Hydrophytic vegetation criterion met?	☒	☐	
Hydric soils criterion met?	☒	☐	
Wetland hydrology criterion met?	☒	☐	
IS THIS DATAPOINT IN A WETLAND?	☒	☐	

PROJECT TITLE: NU - Rood Ave Substation | TRANSECT: T2-16 | PLOT: A

Location: Wetland 2

DELINEATOR(S): J. Peterson, D. Gustafson | DATE: 5/3/07

VEGETATION Stratum and Species	Dominance Ratio	Percent Dominance	D O M	NWI Status
Seedlings & Herbs				
Canada mayflower (*Maianthemum canadense*)	10.5/10.5	100	X	FAC -
Shrubs				
Arrowwood (*Viburnum recognitum*)	10.5/16.5	64	X	FACW-
Red oak (*Quercus rubra*)	3/16.5	18		FACU-
White oak (*Quercus alba*)	3/16.5	18		FACU-
Saplings				
Beech (*Fagus grandifolia*)	10.5/10.5	100	X	FACU
Trees				
Red oak (*Quercus rubra*): 23", 22, 25, 9, 19, 16	1866/2417	77	X	FACU-
Red maple (*Acer rubrum*): 12", 9, 8	219/2417	9		FAC
White oak (*Quercus alba*): 16"	189/2417	8		FACU-
Beech (*Fagus grandifolia*): 14"	143/2417	6		FACU
Vines				
No stems in plot	-	-	-	-

HYDROPHYTES

0	1	0	0
OBL	FACW	FAC	*OTHER

NON-HYDROPHYTES

1	2	0
FAC-	FACU	UPL

Hydrophytes Subtotal (A): 1

Non-hydrophytes Subtotal (B): 3

PERCENT HYDROPHYTES (100 A/A+B): 25

HYDROLOGY

☐ RECORDED DATA

Stream, lake or tidal gage Identification: _____

Aerial photography Identification: _____

Other Identification: _____

☐ NO RECORDED DATA

☒ OBSERVATIONS

Depth to Free Water: 12"

Depth to Saturation (including capillary fringe): _____

Altered Hydrology (explain): _____

☐ Inundated ☐ Saturated in upper 12" ☐ Water Marks ☐ Drift Lines ☐ Sediment Deposits ☐ Drainage Patterns within Wetland

☐ OTHER (explain):

SOIL Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.

Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
0-2″	Oe	Black	---	
2-3″	A	10YR 2/1	---	Silt loam
3-6″	E	10YR 4/2	---	Silt loam
6-17″	Bw	10YR 4/4	No features	Silt loam

HYDRIC SOIL INDICATOR(S): No hydric indicators met

REFERENCE(S): New England Hydric Soils Technical Committee. 2004. 3rd ed., *Field Indicators for Identifying Hydric Soils in New England.* New England Interstate Water Pollution Control Commission, Lowell, MA.

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:
Soil drainage class:
Depth to active water table:
NTCHS hydric soil criterion:

CONCLUSIONS

	YES	NO	REMARKS:
Hydrophytic vegetation criterion met?	☐	☒	
Hydric soils criterion met?	☐	☒	
Wetland hydrology criterion met?	☐	☒	
IS THIS DATAPOINT IN A WETLAND?	☐	☒	

PROJECT TITLE: NU - Rood Ave Substation | TRANSECT: T4-16 | PLOT: B

Location: Wetland 4

DELINEATOR(S): J. Peterson, D. Gustafson | DATE: 5/3/07

VEGETATION Stratum and Species	Dominance Ratio	Percent Dominance	D O M	NWI Status
Seedlings & Herbs				
Shrubs				
Red maple (*Acer rubrum*)	20.5/26.5	77	X	FAC
Gray birch (*Betula populifolia*)	3/26.5	12		FAC
Highbush blueberry (*Vaccinium corymbosum*)	3/26.5	12		FACW-
Saplings				
Red maple (*Acer rubrum*)	38/58.5	65	X	FAC
Gray birch (*Betula populifolia*)	20.5/58.5	35	X	FAC
Trees				
Red maple (*Acer rubrum*): 8", 7, 5, 7, 7, 6, 6, 6, 6	296/568	52	X	FAC
Gray birch (*Betula populifolia*): 5", 6, 6, 7, 6, 7	184/568	32	X	FAC
White pine (*Pinus strobus*): 8"	44/568	8		FACU
Cottonwood (*Populus deltoides*): 7"	44/568	8		FAC
Vines				
None	---	---	---	---

HYDROPHYTES

OBL	FACW	FAC	*OTHER
0	0	5	0

NON-HYDROPHYTES

FAC-	FACU	UPL
0	0	0

Hydrophytes Subtotal (A): 5

Non-hydrophytes Subtotal (B): 0

PERCENT HYDROPHYTES (100 A/A+B): 100

HYDROLOGY

☐ RECORDED DATA

Stream, lake or tidal gage — Identification:

Aerial photography — Identification: 1928, 1951, 1057, 1970, 1986, 2004 Aerial Photographs

Other — Identification:

☐ NO RECORDED DATA

☒ OBSERVATIONS

Depth to Free Water: 0"

Depth to Saturation (including capillary fringe):

Altered Hydrology (explain):

☐ Inundated ☒ Saturated in upper 12" ☒ Water Marks ☐ Drift Lines ☐ Sediment Deposits ☒ Drainage Patterns within Wetland

☐ OTHER (explain):

SOIL Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.

Submission of photo of plot is encouraged.

DEPTH	HORIZON	MATRIX COLOR	REDOXIMORPHIC FEATURES (color, abundance, size, contrast)	COMMENTS (USDA texture, nodules, concretions, masses, pore linings, restrictive layers, root distribution, soil water, etc.)
0-3″	Ap1	10YR 2/1	None	mucky loamy sand; weak medium granular; very friable; many medium roots; water at surface
3-5″	Ap2	10YR 2/2	None	loamy fine sand; weak medium granular; very friable; common fine roots
5-8″	Bw1	10YR 4/3	many, medium, prominent (7.5YR 4/6); few fine faint (10YR 4/2)	loamy fine sand; weak medium subangular blocky
8-13″	Bw2	10YR 4/2	many, coarse, prominent (7.5YR 4/4 and 7.5YR 4/6); few (5YR 4/4) Fe concentrations	fine sandy loam; no roots
13-18″	C	10YR 4/3	common, coarse, faint (10YR 4/4) concentrations	sand

HYDRIC SOIL INDICATOR(S): X.B. Sandy with Redoximorphic Features

REFERENCE(S): New England Hydric Soils Technical Committee. 2004. 3rd ed., *Field Indicators for Identifying Hydric Soils in New England.* New England Interstate Water Pollution Control Commission, Lowell, MA.

OPTIONAL SOIL DATA

REFERENCE(S):

Taxonomic subgroup:

Soil drainage class:

Depth to active water table:

NTCHS hydric soil criterion:

CONCLUSIONS

	YES	NO	REMARKS:
Hydrophytic vegetation criterion met?	☒	☐	
Hydric soils criterion met?	☒	☐	
Wetland hydrology criterion met?	☒	☐	
IS THIS DATAPOINT IN A WETLAND?	☒	☐	

Vanasse Hangen Brustlin, Inc.
PHOTOLOG DOCUMENTATION
Rood Avenue Substation – ACOE Wetland Delineation Data Plots
264 Rood Avenue and 25 Shelley Avenue, Windsor, Connecticut

Photo 1: T2-16 A & B (Note: tags mislabeled in field. T4-16 A should read T2-16A and T4-16 B should read T2-16B)

Photo 2: T3-7A

Vanasse Hangen Brustlin, Inc.
PHOTOLOG DOCUMENTATION
Rood Avenue Substation – ACOE Wetland Delineation Data Plots
264 Rood Avenue and 25 Shelley Avenue, Windsor, Connecticut

Photo 3: T3-7B (note: knife points to large Fe/Mn nodules/concretions)

Photo 3: T3-17A & B

Vanasse Hangen Brustlin, Inc.
PHOTOLOG DOCUMENTATION
Rood Avenue Substation – ACOE Wetland Delineation Data Plots
264 Rood Avenue and 25 Shelley Avenue, Windsor, Connecticut

Photo 2: T4-16A

Photo 3: T4-16 B (note: marker points to depletion)

Exhibit 5

SHPO Response Letter

Connecticut Commission on Culture & Tourism

Historic Preservation & Museum Division

59 South Prospect Street
Hartford, Connecticut
06106

(v) 860.566.3005
(f) 860.566.5078

August 21, 2006

Mr. Scott A. Marotta
Northeast Utilities System
PO Box 270
Hartford, CT 06141-0270

Subject: CL&P Substation
Rood Avenue
Windsor, CT

Dear Mr. Marotta:

The State Historic Preservation Office has reviewed the above-named project. This office notes that the project area possesses moderate to high sensitivity for prehistoric and historic archaeological resources. Therefore, we recommend that a professional reconnaissance survey be undertaken to identify and evaluate archaeological resources which may exist within proposed project limits, including equipment storage and associated work areas. All archaeological studies must be undertaken in accordance with our *Environmental Review Primer for Connecticut's Archaeological Resources.* A list of archaeological consultants is enclosed for your information.

No ground disturbance or construction-related activities should be initiated until this office has had an opportunity to review and comment upon the recommended archaeological survey report.

We anticipate working with Connecticut Light & Power Company and all interested parties in the expeditious furtherance of the proposed undertaking as well as in the professional management of Connecticut's archaeological heritage.

For further information please contact Dr. David A. Poirier, Staff Archaeologist.

Sincerely,

J. Paul Loether
Division Director and Deputy
State Historic Preservation Officer

cc: Dr. Nicholas Bellantoni/OSA

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Connecticut Commission on Culture & Tourism

Historic Preservation & Museum Division

59 South Prospect Street
Hartford, Connecticut
06106

(v) 860.566.3005
(f) 860.566.5078

TO WHOM IT MAY CONCERN

The following archaeologists, as known to us, meet the professional qualification guidelines of the National Park Service:

ACS [Archaeological Consulting Services]
Attn: Dr. Gregory Walwer
10 Stonewall Lane
Guilford, CT 06437-2949
Phone: 203-458-0550
Fax: 203-458-0550

American Cultural Specialists
Attn: Dr. Lucianne Lavin
108 New Street
Seymour, CT 06483
Phone: 203-888-8897
Fax: 801-729-5961

Archaeological & Historical Services
Attn: Ms. Mary Harper
PO Box 543
Storrs, CT 06268
Phone: 860-429-2142
Fax: 860-429-9454

Archaeological Services
Attn: Dr. Mitchell Mulholland
The Environmental Institute
Blaisdell House
University of Massachusetts
Amherst, MA 01003
Phone: 413-545-1626
Fax: 413-545-2304

Archaeology Research Center
Attn: Mr. William C. Crandall
University of Maine at Farmington
139 Quebec Street
Farmington, ME 04938
Phone: 207-778-7012
Fax: 207-778-7024

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Marc L. Banks, Ph.D., LLC
11 Lincoln Lane
Weatogue, CT 06089
Phone: 860-658-7482
Fax: 860-217-7402

Louis Berger Group Inc.
Attn: Ms. Hope Luhman, Cultural Resources
20 Corporate Woods Boulevard
Albany, NY 12211
Phone: 518-432-9545
Fax: 518-432-9571

Carini & Associates
Attn: Dr. Stephen Carini
902 Shennecossett Road
Groton, CT 06340
Phone: 860-446-0470

Cultural Resource Consulting Group
Attn: Mr. Peter A. Primavera
327 North 17th Street
PWI Building
Philadelphia, PA 19103
Phone: 732-247-8880
Fax: 732-247-2888

Cultural Resource Specialists of New England
Attn: Mr. Alan E. Strauss
222 Fourth Street
Providence, RI 02906
Phone: 401-861-1714
Fax: 401-278-6336

TAMS/Earth Tech
Attn: Mr. A. Michael Pappalardo
One World Financial Center
200 Liberty Street, 25th Floor
New York, NY 10281
Phone: 212-798-8610
Fax: 212-798-8501

Gray & Pape
Attn: Ms. Mary Lynne Rainey
1376 Kingstown Road
Wakefield, RI 02879
Phone: 401-480-4523

Hartgen Archaeological Associates Inc.
Attn: Ms. Karen S. Hartgen
524 Broadway
Albany, NY 12207
Phone: 518-427-0382
Fax: 518-427-0384

Heritage Consultants LLC
Attn: Mr. David R. George
877 Main Street
Newington, CT 06111
Phone: 860-667-3001

Historical Perspectives Inc.
Attn: Ms. Cece Saunders
PO Box 3037
Westport, CT 06880-9998
Phone: 203-226-7654
Fax: 203-226-8376

John Milner Associates Inc.
Attn: Mr. James A. Chiarelli
410 Great Pond Road, Suite B-14
Littleton, MA 01460
Phone: 978-486-0688
Fax: 978-486-3470

Mashantucket Pequot Museum & Research Center
Attn: Dr. Kevin A. McBride
PO Box 3180
Mashantucket, CT 06338-3180
Phone: 860-396-6814
Fax: 860-396-6851

Northeastern Archaeology Consultants
Attn: Mr. O. Nathan Morphew
28 Woodmont Drive
Mansfield Center, CT 06250
Phone: 860-423-2480

PAL [Public Archaeology Laboratory Inc.]
Attn: Ms. Deborah Cox
210 Lonsdale Avenue
Pawtucket, RI 02860
Phone: 401-728-8780
Fax: 401-728-8784

Public Archaeology Survey Team Inc.
Attn: Ms. Mary Harper
PO Box 209
Storrs, CT 06268
Phone: 860-429-1723
Fax: 860-429-1724

Raber Associates
Attn: Dr. Michael S. Raber
81 Dayton Road, PO Box 46
South Glastonbury, CT 06073
Phone: 860-633-9026
Fax: 860-633-9026

URS Cultural Resource Services
Attn: Dr. Emlen Meyers
7101 Wisconsin Avenue, Suite 700
Bethesda, MD 20814
Phone: 301-652-2215
Fax: 301-656-8059

Mr. Ernest Wiegand
152 Silver Spring Road
Wilton, CT 06897
Phone: 203-733-5184

This information updates and supersedes all previous material provided by the State Historic Preservation Office with respect to the identification of archaeological consultants. Further, this list has been arranged alphabetically; no preferential rating or evaluation should be inferred. The State Historic Preservation Office does not recommend, endorse, or assume responsibility for the quality of work for any individual or firm on this list, nor is there any guarantee, implicit or implied, that any work product produced by those on this list will necessarily meet federal and state requirements.

At its discretion, the State Historic Preservation Office may remove consultants from its informational list if no work has been undertaken in Connecticut over a three year period.

For further information please contact Dr. David A. Poirier, Staff Archaeologist.

Revised 8/06

Exhibit 6
CTDEP Correspondence

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

August 22, 2006

Mr. Scott A. Marotta
Northeast Utilities Service Company
P.O. Box 270
Hartford, CT 06141-0270

Re: Proposed Construction of New Substation on Rood Avenue and I-91, Windsor

Dear Mr. Marotta:

I have reviewed Natural Diversity Data Base maps and files regarding the area delineated on the map you provided for the proposed construction of a new substation on company owned land west of Rood Avenue and Interstate 91 Junction in Windsor, Connecticut. According to our information there are no known extant populations of Federal or State Endangered, Threatened or Special Concern Species that occur at the site in question.

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 Natural Resources Center's Geological and Natural History Survey and cooperating units of DEP, 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 ibecomes available.

Please contact me if you have further questions at 424-3592. Thank you for consulting the Natural Diversity Data Base. Also be advised thatthis is a preliminary review and not a final determination. A more detailed review may be conducted as part of any subsequent environmental permit applications submitted to DEP for the proposed site.

Sincerely,

Dawn M. McKay
Biologist/Environmental Analyst

DMM/blm

Exhibit 7
Phase I Cultural Resources
Reconnaissance Survey Report

DRAFT REPORT AUGUST 2007

PHASE I CULTURAL RESOURCES RECONNAISSANCE SURVEY OF THE WINDSOR SUBSTATION PROJECT, OFF ROOD AVENUE, WINDSOR, CONNECTICUT,

PREPARED FOR:

VANASSE HANGEN BRUSTLIN, INC.
54 TUTTLE PLACE
MIDDLETOWN, CONNECTICUT 06457

ON BEHALF OF CONNECTICUT LIGHT AND POWER COMPANY

HERITAGE CONSULTANTS, LLC
877 MAIN STREET
NEWINGTON, CONNECTICUT 06111

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Figure 25. A digital map depicting all of the previously identified archaeological sites situated within the immediate vicinity of the Areas of Potential Effect.

1.0 Introduction

This report presents the results of a Phase I cultural resources reconnaissance survey of property owned by the Connecticut Light & Power Company located north of Rood Avenue in Windsor, Connecticut. The field investigations for this project, performed on behalf of the Connecticut Light & Power Company, were completed on July 13, 2007 by representatives of Heritage Consultants, LLC. During the course of the current investigation, all work was performed in accordance with the National Historic Preservation Act of 1966, as amended; the National Environmental Policy Act of 1969, as amended; and the *Environmental Review Primer for Connecticut's Archaeological Resources* (Poirier 1987).

The property surveyed measures approximately 20 ac in size and consists of two separate and abutting parcels, identified in Town of Windsor Assessor records as 264 Rood Avenue (Map 56, Block 31, Lot 30) and 25 Shelley Avenue (Map 56, Block 31, Lot 12). For purposes of this report, these two parcels are collectively referred to herein as the "Property". It is bounded to the north by an existing residential neighborhood, to the west by an extant power line corridor, to the east by mixed woodlands and Shelley Avenue, and to the south by an access driveway that extends from Rood Avenue (Figures 1 through 3). Characterized by a mixture of coniferous and deciduous woodlands, the Property also contained underbrush, briers and wetlands (Figures 4 through 7).

We understand that Connecticut Light & Power Company is evaluating the Property as a potential site for development of an electrical substation. To accommodate any design changes or future modifications, the entire Property was examined for cultural resources. The proposed substation would utilize only a small portion of the Property, and will be situated immediately southeast of an existing switching station and utilize a pre-existing dirt access road extending northward from Rood Avenue (Figures 8 and 9). The proposed substation and its associated appurtenances will further be referred to as the "Area of Potential Effect" for the purposes of this report. The Area of Potential Effect is situated at an approximate elevation of 27.3 m (90 ft) NVGD; at the time of survey, it had been previously impacted by agricultural practices, construction of the existing power line corridor, and bordering residential housing. The Property contained areas of woodlands, wetlands, and cleared open spaces (Figures 4 through 9).

The remainder of this report presents discussions of the natural, prehistoric, and historic settings of the project vicinity; previous cultural resources investigations completed in the region; field methods utilized to perform the undertaking; the results of the investigation; and management recommendations for the project. The project personnel for this undertaking included Ms. Catherine M. Labadia, M.A., who served as Principal Investigator for the project, Mr. David R. George, M.A., R.P.A and Mr. Aaron Palermo, B.A., who completed the field review portion of the project and compiled this report, and Mr. William Keegan, B.A., M.A., who drafted the history section of this report. Mr. Keegan also provided GIS support services and project mapping.

The natural setting of the region encompassing the proposed project parcel is presented in Section 2.0; it includes a brief overview of the geology, hydrology, soils, flora, fauna, and climate of the project region. The prehistory of the project region is outlined briefly in Section 3.0, while the history of the region encompassing the Area of Potential Effect is chronicled in Section 4.0. A review of all previously recorded archeological sites and previously completed cultural resources surveys located in the immediate vicinity of the proposed project parcel is contained within Section 5.0; it is based on data maintained by Heritage Consultants, LLC, as well as on data obtained from the Connecticut State Historic Preservation Office. The methods used to complete this investigation are discussed in Section 6.0. Finally, the results of the investigation and management recommendations for the proposed project are presented in Section 7.0.

2.0 Natural Setting

The State of Connecticut exhibits considerable variability in geology, hydrology, soils, flora, and fauna despite the fact that its boundaries encompass only approximately 5,000 mi^2 or roughly 1,295,040 ha

(3,200,000 ac) of land. Connecticut's landscape, which lies in the northern temperate deciduous forest biome (Braun 1950; Shelford 1963), contains many subregions, including areas of locally high relief such as the eastern and western uplands areas; extensive riverine systems dominated by wide alluvial floodplains such as those in the north-central part of the state; widespread and extensive wetland systems composed of swamps, freshwater marshes, and tidal estuaries; and, finally, coastal areas. Regional differences in climatic variables, including precipitation, temperature, and growing season, as well as differences in topography and distance from the Long Island Sound, are reflected in the distribution of various floral and faunal resources (Dowhan and Craig 1976:25).

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 very 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: the North-Central Lowlands ecoregion. A brief summary of the North-Central Lowlands is presented below. It is followed by a discussion of the geology of the State of Connecticut, as well as by overviews of the hydrology, soils, flora, fauna, and climate characteristic of the region containing the proposed project area.

North Central Lowlands Ecoregion

The North-Central Lowlands region consists of a broad valley located between approximately 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. Elevations in the North-Central Lowlands generally range from 15.2 to 76.2 m (50 to 250 ft) above sea level, reaching a maximum of nearly 274 m (900 ft) above sea level along the trap rock ridges that surround the central valley. The bedrock of the region is composed of Triassic sandstone, interspersed with very 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 (Sheanin and Hill 1953).

The major forest type found in the North-Central Lowlands region is the Central Hardwoods-Hemlock-White Pine type. Major tree species identified in this area include red, black, and white oaks (*Quercus rubra, Q, velutina,* and *Q. alba*), shagbark, pignut and butternut hickories (*Carya ovata, C. glabra,* and *C. cordiformis*), hemlock (*Tsuga canadensis*), and white pine (*Pinus strobes*). White pine reaches its southern limit in this region. Other trees identified in the North-Central Lowlands region include red

cedar (*Juniperus virginiana*), black birch (*Betula lenta*), gray birch (*Betula populifolia*), and white ash (*Fraxinus americana*). Maples (*Acer* sp.) are also common in disturbed and secondary successional habitats that are characteristic of the area. As discussed in more detail below, the various resources found within the Central Hardwoods-Hemlock-White Pine forests were exploited by prehistoric Native American and historic residents of the area. They consisted of foodstuffs, wood for fuel, and raw materials for tool production.

The Geology of Connecticut

The development of Connecticut's ecoregions is tied to its underlying geology. The geology of the State of Connecticut is complex, and it is the product of both large scale and long-term constructional and destructional processes. These processes are described briefly below.

Continental Drift, Erosion, and the Early Development of Connecticut

The geology of Connecticut as expressed today has its origins in developmental processes that began as early as 500 million years ago (mya) (Bell 1985). At that time, the earth was characterized by the presence of several proto-continents and large islands that were distributed around the equator and within the southern hemisphere. By approximately 250 mya, these proto-continents and islands, i.e., large tectonic plates, had "drifted" together to form the supercontinent of Pangea. The supercontinent remained in place as a large landmass for approximately 50 million years, after which it began to split into several large pieces that are recognized today as the seven continents. During this early developmental sequence, the land that was to become known as Connecticut was positioned within the heart of Pangea. As a result, the formation and eventual disintegration of Pangea has left its mark on the geology of Connecticut (Bell 1985; Robinson and Hall 1980).

Connecticut's Four Terranes

Geologists recognize that the State of Connecticut is composed of four major underlying terranes that were pushed into close proximity with one another during the formation of Pangea (Bell 1985). These terranes are defined on the basis of shared geological attributes, specifically rocks and strata with similar histories and chemical compositions. The four terranes underlying Connecticut's landscape are known as the Proto North American, Newark, Avalonia, and Iapetos terrenes; the proposed project items lie within the Iapetos terrain (Bell 1985:140). The eastern edge of the Proto North American terrane, corresponding to today's Northwest Highlands ecoregion, once formed the eastern shoreline of the area now known as the United States. The Newark terrane, corresponding in area to the Central Valley, formed as Pangea began to break apart. This area underwent tremendous stresses as it was pulled apart slowly by the disintegration of Pangea. Avalonia, which can be identified today as a series of gneiss and granitic rocks distributed in a broad arc in the southeastern portion of the state, once was part of a large island that was situated to the southeast of the Proto North American continent prior to the formation of Pangea. Finally, The Iapetos terrane, corresponding roughly to the Eastern and Western Uplands areas, formed during the coalescence of Pangea. These portions of the state represent areas that once were shallow portions of the Iapetos Ocean; it eventually was filled with sediments eroding from the Proto North American terrane and Avalonia. Both the Proto North American terrane and Avalonia, because they existed prior to the formation of Pangea, predate the Iapetos and Newark terranes. They date from prior to 570 mya, whereas the intervening Iapetos and Newark terranes, formed during the period of continental collision, date from approximately 500 to 250 mya (Bell 1985:153).

While these four terranes underlie Connecticut's approximately 160.9 km (100 mi) wide modern landscape, they once spanned more than 804.6 km (500 mi) from east to west (Bell 1985:147). During the course of the formation of Pangea, Avalonia was pushed westward. Sediments from Avalonia and the Proto North American continent eroded and washed into the shrinking Iapetos Ocean, forming what was to become the Eastern and Western Uplands of Connecticut. When Pangea formed, the area became cemented together and confined to the space between the state's modern borders (Bell 1985).

As the supercontinent divided, tremendous forces were put upon the area, forming a large fissure that eventually became the Newark terrane. The Newark terrane was filled with sediments eroding from the east and west, forming the distinctive sandstone and brownstone strata of the Central Valley of Connecticut. As this area continued to expand, the underlying bedrock began to tilt towards the east, allowing large lava flows to reach the surface and cool into a series of traprock ridges. These ridges still are visible today; prominent among them is Metacomet Ridge. Eventually, the pressures acting upon the Newark terrane were relieved when a larger fissure opened to the east, allowing the European and African continents to move off to the east and the Atlantic Ocean to occupy the intervening area (Bell 1985).

For millennia after the break up of Pangea, the area that has become known as Connecticut has undergone extensive erosion. Continued washing away of sediments originating from what was Proto North America, the Iapetos terrane, and Avalonia have aided in the formation of today's landscape. These forces, coupled with the tremendous power of the glaciers that scoured the area during the Pleistocene, have left Connecticut what it is today, a rich and varied landscape consisting of a mosaic of mountains, rolling hills, fertile valleys, a rocky coastline, and numerous watercourses.

The Geology of the Connecticut Valley

Connecticut lies within the New England province as defined by Fenneman (1938). This province is characterized by rocks that "have been greatly compressed, generally metamorphosed, uplifted, and deeply denuded" (Fenneman 1938:343). The New England province extends from roughly southeastern New York and northern New Jersey to as far inland as Canada. The surface of the uplands forms a peneplain that slopes southeastward from maximum inland altitudes of approximately 670.5 m (2,200 ft) to 121.9 m (400 ft) or 152.4 m (500 ft) before reaching the seaboard lowlands. The topography is that of a maturely dissected plateau with numerous hills and mountains rising above the general level of the upland.

Bell (1985) recently has re-interpreted the geology of Connecticut and he has divided the state into four smaller geological regions. These regions consist of the Western Uplands, the Central Valley, the Eastern Uplands and the Coastal Slope. The proposed project area is located with in the heart of the Central Valley, designated by Dowhan and Craig (1976) as the North-Central Lowlands ecoregion. This area is discussed in more detail below.

The Connecticut River Valley has been referred to by many names, including the Central Valley, the Connecticut Valley, the Hartford Basin, the Mesozoic Valley, and the Newark Terrane (Bell 1985:13; Fenneman 1938; Hughes and Allen 1976). These descriptors indicate that the valley is centrally located in the state and that it dates from between 225 to 65 mya. While Fenneman (1938) originally classified the Central Valley as a subdivision of the seaboard lowland section, it is clear that it has a very different geological history. The Central Valley consists of an area that measures approximately 152.8 km (95 mi) in length by 32.2 km (20 mi) in width. It reaches its southernmost point in the vicinity of the towns of Glastonbury and Rocky Hill, Connecticut. The Central Valley has a moderately rolling floor and it averages between 15.2 and 76.2 m (50 and 250 ft) NGVD (Figures 8 and 9). The underlying rocks found in this area include "Triassic sandstones, conglomerate, and shale, all relatively soft, with included igneous sheets, extrusive and intrusive, both familiarly known as traprock" (Fenneman 1938:373). The constant erosion of the bedrock gives this region its distinctive red soils (Bell 1985; Sheanin and Hill 1953).

Following deglaciation between approximately 17,000 and 13,000 years ago, the Central Valley was inundated by glacial Lake Hitchcock (Thorson and Schile 1995). Named after Reverend Edward S. Hitchcock, this impoundment of a large glacial meltwater lake was facilitated by a massive build-up of glaciolacustrine sediments between Glastonbury and Middletown, Connecticut. Glacial Lake Hitchcock

extended for more than 241.4 km (150 mi) in a north-south direction and for approximately 32.2 km (20 mi) in an east-west direction (Bell 1985: 20-21).

A chronology for Lake Hitchcock first was established through by Antev (1922) through his detailed examination of lake varves deposited in the region. Subsequent radiocarbon correlations with Antev's study indicates that Lake Hitchcock formed approximately 15,600 years ago and that it remained in place for approximately 3,000 years. At approximately 12,400 years ago the build up of sediments at Middletown, Connecticut was breached and the lake drained rapidly (Ridge and Larsen 1990), creating major changes in downstream landscapes.

Geological investigations of the dry lakebed soils indicate that the draining of glacial Lake Hitchcock was very rapid, and that it produced many unique geological features within the Central Valley. Most notable among these are eolian features such as massive sand dunes and lacustrine spits that provide the basis for modern terrace and inland physiography (Thorson and Schile 1995). In addition, sediments found in the Central Valley proper contain very few rocks, and with the addition of massive amounts of nutrients from the regular flooding of the Connecticut River, they have become some of the best agricultural soils in New England (Sheanin and Hill 1953).

In addition to the low rolling valley floor, the Central Valley also contains a series of high traprock ridges. The largest of these ridges flanks the western border of the Central Valley and it is known as Metacomet Ridge. The Metacomet Ridge extends from Branford, Connecticut in the south to Northampton, Massachusetts in the north. It consists of dense traprock or basalt. Unlike the remainder of the Central Valley's easily eroded sandstone and brownstone, the basalt of Metacomet ridge is very erosion-resistant. The igneous rock of Metacomet Ridge was formed when lava breached the ground surface and cooled. The basalt from the traprock ridges has been quarried by prehistoric Native American groups and used for stone tool manufacturing (Calogero 1991).

Hydrology in the Vicinity of the Proposed Project Area

The proposed project area is situated within the vicinity several large rivers, and small unnamed wetland areas and streams. The Connecticut River is situated approximately 2.0 km (1.2 mi) east of the project area, while the Farmington River is positioned approximately 3.4 km (2.1 mi) north/northeast of it. In addition, all of the small, unnamed water sources in the project region drain to the south and east, where they eventually meet the Connecticut River. While they probably were too small to be navigable this far in the interior, they would have served as excellent areas for prehistoric resource extraction. And, as previous archeological investigations in Connecticut have demonstrated, wetlands and rivers of the type located in the vicinity of the proposed project area were focal points for prehistoric Native American occupation because they provided vital linkages to transportation routes, sources of freshwater, and abundant faunal and floral resources.

Soils in the Vicinity of the Proposed Project Area

Soil formation is the direct result of the interaction of a number of variables, including climate, vegetation, parent material, time, and organisms present (Gerrard 1981). Once archeological deposits are buried within the soil, they are subject to a number of diagenic processes. Different classes of artifacts may be preferentially protected, or unaffected by these processes, whereas others may deteriorate rapidly. Cyclical wetting/drying, freezing/thawing, and compression can accelerate chemically and mechanically the 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 study area. In contrast, acidic soils enhance the preservation of charred plant remains. A review of the mapped soils within the study region is presented briefly below.

Specifically, the proposed project parcel is characterized by a several mapped soil series (Figure 10). These soils range from poorly to moderately well-drained types, with a large portion of the south-central project parcel being comprised of graded Udorthent soils.

Flora Noted within the Vicinity of the Proposed Project Area

A wide variety of trees are found within the vicinity of the proposed project area (Niering and Olmstead 1995; Peterson and McKenny 1968). Trees common to the area include oaks (*Quercus* sp.), pines (*Pinus* sp.), hickories (*Carya* sp.), maples (*Acer* sp.), beech (*Fagus grandifolia*), Eastern Hemlock (*Tsuga canadensis*), and Eastern Red Cedar (*Juniperus virginiana*), among others. Historically, Native Americans in the northeastern United States used trees and tree products for a number of technological purposes. Oak, hickory, and other hardwoods were preferred for firewood and construction materials. Pestles and mortars also were made of hardwoods, especially hickory. Hickory nuts were an important food resource for prehistoric (and some historic) Native American populations throughout the eastern United States. Whole hickory nuts were crushed and added to boiling water to produce a rich milky liquid (hickory milk) with high oil and protein content (Larson 1980:187; Swanton 1946:273). Hickory nutshell is a major component of Archaic and Woodland period paleoethnobotanical assemblages (Asch and Asch 1985; Chapman and Shea 1981; Johannessen 1984). In the American Bottom and the Southeast area, hickory nutshell decreased during the Emergent Mississippian period, but still remained an important part of most Eastern Woodland subsistence economies until contact (Johannessen 1984). In addition, pecans (a thin-shelled hickory species) were gathered and later cultivated by European settlers. According to Brown (1965:43) "the cultivated forms have much larger meats, less bitter material in the grooves of the meat, and some better horticultural varieties have much thinner shells."

Archeological acorn nutshell tends to be poorly preserved and highly fragmented, making comparisons between raw counts of acorn and hickory nutshell misleading. Paleoethnobotanical evidence of acorn use begins during the Archaic period (Chapman and Shea 1981) and it continues, at a low rate, until the late prehistoric. At contact, several Native American groups consumed acorn nutmeats that had been leached in water to remove the toxic tannins. These nutmeats were ground and used as flour for breads (Tuck 1978). Another use of acorn nutmeat was for oil, which was used for cooking and personal adornment. According to Larson (1980:187-197), acorns were harvested during the autumn months.

In addition to trees, many of the locally available fleshy fruits were good sources of sugar, vitamins, and minerals. Historic Native American groups in the Northeast dried some fruits for winter use, but most were consumed fresh. European settlers often preserved fruits by drying, canning, or making them into jams. In addition, the seeds of several weedy plants also were collected and processed by historic, northeastern Native Americans. Grains generally are assumed to have been major carbohydrate sources, but many of the wild grains were rich in oils and proteins as well. Some of the more common wild grains in the area include pigweed (*Chenopodium* sp.), ragweed (*Ambrosia trifida*), sedge (*Cyperus* sp.), panic grass (*Panicum* spp.), knotweed (*Polygonum* sp.), and wild rice (*Zizania aquatica*). In addition, there is paleoethnobotanical evidence that goosefoot, sunflower (*Helianthus annus*), sumpweed (*Iva annua*), maygrass (*Phalaris carolinania)*, and knotweed, all of which thrive in bottomland environments, were cultivated or even domesticated in the Eastern Woodlands (Asch and Asch 1985; Chapman and Shea 1981; Ford 1985; Fritz 1990; Smith 1992; Watson 1989), though evidence of this remains scarce in Connecticut (see George and Dewar 1999 for a discussion of the possible domestication of *Chenopodium* sp., in Connecticut).

Plants that were sources of "greens" also were present on the riverbanks and other disturbed areas of the Northeast. These species include goosefoot, pokeweed (*Phytolacca americana*), purslane (*Portulaca* sp.), knotweed, and pigweed (*Amaranthus* sp.). Greens are generally young leaves and shoots that are steamed or boiled prior to consumption. Such foods were important additions to the late winter/early spring diet of Native Americans and Euro-Americans. Greens were a source of numerous minerals and vitamins, as well as a relief from the otherwise monotonous winter meals for both Euro-American and Native American

residents. Root foods also were noted as important subsistence items to Native Americans. Roots of sedges, cat/greenbriars (*Smilax* sp.), jack-in-the-pulpit (*Arisaema atrorubens*), and cattail (*Typha* sp.) all were utilized. Roots were important subsistence items because many could be gathered in the late fall and winter when other plant foods were unavailable. In addition, roots foods could have been dried and stored for long periods of time. Many other plant species also had historic and presumably prehistoric technological uses. Vining species such as grape (*Vitis* sp.) were used for basketry.

Finally, species such as hickory, elms (*Ulmus rubra*), and oaks may have been sold or used locally for lumber by Europeans. The young black willow (*Salix nigra*) twigs can be woven into baskets and wicker furniture. White oak (*Quercus* alba) can be split into fine strips and used for basketry. Wine and beer barrels also were produced from white oak lumber. American elm wood was steamed and bent into forms for barrel and wheel hoops, veneer, and baskets. This summary indicates that the flora of the proposed project region is not only diverse in nature, but also could have been put to a multitude of uses by both prehistoric and historic inhabitants of the Central Valley area. The vegetation provided not only sustenance, but also raw materials for commodities, tools, and fires.

Fauna Noted within the Vicinity of the Proposed Project Area

The area containing the proposed project parcel also contain a wide variety of faunal resources. Most of the terrestrial animal species present in this area range freely between the upland and bottomland environments. White-tailed deer (*Odocoileus virginianus*) and bear (*Ursus americana*) were historically important resources to Native Americans (Tuck 1978) and Euro-Americans. Both species were hunted for the large amount of meat present on a given animal (Larson 1980), and they were excellent sources of raw materials, e.g., bone, antler, sinew. Deer bones were made into hide preparation tools, needles, beads, decorative items, and musical instruments. Deer antler was used in the manufacture of arrow points, club tips, glue, ornaments, and tools. Thread and some tools were made from entrails. In short, almost every part of the deer carcass was exploited by these groups.

Historic accounts of northeastern Native Americans suggest that the second most useful animal was bear. Bear fat was a vital food resource during the late winter and early spring when the fresh meat was relatively lean. Bear fat also was used for skin and hair treatment. In addition, bear hides were used as heavy robes and winter moccasins. A variety of terrestrial mammals such as rabbits (*Sylvilagus* sp.), squirrels (*Sciurus* sp.), raccoons (*Procyon lotor*), and opossums (*Didelphis virginianus*) undoubtedly were hunted by residents of the area (Larson 1980). Additional mammals, like mink (*Mustela vison*) and weasels (Mustela *sp.*) may have been hunted for their pelts, as well as their flesh.

In addition, the project area vicinity is home to a variety of bird species. Large numbers of these birds could have been harvested during the fall and winter. The nearby marshes and aquatic environments also supported a variety of wading and songbirds. Terrestrial species such as bobwhite quail (*Colinus* sp.) and wild turkey (*Meleagris gallopavo*) would have been more abundant in the upland areas. As Swanton (1946:251) pointed out, "the turkey seems anciently to have been the most utilized [by Native Americans] of all birds." The flesh of turkeys was consumed, and the feathers used for ornaments, feather mantels, fans, and arrow production. Non-game birds (e.g. heron [*Ardea herodias*] and woodpecker [Family Picinae]) and raptorial species (e.g., hawks [*Buteo*], eagles [Haliaeetus sp.], and owls [Family Tytonidae]) also may have been captured by Native Americans for feathers, hides, or ceremonial purposes.

The freshwater environments of the project region support a number of fish, reptile, and amphibian species. Among the important freshwater game fish species are bass (Family Centrarchidae), freshwater catfish (Family *Ichtaluridae*), and sunfish (*Enneacanthus obesus*). In terms of use, fish bones were fashioned into needles and other small tools by northeastern Native Americans. Frogs (Family Ranidae), and snapping turtles (*Chelydra serpentina*), probably were part of local subsistence systems. Other turtle species

(*Chrysemys* sp.) and even snakes (Family Coluber) probably were collected by the Native American inhabitants of the area.

Climate in the Vicinity of the Proposed Project Area

The climate in the area encompassing the proposed project area is affected by both cold, dry air masses originating from the Arctic region and warm, humid air masses that move northward from the Gulf of Mexico region (Sheanin and Hill 1953). The average maximum temperature of the area ranges between 26.6 to 29.4 degrees Centigrade (80 to 85 degrees Fahrenheit) in summer and between 1.6 to 4.4 degrees Centigrade (35 to 40 degrees Fahrenheit) in winter. The average minimum winter temperature of Hartford County is –6.7 degrees Centigrade (20 degrees Fahrenheit), while in the summer the average minimum temperature is 15.6 degrees Centigrade (60 degrees Fahrenheit). Because of this seasonal cycling in temperatures, the first frost of the year typically occurs in October, and the growing season averages approximately 180 days per year (Sheanin and Hill 1953).

Annual rainfall in the vicinity of the proposed project area reaches approximately 104.1 cm (41 in) in the eastern part of the Connecticut River Valley. Rainfall is fairly evenly distributed throughout the yearly cycle, with the lowest amounts occurring in February and October. The extreme range in monthly precipitation is from 76.2 to 127 cm (30 to 50 in). In terms of winter precipitation, the area encompassing the proposed project parcel receives approximately 101.6 cm (40 in) of snow each winter, with storms typically occurring between November and March. During winter, the prevailing winds are from the south and/or southwest. Thunderstorms, on average, occur approximately 20 to 30 times per year. They tend to be the worst type of storm to impact the area; however, tornadoes and hurricanes occur infrequently, causing significant damage to homes, businesses, and crops in the area. Finally, floods are not frequent in the area, but winter ice storms may cause significant power outages, traffic-related difficulties, and damage to vegetation (Sheanin and Hill 1953).

3.0 Prehistoric Setting

Prior to the late 1970s and early 1980s, very few systematic archeological 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 located in such as 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 archeological studies were completed, including the Eastern Coastal, Southeast Hills, North-Central Lowlands, and Northeast Hills Ecoregions. In the North-Central Lowlands ecoregion, for example, McBride, Dewar, and Wadleigh (1979) and McBride, Wadleigh, Dewar, and Soulsby (1980) completed town-wide surveys of South Windsor and Glastonbury, respectively. In addition, town-wide surveys were completed in East Haddam and Haddam, e.g., Southeast Hills ecoregion, and in Woodstock, e.g., Northeast Hills ecoregion, in the early 1980s (McBride, Dewar, and Wadleigh 1979; McBride 1984), as well as while conducting the Route 6/1-84 Relocation Survey (McBride and Soulsby 1989). These investigations led to the creation of several archeological 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 proposed project area. For the sake of ease and clarity, the chronology used below employs the standard period/subperiod that has characterized Connecticut prehistory for decades. However, when applicable, the identified archeological phases will be discussed to shed additional light on prehistoric

settlement and subsistence patterns noted for particular period of time. The phase names and associated dates used below are adapted from McBride's (1984) unpublished dissertation entitled "*Prehistory of the Lower Connecticut River Valley.*"

Paleo-Indian Period (12,000-10,000 B.P.)

The earliest inhabitants of the area encompassing the State of Connecticut, referred to as Paleo-Indians, probably arrived in southern New England after the end of the Wisconian Glaciation (ca. 14,000 B.P.) (Gramly and Funk 1990; Snow 1980). At glacial maximum, sea level was as much as 130 m (426 ft) below its present level (Edwards and Emery 1977; Edwards and Merrill 1977), exposing a large portion of the continental shelf that was suitable for use by human populations that may have moved there from the west and southwest. By the time the glaciers receded from the area (ca. 11,000 B.P.), sea level was still much lower in southern New England than at present (Edwards and Emery 1977). While deglaciation occurred slowly, most of Connecticut was clear of ice by about 13,500 B.P., and the central portion of the state was inundated under glacial Lake Hitchcock (Bell 1985; Snow 1980; Gramly and Funk 1990). Megafauna that existed in the area at the time included mammoth, mastodon, horse, and bears, as well as elk, caribou, giant beaver, and musk ox (Gramly and Funk 1990; Martin and Guilday 1967; Ritchie 1969). Due to the presence of large Pleistocene mammals and the ubiquity of large fluted projectile points at this time, Paleo-Indians often are described as big-game hunters (Ritchie and Funk 1973; Snow 1980); however, as discussed further below, it is more likely that they hunted a broad spectrum of small and medium sized animals.

According to pollen studies, the tundra environment that developed shortly after deglaciation transformed rapidly into a forested biome, with a spruce forest in place by approximately 12,000 B.P. (Davis 1969). The spread of birch, pine, larch, and fir into the region, as well as limited amounts of oak, occurred by approximately 10,000 B.P. (Davis 1969; Thorson and Webb 1991). It was in this type of environment that Paleo-Indian culture flourished.

While there have been numerous 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). Almost all other Paleo-Indian sites located in Connecticut are surface finds. Many of these occur within the limits of the former glacial Lake Hitchcock basin (Curren and Dincauze 1977), demonstrating that the lake had drained close in time to the arrival of Paleo-Indian groups in the area.

As mentioned above, the Templeton Site (6-LF-21), excavated by Roger Moeller (1980), is located in Washington, Connecticut; it is positioned on a terrace overlooking the Shepaug River. Moeller (1980:19) indicates that the site area was located approximately 3.4 m (11.5 ft) above the river, and that the site area was characterized by loamy fine sand. Carbon samples recovered during excavation of the site area produced radiocarbon age of 10,190$\pm$300 B.P., for the occupation; thus, the site was used sometime between 10,490 and 9,890 years ago. In addition to a single large and two small fluted points, the Templeton Site produced gravers, drills, core fragments, scrapers, and channel flakes, indicating that the full range of lithic reduction took place within the site area (Moeller 1980). Moreover, use of both exotic and local raw materials was documented in the recovered lithic assemblage, suggesting that the site's occupants also had access to distant lithic sources. Use of these distant sources provides evidence for some level of embedded procurement of lithic raw materials 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). Identified in 1992, the Hidden Creek Site is situated on the southeastern margin of the Great Cedar Swamp on the Mashantucket Pequot Reservation in Ledyard, Connecticut. The site area is positioned on a kame terrace that overlooks a small tributary stream that drains into the Great Cedar Swamp. While excavation of the Hidden Creek Site produced evidence of both Terminal Archaic and Woodland Period

components in the uppermost soil horizons, the lower levels of the site area yielded artifacts that have been attributed to the Paleo-Indian Period by Jones (1997). Paleo-Indian artifacts recovered from the site area include broken bifaces, side scrapers, a fluted preform, gravers, and end scrapers. Jones (1997:76) argued that based on typological considerations the artifacts likely date from ca., 10,000 to 9,500 years ago.

Based on the types and number of tools present, Jones (1997:77) has hypothesized that the Hidden Creek Site represents a short-term occupation, probably in the range of 7 to 18 days in duration. Moreover, the distribution of artifact types and kinds of lithic debris indicate that discrete activity areas are discernible within the site area. Jones (1997:73-74) contends that separate lithic reduction and tool rejuvenation areas are indicated, and, since they were noted within an oval pattern, they are located within the confines of a former structure, possibly a skin tent.

While the evidence for Paleo-Indian occupation is scarce in Connecticut, combined with data from such sites as the West Athens Road and King's Road Site in the Hudson drainage, and the Davis and Potts Sites in northern New York support the hypothesis that there was human occupation of southern New England by 11,000 to 10,000 B.P. (Snow 1980). Further, the site types currently known suggest that the settlement pattern is 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 hunting and processing tools.

Archaic Period (10,000 to 2,700 B.P.)

The Archaic Period, first designated by Ritchie (1943) to describe all pre-ceramic cultures of the Northeast, began by ca., 10,000 B.P. (Ritchie and Funk 1973; Snow 1980). Later, Griffin (1967) and Snow (1980) divided the Archaic Period into three subperiods: the 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 meant to describe all non-horticultural populations in the Northeast. Moreover, the populations lacked ceramic technology.

After additional investigations, northeastern archeologists added a final "transitional" Archaic Period, the Terminal Archaic Period (3,400-2,700 B.P.), which was meant to describe those groups that existed in the area 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). Although these divisions are used commonly by northeastern archeologists, McBride (1984) and others have found substantial temporal and stratigraphic overlap in the distribution of "diagnostic" artifact types, especially for the Archaic. As discussed in detail below, this overlap and the presence or absence of various cultural traits has led to the formation of several cultural phases for the Archaic Period of southern New England (McBride 1984).

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 the lack of sites of this age 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 Early Archaic sites in the region, and the recognition of the problems of preservation and visibility of these sites in New England (McBride 1984), it is difficult to maintain the discontinuity hypothesis (Curran and Dincauze 1977; Snow 1980).

In addition to the problems of differential preservation, Early Archaic Period occupations in southern New England, unlike other portions of the country (notably the Southeast), are difficult to identify. Like their Paleo-Indian predecessors, Early Archaic sites tend to be very small, and they 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 the recovery of 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, though some quartz and quartzite specimens have been recovered. 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 of prehistory.

In Connecticut, a notable site that has produced stratified deposits dating from the Early Archaic Period is the Dill Farm Site in the lower Connecticut River Valley (McBride 1984; Pfeiffer 1986), and others (Barber 1980; Thomas 1980). Extrapolating from the Dill Farm Site, which dates from 8,050±90 B.P., and from regional surveys in the lower Connecticut River Valley, McBride (1984) has determined that Early Archaic sites generally are positioned within 0.2 km (0.5 mi) of the Connecticut River. This site distribution, combined with a shift in projectile point technology from large lanceolate points in the Paleo-Indian Period to shorter, more robust bifurcate-based projectile points suggests a "settling in" process occurred and that groups became more focused on locally available and smaller game species. Occupations of this time period are represented by camps that moved periodically to take advantage of seasonally available resources (McBride 1984). 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 southern England (Davis 1969). It is at this time that increased numbers and types of sites are noted in the region (McBride 1984). The most well known Middle Archaic site in New England is the Neville Site, which is located in Manchester, New Hampshire and which was studied in detail by Dincauze (1976). The Neville Site produced the first evidence of a Middle Archaic component that was stratigraphically intact and which could be dated reliably using the radiocarbon method.

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). Dincauze argued that the Neville projectile point, which is the oldest type of Narrow-Stemmed projectile point in the region (see below), is typologically similar to, but distinct from, the Stanley projectile point described by Broyles (1966) and (Coe 1964) at the St. Albans and Doerschuck Sites in the Southeast.

In addition to Neville projectile points, Dincauze (1976) described two other projectile points styles recovered from stratified contexts at the Neville Site that are attributable to the Middle Archaic Period. They are the 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. She 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.

As a result of the investigations at the Neville Site, Dincauze (1976) proposed that the Middle Archaic Period is characterized by the "Atlantic Slope Cultural Area," which is represented by the oldest, small or narrow stemmed projectile points in the region. This concept was devised by Dincauze (1976) to unite sites of this age from both the Southeast and Northeast into a single cultural unit, as well as to distinguish this area from other areas to the west of the Appalachian highlands.

During the late 1970s and early 1980s, McBride (1984) conducted archeological investigations in the lower Connecticut River Valley in an attempt to better describe the prehistoric settlement and use of the area. While radiocarbon dates are largely lacking, McBride (1984) noted that Middle Archaic sites in the lower Connecticut River Valley tend to be represented by moderate density artifact scatters that produce examples of Neville and Stark projectile point types; Merrimac projectile points are largely lacking in the region. Further, archeological investigations in the area led to the determination that the lower Connecticut River Valley was occupied fairly intensively by Middle Archaic times, and that occupations identified in the area represent a "diversity of site types, with both large-scale occupations and small special purpose present (McBride 1984:96). As McBride (1984) has pointed out, Middle Archaic sites are distributed in both riverine and upland locales. Based on the available archeological evidence, the Middle Archaic Period is characterized by continued increases in diversification of 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 in the region. They include the Laurentian and Narrow-Stemmed Traditions (Funk 1976 McBride 1984; Ritchie 1969a and b). Archeological sites, cultural traits, settlement patterns, and land use patterns characteristic of these two traditions are discussed below.

The Laurentian Tradition (ca., 6,000 to 4,200 B.P.)
The Late Archaic of the Northeast was much more regionally diversified than either the Early or Middle Archaic Periods. This difference is attributed to environmental stabilization and population increases. The earliest Late Archaic sites in southern New England can be ascribed loosely to cultures of the Laurentian tradition (ca., 6,000 to 4,200 B.P.) (Dincauze 1974:48-49, Ritchie 1969a:233). They cannot, however, be strictly considered "Laurentian" because they lack many of the traits associated with that complex. Rather, they are local manifestations that rarely exhibit more than the diagnostic projectile point forms associated with the Laurentian Tradition (Snow 1980:2 19).

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). In general, the lithic assemblage of this tradition is characterized by flint, felsite, rhyolite and quartzite, while quartz was largely avoided as a raw material for stone tool manufacturing.
In terms of settlement and subsistence, archeological evidence in southern New England suggests that Laurentian Tradition populations consists of groups of mobile hunter-gatherers. While a few large Laurentian Tradition occupations have been identified and studied, they generally encompass less than 500 m^2 in area. 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 1984:252).

Subsistence strategies of Laurentian Tradition focused on hunting and gathering of wild plants and animals from multiple ecozones. While White-tailed deer comprised a prominent part of the diet, plant foods, including seeds and hickory nuts, were utilized. For example, the Bashan Lake Site, a Laurentian Tradition campsite located in East Haddam, Connecticut, has yielded evidence of Brewerton projectile points, net sinkers, grinding stones, hearths and charred hickory nuts dating from 4,730$\pm$280 years ago (Pfeiffer 1983:10).

The relative absence of storage pits and structural remains from the Laurentian Tradition occupations in southern New England indicates a lifestyle dominated by a high degree of mobility. Small groups of hunter/gatherers moved across the landscape in pursuit of seasonally abundant resources. An exception to this pattern is the Bliss-Howard Site discovered by Pfeiffer (1984:74-75). The Bliss-Howard Site, located in Old Lyme, Connecticut, is a cremation/occupation complex dating from approximately 4,700 years ago. At this site, Pfeiffer (1984) identified 21 cremation burials with grave offerings including Brewerton projectile points, atlatl weights, axes, pestles, scrapers, faunal remains, and carbonized seed and nut remains (Pfeiffer 1984:74-75). Adjacent to the cremation cemetery is situated a large Laurentian Tradition occupation site. Pfeiffer (1984) argued convincingly that the habitation and cemetery were contemporaneous because artifacts found in these two contexts cross-mended in some cases. The cremation/occupation complex may have been a place where families aggregated for a period of time during the year. Large sites, such as Bliss-Howard and Bashan Lake, suggest that aggregations occurred for at least a portion of the year.

In his study of prehistoric settlement patterns of the lower Connecticut River Valley, McBride (1984) suggested the use of the term Golet phase to discuss occupation sites that have produced Laurentian projectile point types (e.g., Vosburg and Brewerton series). By obtaining radiocarbon dates from a variety of sites that produced Vosburg and Brewerton projectile points, McBride (1984) derived a time span of 4,700 to 4,200 B.P., for the Golet Phase. The evidence from occupation sites such as Bashan Lake and burial areas such as Bliss-Howard indicate that a significant population of hunter-gatherers inhabited the lower Connecticut River Valley during the early part of the Later Archaic Period (e.g., during the Golet phase). According to McBride (1984) Golet phase populations employed a settlement patter that "appears to be very dispersed, with small mobile groups exploiting a wide range of microenvironments and environmental locales."

The Narrow Stemmed Tradition (ca. 4,200 to 2,900 B.P.)

The latter portion of the Late Archaic is dated between 4,200 and 2,900 years ago, and it is represented by local manifestations of the largest cultural tradition indigenous to southern New England and the mid-Atlantic regions (Dincauze 1975:47, McBride 1984:110). Known regionally as the Narrow-Stemmed Tradition, it is unlike the Laurentian Tradition; 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).

In general, the Narrow-Stemmed Tradition corresponds to when Late Archaic populations in southern New England began to "settle into" well-defined territories. As mentioned above, the lithic industry of this period was dominated almost exclusively by the use of locally available quartz cobbles. The characteristic narrow-stemmed projectile points were manufactured using a bipolar reduction technique whereby a quartz cobble was crushed using a hammerstone and anvil to produce raw material for stone tool manufacture. Other tools found in Narrow-Stemmed Tradition artifact assemblages include choppers, adzes, pestles, antler and bone projectile points, harpoons, and awls, as well as notched atlatl weights. Many of these tools, notably the projectile points and pestles, indicate a subsistence pattern dominated by hunting and collecting of plant foods, especially nuts (Snow 1980:228).

In addition to terrestrial fauna and flora, evidence for the use of shellfish increased during the Narrow-Stemmed Tradition. For example, at the Archaic Midden site in Haddam, Connecticut, a Narrow-Stemmed Tradition site dating to 3 990±60 years ago, McBride (1984:112) recovered evidence for the use of freshwater clams, oyster, and quahog. Similarly, Ritchie has found abundant evidence for use of the same species on the Horn Blower II site on Martha's Vineyard. The date for the Horn Blower II site is ca., 4,000 years ago (Ritchie 1969b:38).

Further, Narrow-Stemmed Tradition settlement patterns are marked by an increase in the types of sites utilized. Whereas the Laurentian Tradition usually is characterized by smaller sites and higher mobility, the Narrow-Stemmed Tradition witnessed the introduction of large base camps supported by small task-specific sites and temporary camps. The introduction of these new site types suggests a more entrenched settlement pattern than that of the preceding Laurentian Tradition. This is evidenced by the archeological deposits at the Woodchuck Knoll Site (McBride 1978:124).

Woodchuck Knoll is a large Narrow-Stemmed Tradition base camp located on the floodplain of the Connecticut River in South Windsor, Connecticut. The associated radiocarbon dates for Woodchuck Knoll fall between 3,760 and 3,500 years ago. The site is particularly important for understanding Narrow-Stemmed Tradition settlement patterns because it demonstrates the re-occupation of a single area many times, something which was largely lacking during preceding periods. Moreover, Woodchuck Knoll exhibits the remains of numerous features, including hearths, caches and storage pits, all of which indicate a long term, perhaps multi-season, use of the site. This is particularly true of storage pits, which, until Narrow-Stemmed Tradition times, apparently were not utilized in southern New England. Storage pits at the Woodchuck knoll Site contained the charred remains of hickory, walnut, hazelnut, and *Chenopodium* sp., indicating a heavier reliance on local plant foods (McBride 1978:130).

In addition to the Woodchuck Knoll Site, many task-specific and temporary camps of the Narrow-Stemmed Tradition have been detected in almost every microenvironment in southern New England, including riverine areas, interior wetlands, upland streams, coastal zones, and lacustrine settings. These sites were utilized as support mechanisms for the larger base camps, such as Woodchuck Knoll. Further, they attest to a more well-established settlement pattern during the Narrow-Stemmed Tradition. While this pattern was well established, it still relied on frequent groups movement. The difference at this time is that group movements were made between areas that were frequented over and over in the past.

Based on recovered archeological evidence, McBride (1984) has suggested two separate phases for the Narrow Stemmed Tradition. They are the Vibert and Tinkham phases. The Vibert phase was identified first at the Woodchuck Knoll (McBride 1978), while the Tinkham phase was interpreted from archeological deposits encountered at the Tinkham Site in Tolland, Connecticut. In terms of temporally diagnostic tool types, the Vibert phase is recognized by the presence of small, triangular Squibnocket projectile points, while the Tinkham phase is represented by the ubiquitous narrow stemmed projectile point. In addition, the Vibert and Tinkham phases were marked by the introduction of new and diverse site types, a heavier reliance on local plant foods, and re-occupation of and longer stays at base camps. These data suggest larger seasonal aggregations of people than the previous Golet phase, as well as decreased mobility. The increased number of temporary and task specific sites, especially those belonging to the Tinkham phase, indicates frequent movements out of and back into base camps for the purpose of resource procurement; however, the base camps were relocated seasonally to position groups near frequently used, but dispersed, resources (McBride 1984:262).

The Terminal Archaic Period (3,700 to 2,700 B.P.)

The Terminal Archaic, 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" (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 southern New England 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, namely the Susquehanna Tradition (McBride 1984; Ritchie 1969b). The Susquehanna Tradition is recognized in southern New England by the presence of a new lithic 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 Broad, Mansion Inn, and Orient Fishtail types (Lavin 1984; McBride 1984; Pfeiffer 1984). Generally, 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). There is much variation within the suite of artifacts within the Susquehanna Tradition, and, as a result, it should not be interpreted directly as a cultural system (Snow 1980:239).

The Susquehanna Tradition lithic industry was based on the use and modification of such raw material types as flint, chert, argillite, hornfels, rhyolite, and quartzite. Locally abundant quartz was avoided because of its poor fracturing qualities (McBride 1984:115-116). Thus, it can be said that the Narrow-Stemmed Tradition differs from the Susquehanna Tradition in technology, morphology, and raw material preferences. In addition, the material culture of the Terminal Archaic includes soapstone vessels, chipped and ground stone adzes, atlatl weights, drills, net sinkers, plummets and gorgets (Lavin 1984; McBride 1984; Ritchie 1969a and 1969b; Snow 1980), the most temporally diagnostic of which soapstone or steatite bowl. These vessels are shallow, have flat bottoms, are oval or rectangular in shape, have lugged handles at the narrow ends, and range from 12 to 50 cm (5 to 20 in) in length. The finished bowls are heavy and they demonstrate extended use; that is, many often have evidence of repairs (Snow 1980:240). It has been suggested that they are modeled after wooden prototypes (Snow 1980:240). The soapstone bowls tend to be found only at base camps along river terraces.

In the late Terminal Archaic there also is the appearance of interior cord marked, grit tempered, thick walled ceramics with conoidal bases; these ceramics occur in very minor amounts. These are the first ceramics in the Northeast and are named Vinette I (Ritchie 1969a; Snow 1980:242); this type of ceramic vessels appears with much more frequency during the ensuing Early Woodland Period. 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 (Snow 1980:250).

In addition, the recovery of soapstone bowls from numerous archeological sites in Connecticut indicates that local populations had access to and participated in regional exchange networks. For example, soapstone, or steatite, bowls appear to be tied into large inter-regional exchange networks that extended across the Northeast (Snow 1980:240). Moreover, the increased percentage of high quality lithics, e.g., chert, flint, felsite, etc., recovered from Terminal Archaic sites in the region also attests to the maintenance of long distance exchange networks, since these raw materials do not exist naturally within the borders of the State of Connecticut. As such, this is the best and earliest evidence of trade and exchange in southern New England. The majority of raw materials exchanged at this time can be found in riverine settings, and settlement along the major drainages would have facilitated trade.

There also are a large number of Terminal Archaic cremation cemeteries with burials that have produced broadspear points and radiocarbon dates between 3,700 and 2,700 B.P. (Pfeiffer 1990). Among the grave goods are ritually “killed” (intentionally broken) steatite vessels, as well as ground stone and flaked stone tools (Snow 1980:240); however, this represents an important continuation of traditions from the Late Archaic and it should not be regarded as a cultural trait unique to the Susquehanna Tradition (Snow 1980:244).

In addition, just as the artifact assemblage of the Susquehanna Tradition differed from Narrow-Stemmed Tradition, so too did settlement patterns. While Susquehanna Tradition settlement patterns are centered

around large base camps that are analogous to that unearthed at the Late Archaic Woodchuck Knoll Site, they were located in a different ecozone: terrace edges overlooking floodplains. Terminal Archaic settlements generally are situated on river terraces with few, very small task specific upland sites located nearby (McBride 1984:282, Lavin 1988). Ritchie and Funk (1973), for example, noted that nearly all the Orient Fishtail components of the Susquehanna Tradition are located near seashores or along major rivers, usually in locations protected from prevailing winds (see also Snow 1980:249). The Timothy Stevens Site is an example of such a large Terminal Archaic base camp in the Connecticut River drainage. This site, radiocarbon dated from 2,740±60 years ago, is situated on the edge of a terrace adjacent to the Connecticut River floodplain in central Connecticut. The site area has produced evidence of house remains, hearths, caches and storage pits, all of which area indicative of a large-scale, long term occupation (Pagoulatos 1988:76). Prolonged occupation of these sites may explain partially the changes in settlement from occupying the floodplain to moving up onto the terraces. That is, the terraces can be occupied earlier in the spring because they are not threatened by the annual spring flooding.

Acting as support facilities for the large Terminal Archaic base camps were numerous task specific sites and temporary camps. In general, these sites measure between 100 to 200 and 300 m^2 or larger in size, respectively. Such sites were used as extraction points for the procurement of resources not found in the immediate vicinity of the base camps, and they generally were located adjacent to upland streams and wetlands (McBride 1984:282). It is generally accepted that base camps were occupied from spring to fall in order to harvest anadromous and catadromous (migratory) fish runs, while interior sites were occupied during the colder months (Snow 1980:249).

While superficially it would appear those sites that have produced Susquehanna Tradition materials and sites containing Narrow-Stemmed Tradition materials were similar in nature, they were not. McBride (1984) indicated that settlement patterns associated with the Narrow-Stemmed Tradition, were characterized by large base camps, task-specific sites and temporary camps that were relatively evenly distributed across the landscape; they were ascribed to the above-referenced Tinkham phase. As mentioned above, Tinkham phase occupations appeared in all microenvironments, including riverine, upland, inland wetlands and lakeshores. Susquehanna Tradition settlements, on the other hand, which McBride (1984:278) argues belong to the Salmon Cove phase, were not so evenly distributed. That is, whereas Tinkham phase base camps sometimes occurred in upland locales, Salmon Cove phase base camps appeared almost exclusively within riverine settings (McBride 1984:278). In addition, those Salmon Cove phase temporary camps and task-specific occupations located in the uplands were of short duration, long enough only to replenish supplies for the riverine base camps.

Unlike settlement patterns, however, Terminal Archaic Salmon Cove phase subsistence patterns were analogous to earlier patterns. The subsistence pattern still was diffuse in nature, and it was scheduled carefully. For example, food remains recovered from the Timothy Stevens Site included 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 ceramics 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 commonly divided into three subperiods: Early, Middle, and Late Woodland. In contrast, Snow (1980) has segmented the Woodland Period into two subperiods. He combined the Early and Middle Woodland to

form the Early Horticultural Period (2,700 to 1,000 B.P.), while he renamed the Late Woodland into the Late Prehistoric Period (1,000-350 B.P.).

While Snow's (1980) reconfiguration of the Woodland Period is not without merit, it has met with resistance among southern New England archeologists, who continue in large measure to use the traditional three subperiod nomenclature. An exception to this rule can be found in McBride's (1984) study of the lower Connecticut River Valley, where he subdivides the Woodland period into four phases: the Broeder Point Phase (ca., 2,700 to 2,000 B.P.), The Roaring Brook phase (ca., 2,000 to 1,250 B.P.), the Selden Creek phase (1,250 to 450 B.P.), and the Niantic phase (ca., 450 to 350 B.P.). The latter phase typically is referred to as the "Final Woodland" period. The various Woodland subperiods and phases are discussed in detail below.

Early Woodland Period (ca., 2,700 to 2,000 B.P.)
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 horticulture, the initial use of ceramic vessels, and increasingly complex burial ceremonialism, with the use of mounds to bury the dead in the Midwest (Dragoo 1967; 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.

In southern New England and New York, two different regional complexes have been described for the Early Woodland Period. They are the Meadowood Complex in New York (Ritchie 1969a) and the Lagoon Complex on Martha's Vineyard (Ritchie 1969b). Both are characterized by the presence of Meadowood and Rossville projectile points, settlement patterns focused on riverine and coastal settings, and thick grit-tempered ceramic vessels.

In his study of the lower Connecticut River Valley, McBride (1984) identified a distinct phase for the Early Woodland Period. McBride (1984:294) named it the Broeder Point phase, and it encompasses the entirety of the Early Woodland Period (i.e., 2,700 to 2,000 B.P.). As described, the Broeder Point phase "is characterized by a quartz cobble lithic industry, narrow-stemmed points, an occasional Meadowood projectile point, thick, cord-marked ceramics, and perhaps human cremations" (McBride and Soulsby 1989:50).

Despite this description, data associated with Broeder Point phase are not recovered often; however, one the best known sites of this phase is the Waldo-Hennessey Site in Branford, Connecticut McBride (1984:125). Excavation of the site area revealed the presence of several small seasonal, and perhaps sequential, occupations situated adjacent to a tidal estuary. Careful investigation of the site area also 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 (McBride 1984:296-297). McBride (1984) argued that the combination of the subsistence remains and the recognition of multiple superimposed cultural features indicates that the site was reoccupied on a seasonal basis by a small co-residential group.

In terms of regional settlement patterns, Broeder Point phase sites, like those of the Late Archaic Tinkham phase, are located in a variety of different ecozones; however, the largest settlements associated with this phase were focused on floodplain, terrace, and lacustrine environments (McBride 1984:300). Thus, while there is similarity to settlements patterns of the Tinkham phase, it is a superficial one. The main difference between the phases is that the Broeder Point phase is characterized by "population aggregations along major rivers, interior lakes, and wetlands" (McBride and Soulsby 1989:50), whereas Tinkham phase occupations reflect seasonal groups movements by smaller numbers of people.

Despite this difference, McBride (1984:299) suggests that the Broeder Point phase was characterized by seasonal base camps only; that is, task-specific and temporary camps are largely lacking during this phase. This may reflect two difference situations. First, such site types were not employed for the collection of resources, which seems unlikely. Second, Broeder Point temporary and task-specific sites are largely unrecognizable because of both their size and the fact that they do not produce the whole suite of Broeder Point technology, namely narrow stemmed projectile points and ceramics. If lacking the latter, such sites are likely to be misinterpreted as Tinkham phase occupations, which were characterized by the presence of narrow stemmed projectile points and the absence of ceramic technology. As a result, it is very likely that southern New England archeologists are misidentifying many Broeder Point phase sites, ultimately leading to the interpretation that the area was occupied by a population smaller than that of previous prehistoric periods (Dincauze 1974).

In terms of Broader Point phase occupations that have been identified and investigated in detail, McBride and Soulsby (1989:50-51) discussed five sites that were identified during the Route 6/I-84 expansion project. They indicate that the identified sites were "distributed fairly evenly between upland streams and interior swamps, and generally found less than 20 meters from a water source" (McBride and Soulsby 1989:50). Radiocarbon samples obtained from Sites 22-2, 19-6, and 12-2 returned dates of 2,380±210 B.P., 2,650±90 B.P., and 2,060±90 B.P., respectively (McBride and Soulsby 50-51). The sites produced multiple cultural features, as well as significant amounts of quartz debitage, including resharpening flakes, which indicate that both tool manufacture and maintenance activities took place within the limits of each site area. McBride and Soulsby (1989:51) argue that the recovered lithic assemblage is reflective of "woodworking, animal butchering, skin working, and plant processing activities." In addition, the recovered faunal assemblage consisted of specimens of raccoon, snake, White-tailed deer, and hickory and walnut shell fragment. Their recovery, as well as the evidence for multiple cultural features and tool manufacturing and curation, suggest that the sites reflect multi-season use as base camps (McBride and Soulsby 1989:51).

In sum, archeological evidence collected by McBride (1984) during his dissertation research in the lower Connecticut River Valley, as well as that noted by McBride and Soulsby (1989) during their survey of the then-proposed Route 6/I-84 expansion corridor, indicates that Broeder Point phase populations consisted a mobile hunter/gatherers that moved seasonally throughout a diversity of environmental zones in search of available plant and animal resources. As such, Broeder Point phase populations employed a foraging type of resource exploitation strategy, reflecting somewhat of a return to a Late Archaic lifestyle.

Middle Woodland Period (2,000 to 1,200 B.P.)

The Middle Woodland Period of southern New England prehistory 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 indicates that regional exchange networks were operationalized once again, and that they were used extensively to supply local populations with necessary raw materials (McBride 1984; Snow 1980). Specifically, the recovery of certain types of chert and jasper indicate that Middle Woodland populations of the lower Connecticut River Valley had obtained raw material for stone tool manufacturing from the Hudson Valley (cherts) and eastern Pennsylvania (jasper) (George and Tryon 1996). Some authors have argued that the changes in ceramic technology and the increased reliance on regional exchange signified the beginning of a trend toward sedentism (McBride 1984; Snow 1980; Ritchie 1969a, 1969b); this argument is bolstered by the increased use of shellfish on the coast, as well as by the diversification of the diet to include additional types of wild plant foods and animal resources. These trends are discussed in more detail below.

In Connecticut, the Middle Woodland Period is represented archeologically by the Roaring Brook phase, which was defined by McBride (1984:134) during his investigations of settlement patterns in the lower Connecticut River Valley. In particular, McBride (1984:135) indicates that the Roaring Brook phase is

marked by use of 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 Roaring Brook phase include Linear Dentate, Rocker Dentate, Windsor Cord Marked, Windsor Brushed, Windsor Plain, and Hollister Stamped (Lizee 1994a:200). In addition, Lizee (1994a:200) has noted that shifts in Roaring Brook phase "vessel morphology include two contemporary forms: conoidal and elongated conoidal." He further indicates that this change was gradual and that it happened throughout the Roaring Brook phase; in addition to morphological changes, the Roaring Brook phase witnessed the first use of shell tempering in ceramic vessels (Lizee 1994a:200).

What this shift in ceramic technology reflects is difficult to say at present because large-scale investigations of Roaring Brook phase components have been conducted only infrequently. However, in his 1987 article, Braun suggested that changes in ceramic technology, specifically morphological evolution from conoidal toward elongated and globular with constricted necks, may represent a subsistence shift to include the use of starchy plant foods such as maize and/or other domesticated plant foods, e.g., *Chenopodium* sp., which required suspension of pots over fires rather than placement within a heating source. In addition, the addition of shell temper to ceramics has been demonstrated to reduce the amount of thermal shock to a pot that is put under slow boiling conditions such as would have been the case with the preparation of maize and other domesticated plant foods (Braun 1987).

In terms of settlement patterns, the Roaring Brook phase is characterized by the occupation of village sites by large co-residential groups. These sites were the principal place of occupation, and they were positioned in close proximity to major river valleys, tidal marshes, estuaries, and the nearby 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 Roaring Brook phase 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 Selden Creek and Niantic phases (McBride 1984). The Selden Creek Phase, which dates from ca., 1,200 to 450 B.P., is considered significant by Connecticut archeologists because it has produced the earliest evidence for the use of maize 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 1973, 1974; McBride 1984; Snow 1980).

Lithic assemblages associated with Selden Creek Phase occupations, especially village-sized sites, are functionally variable and they reflect plant and animal resource processing and consumption on a large scale. McBride (1984:322) argued that lithic assemblages recovered from Selden Creek Phase sites typically contain approximately 20 percent non-local lithics at the beginning of the phase, whereas they reach densities of 60 to 70 percent by the end of the phase. Finished stone tools recovered from Selden Creek Phase 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).

In addition, ceramic assemblages recovered from Selden Creek Phase sites are as variable as the lithic assemblages. Ceramic types identified in Selden Creek Phase settlements 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; 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). Surface treatments of Selden Creek Phase ceramics include fabric impression, cord marking, smoothing, and brushing (Lavin 1980; Lizee 1994a; McBride 1984).

Further, ceramic vessel morphology underwent extensive changes during the Selden Creek Phase. For example, Selden Creek Phase vessels exhibit a more globular form, with rounded bottoms, constricted necks, and out-flaring rims becoming common. They also are thinner than their earlier counterparts, and they include collars and castellations, as well as some new forms of lip treatment. The use of shell tempering also became common and geographically widespread during the Selden Creek Phase (Lavin 1980; Lizee 1994a; McBride 1984).

In addition, as a result of his investigation of the distribution, size, and inferred function of archaeological sites in the lower Connecticut River Valley, McBride (1984:323-329) characterized Selden Creek Phase settlement patterns as more nucleated than the preceding Roaring Brook phase, with fewer, larger sites situated in estuarine and riverine ecozones. Both river confluences and coastal zones were favored for the establishment of large village sites that contain numerous hearths, storage pits, refuse pits, ceramic production areas, house floors, and human and dog burials (Lavin 1988b; McBride 1984). McBride (1984:326) has argued that these sites certainly reflect multi-season use, and were perhaps occupied on a year-round basis (see also Bellantoni 1987).

In addition to large village sites, McBride (1984:326) identified numerous temporary and task-specific sites in the uplands of the lower Connecticut River Valley and along the coastline. These sites likely were employed for the collection of resources such as plant, animal, and lithic raw materials. These sites tend to be very small, lack internal organizational structure, and usually contain a limited artifact assemblage and few cultural features, suggesting that they were occupied from only a few hours to perhaps overnight. Temporary camps, on the other hand reflect a longer stay than task-specific camps, perhaps on the order of a few days to a week, and they contain a more diverse artifact assemblage indicative of more on-site activities, as well as more features (McBride 1984:328-329). In sum, settlement patterns of the Selden Creek Phase in the lower Connecticut River Valley and adjacent coastline area are characterized by "1) aggregation in coastal/riverine areas; 2) increasing sedentism, and; 3) use of upland areas by small task groups of individuals organized for specific tasks" (McBride 1984:326).

In addition to the Selden Creek Phase, the Late Woodland Period encompasses the Niantic phase of Connecticut prehistory. The Niantic phase, sometimes referred to the Final Woodland Period, spans from ca., 450 to 350 B.P. (McBride 1984:145). While encompassing a short period of time, this phase is characterized by the continued increase in the reliance on non-local lithic raw materials for stone tool manufacture, use of maize horticulture, and a decrease in the number of ceramic types utilized. Projectile points characteristic of the Niantic phase are the Levanna type (McBride 1984).

In his dissertation research of the Windsor Tradition ceramics, Lizee (1994a) indicated that stylistic diversity in Niantic phase ceramics decreased, while the numbers and types of tools used to produce and decorate vessels increased. Lizee (1994a:233) argues that decreases in stylistic variation may reflect the

consolidation of ceramic production techniques and decorative styles, with such changes possibly related to the evolution of tribal groups within the area. Lizee (1994a) also suggests that increased variety in vessel sizes during the Niantic phase may be attributed to shifts in ceramic vessel function. Various vessel functions apparent at this time include cooking versus storage, among others.

It is important to note that numerous researchers have indicated that maize horticulture is a central feature of the subsistence pattern by Niantic phase times in Connecticut (Bendremer 1993; Bendremer and Dewar 1993; George 1997; Lizee 1994a; Lavin 1988; McBride 1984). This is consistent with Lizee's (1994a) arguments concerning ceramic treatments and the possible development of tribal entities at this time. Interestingly, however, Niantic phase settlement patterns are different from those of the preceding Selden Creek phase. While large village sites still are found in a multitude of eczones, including riverine, estuarine, tidal, lake, and coastal areas, smaller seasonal camps appear in the archeological record at this time. Such sites were absent during the previous Roaring Brook and Selden Creek phases, and their appearance represents a shift in land use patterns during the Niantic phase.

McBride (1984:337) argues that the small seasonal camps of the Niantic phase are located primarily in upland settings near streams and interior wetlands. This is in contrast to Selden Creek settlement patterns, McBride (1984), McBride and Bellantoni (1983), and McBride and Dewar (1987) suggest that this shift represents the dispersal of village populations at certain times of the year into smaller seasonal camps that likely were occupied by single families. McBride (1984:340) argues that this represents a return to a more mobile settlement pattern for the collection of resources; however, this shift occurs at a time when European contact with Native Americans first occurs and the trade in furs was initiated. Thus, the placement of seasonal camps in upland stream and interior wetland locations may be related to individual families moving to areas favorable to hunting beaver and other fur-bearing animals.

Summary

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 pattern, and land use strategies. For the majority 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 Selden Creek phase that incontrovertible evidence for the use of maize horticulture as an important subsistence pursuit 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 items, 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.

4.0 Historical Setting

Windsor was founded as early as 1633, if the first and non-permanent settlers are counted as the founders of the town. Its original territory extended for some miles on both sides of the Connecticut River. Although the earliest descriptions of the town are very vague, the present towns of Windsor, Windsor Locks, East Windsor, South Windsor, and Ellington are all daughter towns of Windsor, and it also contributed parts of Bloomfield and East Granby. East Windsor formed in 1768 (and South Windsor and Ellington later came from East Windsor), Bloomfield in 1835, Windsor Locks in 1854, and East Granby in 1858. As one of the three original "river towns" of Connecticut, Windsor sent delegates to the assembly that formed the colony's first legislature, which approved the Fundamental Orders of 1639 that acted as the government's founding document until the Royal Charter was granted by the British Crown in 1662. Located in the fertile Connecticut River Valley, and despite its large size, early start, and productive agriculture, Windsor remained one of Connecticut's smaller towns through the advent of the industrial age, as the most industrious residents focused on the production of tobacco and related products.

Contact Period

The Native Americans who lived in the Windsor area were known to the colonists as the Poquonocks, and a road and a village in Windsor still bear that name. A lengthy series of purchases and repurchases transferred the land from Indian hands to those of the colonists. The first purchase in the area was west of the Connecticut River, in 1633, consisting of a vaguely defined area bounded south on the Hartford purchase. The sellers were named Sequassen and Nattawanut (sometimes referred to as Attawanot); in 1670 a confirmatory deed from Arramamett and Repequam, said to be Nattawanut's successors, defined the area as running from the Hartford bounds north to the edge of the 1635 Poquonnock purchase and westward seven miles from the Connecticut River. It certainly went as far north as the historic center of Windsor, which was located along the Farmington River, but probably not far enough north to include the parcel of the Area of Potential Effect. The Poquonnock purchase of 1635 also had to be repurchased, in 1665, and may have gone far enough north and west to include the future Area of Potential Effect, but the description is too vague for certainty. The seller in 1635 was one Sehat, and the later confirmatory deed named his kinsmen Coggernosset and Nassahegan The third purchase apparently dated to about 1637, made from one Tehano (or Nehano), and was repurchased in 1687, and included the northern third of Windsor, all of Windsor Locks, and part of Suffield. This was probably too far north to include the Area of Potential Effect. A fourth purchase, however, from 1642, transferred all Nassahegan's title to the land south and west of the Tunxis or Farmington River, westward to Simsbury, and would certainly have included the Area of Potential Effect. This deed reserved a small area at the place called Indian Neck on the Farmington River, but in 1659 nine or ten acres was sold to George Griswold. A few later purchases may have overlapped the 1642 sale, but it seems that this was the key deed as far as the Area of Potential Effect is concerned (Stiles 1891).

The number and location of Indians in Windsor in the seventeenth century is uncertain, but it is known that many of them died in a smallpox epidemic of 1634 (Stiles 1891). According to Thistlethwaite (1989), the first English settlement at Windsor was located atop the old Indian village. The survivors may have moved to the east side of the river, where larger villages continued to exist, or westward to Farmington, where another Indian community survived for many years. The first sale of land to the colonists seems to have occurred as a result of the sachem Nattawanut's seeking protection from the English, as he sold that land in 1633 to the Captain Holmes who accompanied him back, and then seems to have died in the smallpox epidemic the next year. His successor, Aramamet, confirmed the first purchase in 1670, and seems to have been connected in some way with the Podunk Indians who lived on the opposite side of the river. Stiles asserts that these two leaders and their people were a distinct group from the Poquonnock, who lived north of the Farmington River. The leaders of the latter group certainly acted independently of Aramamet; the sachem Nassahegan made the 1642 sale mentioned above (which contradicts Stiles' own statement about their territory being north of the river), and accompanied the colonists to the battle at Springfield in 1675, during King Philip's war (Stiles 1891). Despite the land sales, Stiles reports, "[r]emnants of the Poquonnoc tribe lingered for many years around the homes of their fathers, and some have dwelt there even within the memory of people who are now living" (Stiles 1891, 110). As the number of white colonists increased, however, many of the natives moved westward; first to Farmington, than to northwestern Connecticut, and eventually to the Brotherton community in Oneida, New York, from whence many of them moved to Wisconsin (Stiles 1891). At each stage of travel, however, some remained behind, so that Stiles also could refer to those survivors in Windsor in the nineteenth century. The contradictions and inconsistencies of these reports reflect the difficulty of attempting to understand Native American groups' historic relationships when our information comes from colonial sources who did not understand Indian society at all.

Seventeenth through Nineteenth Centuries

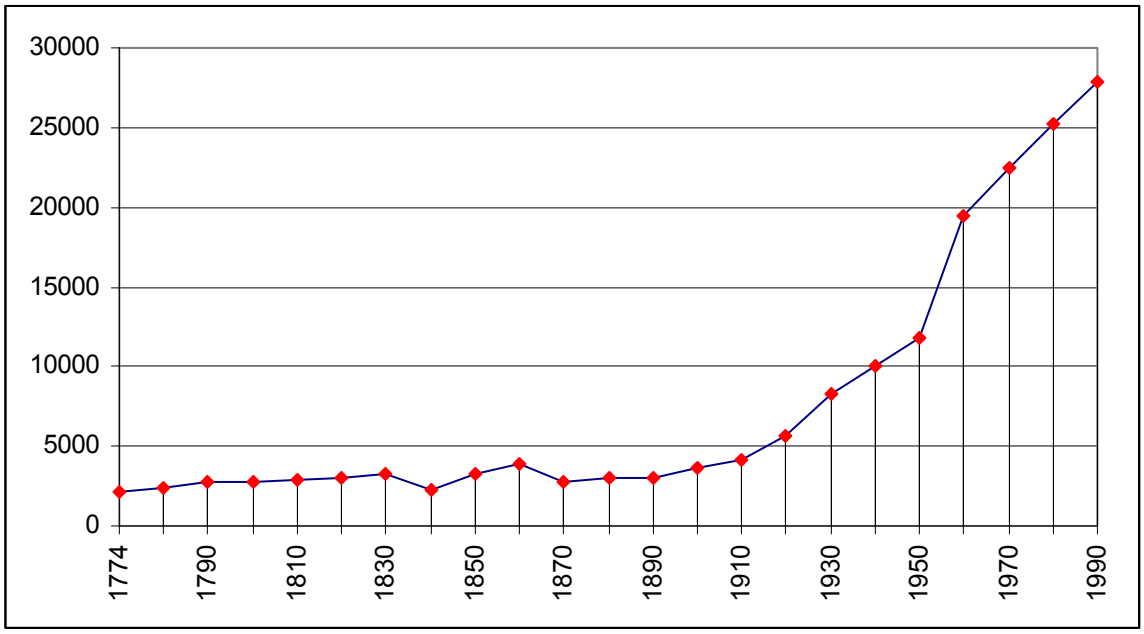
The first European presence on the Connecticut River was Dutch. The explorer Adriaen Block led an expedition that went up the river as far as Enfield Falls in 1614, but it was not until 1633 that the Dutch

set up a trading post at the future site of Hartford. In the same year, an expedition from the English Plymouth Colony, led by William Holmes, arrived at the future Windsor, first passing under the guns of the Dutch fort. As was noted above, Holmes brought with him the sachem Nattawanut, who had sold him a piece of land there. The Dutch failed to dislodge them, and soon were dislodged themselves by the English arrivals from Massachusetts Bay at Hartford. By 1635, however, the Plymouth outpost at Windsor (initially known as Matianuck) was besieged by newcomers from the Massachusetts Bay town of Dorchester, who also wanted to settle there, and then a third group led by Mr. Francis Stiles, who claimed to have a legal patent to the area, namely the same patent that supported the settlement on the coast at Saybrook. In 1637, the dispute between the Plymouth and Dorchester people was settled (by the former selling most of their claim to the latter). It was probably the Dorchester group that affiliated with Hartford and Wethersfield to prosecute the Pequot War and to form a joint government among the three towns, as in 1637 this "court," as it was called, decided to give the settlement called Dorchester the name Windsor instead. The Stiles group apparently had to abandon its claim in the face of superior numbers and organization. From this initial confusion, then, emerged a single town called Windsor, whose residents continued to acquire additional land from the Indians, as was discussed above (Stiles 1891). By 1650, a sprawling settlement had emerged on both sides of the Farmington River (Figure 11).

In 1675, tensions with the Native Americans, whom the colonists had been displacing at an ever-increasing rate, erupted into a violent conflict known as King Philip's War. Windsor's residents, being further north than other towns, were particularly fearful of attack during this conflict. No such attack occurred, perhaps because of the town's many precautions and the soldiers constantly marching through on their way north, but Simsbury, the town on its western border, had been evacuated to Windsor (from where many of the residents had originally come), and in 1676 some force of Indians burned the town's houses. Some 125 Windsor residents served during the war, and the town also supplied its share of food and munitions for the war effort and substantial charitable contributions as well. The war ended in defeat for the Indians later that year, and despite various alarms in later years, there was no serious threat to Connecticut from the Native Americans afterwards. Other colonies, however, were exposed to danger during Britain's wars with the French, which were transplanted to the New World in the form of Queen Anne's War (1702-1713) and the French & Indian War (1722-1724). Connecticut militias were on the alert, and in 1704 the British called upon Connecticut to supply 400 men for the war effort, the first of many demands. Soldiers and chaplains from Windsor served with the British from New York to Canada, sometimes losing their lives as well as months of their time. Then 1739, England's war against Spain drew colonial troops into war in the West Indies, with France added to the mix in 1744; the conflict, occasionally drawing men from Connecticut and Windsor (including at one point lieutenant-governor, later Governor, Roger Wolcott of Windsor) (Stiles 1891).

The initial Windsor settlement was at the junction of the Connecticut River and the Farmington River, extending northerly along both waterways. The Area of Potential Effect is located in one of the more remote sections of Windsor; while the closest cluster of settlement is the center of the town, historic maps show the Area of Potential Effect as an uninhabited area. The town as a whole had a healthy population of 2,125 as of 1774, though that made it far from the largest in Connecticut. Through 1910, however, Windsor's population remained below 5,000, reflecting its inability to compete with Hartford as an industrial center (Chart 1; CT-DEP 1996). A map of 1798 shows the roads and continuing absence of houses near the Area of Potential Effect; by this time, the map shows a string of houses along the road to the east, which was the principal land route between Windsor and Hartford, but west of that road there were very few residences (Figure 12; Pease 1798). As of 1836, the town still had only two Congregationalist ecclesiastical societies, Windsor and Poquannoc, and the only other church was a Methodist one; the small number of churches reflects the relatively small population, between 2,000 and 3,000. For agricultural purposes, the town was described by Barber as "generally of a level surface, having some extensive tracts of plains … [t]he soil is various, but generally fertile, and free from stone" (Barber 1836, 123). Interestingly, and perhaps significantly, the town was entirely bypassed by the

turnpike system that developed between about 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 foster the development of commerce and industry (Wood 1919).



The town also had some manufacturing in 1836 – four paper mills, a "Kentucky jean factory," a cotton batting factory, a wire factory, and a satinet factory (Barber 1836, 123). However it was primarily an agricultural town. Toward the end of the nineteenth century, the town's industry included the Spencer Arms Manufacturing Company, which made the Spencer gun, the Best Manufacturing Company, which made cigars and tobacco, and the Eddy Electric Company; otherwise, the town had two combined grist and saw mills, three blacksmith shops, ten stores, and two hotels, along with seven churches and twelve schools. Between 1853 and 1873 the Sequasson Woolen Company (at first called Windsor Knitting and Manufacturing) operated in town, until its facility burned down. Poquonock had, as of 1859, the Franklin Paper Works, two cotton mills, and a grist mill. In addition, the area immediately northwest of Poquonock is known as "Rainbow," and on the river at that point there were also a number of manufacturing enterprises (Stiles 1891). In 1842, the Hartford & Springfield Railroad was incorporated and built its road through Windsor by 1844; since it linked with the Hartford & New Haven line in Hartford, Windsor had a good connection to the state's rail system thereafter. In 1871, the Central New England line was completed, running from Hartford to Winsted, but passing across only a corner of Windsor. By passing through the east end of town, in the first case, and through the agricultural hinterland in the second, these railroads bypassed the nascent industrial villages of Poquonock and Rainbow, doing little to encourage the development of industry in Windsor (Turner & Jacobus 1987). As a result, though the town seems to have had some industrial activity through much of its history, it was not a dominant economic sector.

Twentieth Century

As of 1900, Windsor's population was still under 5,000, but had begin a rising trend as of 1890, and reached 5,620 by 1920; by 1950 it had doubled to over 10,000 (CT-DEP 1996; see Chart 1). In 1932, the town's principal industries were described as "agriculture and manufacturing," which suggests that the town had some general manufacturing but no specialization; at the time, the town was also served by a trolley line to Hartford (Connecticut 1932, 311). From 1950, the population rose much more steeply, doubling again by 1970 and passing 27,000 as of 1990, which made it only the thirty-fourth largest of Connecticut's 169 towns (CT-DEP 1996; see Chart 1). This growth is consistent with the rest of

Connecticut's, reflecting as it does the postwar adoption of the automobile and the subsequent suburban residential development trend, as well as the construction of highways. In 2000, however, Windsor's population had risen to only 28,237, suggesting a much slower growth rate. As of 2005, the town's economic makeup included only a small fraction of agriculture – only 1.6% of workers were employed in that sector, while 11.2% were in manufacturing, and over 75% in retail, government, and other tertiary-sector activities (CERC 2006).

Ownership History of Area of Potential Effect

The earliest known owner of the Area of Potential Effect was Huldah Marsh of New Hartford. At her death in 1865, she left a will designating her granddaughter Frances Isabella Merrill heir to one-half of her estate, plus her household furniture and clothing; her grandson Oliver Caleb Merrill received one-quarter of her estate, while her daughter Frances Catherine Merrill and grandson Horace Franklin Merrill received one-eighth each. This estate consisted of a horse, two sets of harness and a carriage, fourteen shares in the Farmers & Mechanics Bank, $2,040.00 on deposit at the Hartford Savings Society, two notes owed to her, and 15.25 acres 8 rods of land in Windsor, worth $600 (the estate was worth, in total, $4,900.90, including over $2,000 in a savings account) (New Hartford Probate District, Record #530). It is not presently known how this resident of New Hartford acquired this land in Windsor. According to the 1860 census, she was then 69 years old and lived in the New Hartford household of Roswell M. and Frances C. Merrill and their children Oliver C. and "Florins J." (U.S. Census, 1860, Series: M653 Roll: 81 Page: 134). She also lived in the same household as of the 1850 census (U.S. Census, 1850, Series: M432 Roll: 42 Page: 139). An 1843 probate record for Roswell Marsh of New Hartford identifies the widow as Huldah Marsh, so by the time of her death she had been a widow for some twenty-two years. According to the inventory of Roswell Marsh's estate, he owned a great deal of personal estate – thirteen pages of the inventory – but owned land only in his residence of New Hartford (Probate Records, New Hartford District, #536). It seems likely that Huldah inherited the Windsor property from a relative in Windsor, probably after her husband died; the church records in the holdings of the Connecticut State Library indicate that in 1829, Huldah Marsh, wife of Roswell, was admitted to the New Hartford Congregational Church from Windsor (Index, 1739-1854, p. 70). In the absence of information about her maiden name, however, we cannot determine anything further. A historic map from 1855, possibly during the period of her ownership of the Area of Potential Effect, indicates a continuing absence of residential occupation there. The map omits the road west of the Area of Potential Effect that had appeared in the 1798 map cited above, and shows the linear clustering of residences along the Hartford-Windsor road (dominated at that time by members of the Loomis family on the section nearest the Area of Potential Effect) (Figure 13; Woodford 1855).

Huldah's will does provide useful information to follow up, however. According to the 1870 census, Oliver Merrill of New Hartford was an unmarried 30-year-old farmer, whose household also included Horace (27), Frances (54), and Belle (18, and undoubtedly the Frances Isabella mentioned in the Marsh will). Despite the family's fatherless state, they were well off – Oliver owned $5,000 in real estate and $1,500 in personal estate, while Horace owned another $9,000 in real estate (U.S. Census, 1870, Series: M593 Roll: 105 Page: 222). The brothers sold their interest in the Windsor land in 1874 to Frances C. Merrill and Frances I. Merrill, their mother and sister, for $200. The land was described in the deed as containing 15 acres 2 roods and 8 rods, bounded

N	T. W. Loomis
E	Louisa Loomis
S	highway
W	Phebe L. Phelps

(Windsor Land Records, Vol. 62, Pg. 23). The next day, mother and daughter mortgaged the property to Oliver P. Mills for $500, an encumbrance that was released by his estate in 1902 (Windsor Land Records,

Vol. 49 Pg. 132 and Vol. 62 Pg. 24). The 1869 map of the town of Windsor shows a return of the road west of the Area of Potential Effect, but still no residences other than the Loomis-dominated ones along the Windsor-Hartford road (Figure 14; Baker & Tilden 1869).

The 1880 census found Frances C. Merrill (64) living in Hartford's Fifth Ward with her still-unmarried sons Oliver C. (40) and Horace F. (37), where they ran or worked in a meat market (U.S. Census, 1880, Series: T9 Roll: 97 Page: 259). The land remained in the family's hands until 1902, when Frances I. Merrill Bigelow and her husband Alden (of Grafton, Massachusetts) sold it to Willard M. Lovell of Windsor. The deed referred to the land's provenance in the estate of Huldah Marsh of New Hartford, and also noted that Frances C. Merrill had died and her estate had been settled in the Probate Court for Worcester County, Massachusetts, in 1888, with her interest in the Windsor land going to her married daughter. The abutting owners according to this deed were:

N	Charles H. Rood
E	Welton Denshaw
S	highway
W	Charles H. Rood

(Windsor Land Records, Vol. 57, Pg. 477). The 1900 census had found Willard M. Lovell living in Windsor, where he already owned his own, unmortgaged farm. His household was substantial, including himself (aged 46 and a farmer), his wife Emma A. (47), daughter Edith F. (18), son Fay W. (16 and still at school), son Arthur W. (11), son Jarvis B. (5), father-in-law Henry S. Briggs (74), and farm laborer/servant John F. Pitts (46). According to the schedules, Willard had been born in Connecticut of Massachusetts-born parents, while his wife had been born in Michigan of Massachusetts-born parents; their daughter had been born in New York and the sons in Connecticut, and the servant had been born in Massachusetts of parents from Canada and Maine (U.S. Census, 1900, Series: T623 Roll: 139 Page: 300). This variety in natal origin was not unusual in the later nineteenth century, when movement from place to place had become more common than in earlier eras.

According to the 1910 census, Willard M. Lovell (56) was still farming in Windsor, and his household had been reduced to his wife Emma A. (56), son Fay (27 and working as a clerk in an insurance office), and son Jarvis (16 and not employed) (U.S. Census, 1910, Series: T624 Roll: 131 Page: 163). The 1920 census identifies his residence as being on Windsor Avenue – a very long road that did pass not far from the Rood Road location. His household was the same as at the previous census, except that son Jarvis B. (26) was working with his father on the home farm, while the still-unmarried Fay (37) continued to pursue his career as an insurance company clerk (U.S. Census, 1920, Series: T625 Roll: 180 Page: 206). In 1924, Lovell split the parcel of which the Area of Potential Effect is a part, selling 4.19 acres in a 174-foot-wide strip along the western edge of the parcel to The Hartford Electric Light Company ("HELCO") (Windsor Land Records, Vol. 88, Pg. 367). A 1928 aerial photograph of the area may show some clearing of the land for power lines, but it is difficult to be certain (Figure 15).

HELCO re-sold the 4.19-acre parcel in 1931 to The Connecticut Power Company (Windsor Land Records, Vol. 106, Pg. 298). The 1934 aerial photograph very clearly shows the track of land-clearing for the power lines moving northward along the 4.19-acre strip and then jogging westward, as the present lines do (Figure 16). Moreover, a 1934 map compiled by the WPA shows the parcel outlines and the power line, as well as structures that had been built nearby and a subdivision southeast of the Area of Potential Effect (Figure 17; WPA 1934). A 1951 aerial photograph indicates that the proposed subdivision had never been built, although the number of houses in the area had increased substantially, with several other subdivisions having been built as well (Figure 18). In 1954, HELCO bought the parcel back (Windsor Land Records, Vol. 152, Pg. 477). The map filed with the town clerk at the time of the 1954 sale shows that this is the parcel upon which the current access road and switching station had been

built at some point between 1924 and 1954, in addition to the presence of the power lines (Windsor Land Records, Map. #BD278-E). It is difficult to say, from the early aerial photographs, when the small substation structure was built.

In 1925, Willard M. Lovell sold the remainder of the parcel, upon which the proposed facility is to be built, to Anthony and Cecelia Kolodziej of Hartford. It was described as containing 10.4 acres, abutted

N	William Diechowski
E	George R. Ford
S	Rood Avenue
W	HELCO

(Windsor Land Records, Vol. 94, Pg. 239). The deed also provided that "the said Grantor shall have the right to draw about 200 loads of sand from the bank located on said herein conveyed premises." This right was released in 1929 (Windsor Land Records, Vol. 103, Pg. 189). A month after their purchase, Anthony quit-claimed his interest in the property to his wife, Cecelia (Windsor Land Records, Vol. 95, Pg. 66). The 1928 aerial photograph shows a mix of forest and agricultural land in this area, with two probable structures at the northeastern corner, the beginnings of Shelley Avenue along its eastern edge, and an access road near the eastern edge (Figure 15). In the 1930 census, the "Kolodziey" family was listed as living on Rood Avenue in Windsor, which is the first documentary evidence of persons living on the property. They owned a home worth $9,000 and a radio, and according to the schedule did not live on a farm. Anthony was 34, Cecelia was 32, and they had been married for seven years; they had a daughter, Jennie, aged 6. Cecelia was literate, Anthony was not. Both were Polish immigrants; he had arrived in 1914, she in 1913, and both had received their first papers for naturalization. Anthony worked as a laborer for contractors (U.S. Census, 1930, Series: T626 Roll: 268 Page: 204). The residence of this family on or near the Area of Potential Effect was an effect of the increasing flow of immigrants into the United States, which began in the mid-nineteenth century and slowed significantly only in the 1930s. The 1934 aerial photograph and map both indicate the presence of a house at the south end of what was then the relevant parcel, as well as of other buildings at the northeast corner of the parcel (Figures 16 and 17). The 1951 aerial photograph indicates that most of the Area of Potential Effect had been cleared for agriculture, while other places in the vicinity had been subdivided for housing (Figure 18).

By 1957, the level of residential development in the vicinity had increased dramatically, while the Area of Potential Effect and much of its vicinity still remained largely cleared for agriculture (Figure 19). In addition, Interstate 91 had been constructed a short distance east of the Area of Potential Effect. Plans for this limited-access highway, which runs through Connecticut from New Haven to the Masschusetts border, were first laid in the 1940s. In 1952, nearly final plans for the segment north of Hartford were laid out, and the road itself was completed through Windsor Locks in 1958 (Oglesby 2005). Cecelia Kolodziej sold this property, consisting of 8.79 acres after the sale of two or three small pieces of it for residences, to HELCO in 1966. The use to which the property was being put at the time is indicated by the grantor's reservation of "the right to maintain upon and remove from the granted premises, at the Grantor's expense, the nursery stock presently situated on said premises" (Windsor Land Records, Vol. 204, Pg. 451). The map filed with the town at this time indicates that the Kolodziej family no longer lived on the property, as the adjacent house lots were owned by other persons. The map also shows a barn and two smaller outbuildings near Shelley Avenue, which had appeared along the eastern boundary of the property, leading north from Rood Avenue; the map indicates, however, that it still was only a dirt road (Windsor Land Records, Map #2-282). The 1970 aerial photograph shows a further increase in the amount of residential housing in the area, and the appearance of a golf course located north of the Area of Potential Effect. The Area of Potential Effect itself was still partly cleared, but may have already begun the reforestation process, and other former agricultural fields in the area seem to have been doing the same (Figure 20). These processes were well advanced by the time of the 1995 aerial photograph, in

which structures associated with the power lines are also more clearly visible. In addition, still more residential development had occurred in the area – most notably, replacing the golf course (Figure 21). The 2003 aerial photograph shows relatively little change, however, except perhaps in the size of the trees in the area (Figure 22). This process of residential infilling is consistent with the spread of suburbanization in Connecticut, and began at an early point in southern Windsor because of its proximity to the urban center of Hartford. The population figures discussed above are consistent with the pattern seen in these documents.

Hartford Electric Light Company

Although the Rood Avenue Property is currently owned by the Connecticut Light and Power Company, its origins lie in the Hartford Electric Light Company (HELCO) and the Connecticut Power Company (CPC). HELCO was incorporated on April 12, 1881, at Hartford, Connecticut. This was a time when a number of independent electric companies, many of them municipal in nature, were being incorporated in Connecticut. Electric power was new, speculative, and an arena of fierce corporate and political competition. At first, HELCO's operations were limited primarily to the city, and mainly to arc-lamp street lighting. As a business venture, street lighting was a break-even proposition at best, but it was a starting point for the development of a market for residential and commercial lighting. The initial power plants were based solely in the city, running on steam produced by the Hartford Steam Company. Much of HELCO's early history can be explained by the differing views of two of its key personnel. A. C. Dunham was a tinkerer and a visionary, seeking to develop new markets for electricity by developing uses for it; Samuel Ferguson was a professional manager with a background in engineering, who directed the early growth of the company. Dunham and his heating and cooling workshops developed a very popular early icemaking machine, as well as an electric stove, toaster, and other appliances. Ferguson, in 1924, developed one of the first energy cooperatives, in which several power companies agreed to produce and share surplus of electricity beyond the needs of their existing customers. Dunham also developed hydroelectric power plants, including one at Rainbow in Windsor, at the north end of the town (Weaver 1969).

The company's expansion out of Hartford was primarily due to Ferguson's rural electrification project, begun during the 1920s and continuing thereafter, as a means of expanding the company's market; the federal Rural Electrification Project gave the effort funding after 1936 (Kellogg 1951). The main power lines stretching between Windsor's hydroelectric plant and the Hartford market were the first successful effort at long-distance power transmission using copper and aluminum wires, and were built in 1899. That was also the year that the company's franchise was expanded by the legislature to include Simsbury, East Granby, Bloomfield, West Hartford, Newington, Wethersfield, and Windsor (Weaver 1969). Precisely when the power lines and substation adjacent to the Area of Potential Effect were built is not known at this time. They could easily have been constructed under an easement before the purchase of the property. Clearly, however, these facilities date to the 1920s, though probably not earlier. Present-day power generation in Connecticut still utilizes hydroelectric and gas-powered plants, in addition to the nuclear facilities along the shoreline. Figure 23 shows the location of historic power generation plants in relation to the Area of Potential Effect.

Conclusions

The Area of Potential Effect was used as an agricultural field through a little more than the first half of the twentieth century. It is fairly certain there were no significant residential or industrial structures in the area prior to the twentieth century, although the presence of some small farm-related structures or even small houses cannot be entirely discounted. The area's place in the history of the development of electrical infrastructure in the Connecticut Valley is of some interest, although much of it is currently too recent to be considered historically significant. This documentary history indicates that there is little likelihood of any historical resources being found in this area.

5.0 Previous Investigations

This section presents an overview of previous archeological research completed within the vicinity of the Property in Windsor, Connecticut. This discussion provides the comparative data necessary for assessing the results of the current Phase I cultural resources reconnaissance survey. In addition, it ensures that the potential impacts to all previously recorded cultural resources located within the general vicinity of the Area of Potential Effect are taken into consideration. Specifically, this chapter reviews all previously completed cultural resources surveys conducted within the vicinity of the Property as well as those archeological sites situated within .8 km (.5 mi) of the Area of Potential Effect. The discussions presented below are based on information currently on file at the Connecticut State Historic Preservation Office. In addition, the electronic site files maintained by Heritage Consultants, LLC also were examined during the course of this investigation. Both the quantity and quality of the information contained in the examined cultural resources survey reports and site forms are reflected in this document.

Previously Conducted Cultural Resources Survey Located Within the Vicinity of the Property

A review of the files maintained by the Connecticut State Historic Preservation Office, as well as those archived by Heritage Consultants, LLC, revealed a single historic property located within a half-mile radius of the Areas of Potential Effect (Figure 24). A CHPC HRI is a historic resource, identified during a large-scale investigation (which was undertaken to record properties of historic significance in Connecticut). Further information about this specific property was lacking during the compilation of this report. However, close examination of Figure 24 reveals other CHPC properties and National Register of Historic Places landmarks outside of the half-mile buffer of the Areas of Potential Effect.

Previously Recorded Archeological Sites Located Within the Vicinity of the Property

A review of data currently on file at the Connecticut State Historic Preservation Office, as well as the electronic site files maintained by Heritage Consultants, LLC produced no known archaeological sites within .8 km (.5 mi) of the Area of Potential Effect (Figure 25). Furthermore, the only previously identified site situated within a mile of the Area of Potential Effect is Site 164-59 (which exhibits signs of occupation/activity dating from Connecticut's prehistoric period).

6.0 Methods

The Phase I cultural resources reconnaissance survey is designed to identify all prehistoric and historic cultural resources located within the Area of Potential Effect. Fieldwork for the project was comprehensive in nature. The methods used to complete this investigation were designed to provide complete and thorough coverage of all portions of the Property. This undertaking entailed pedestrian survey, systematic subsurface testing, mapping of the Property, and photo-documentation of the Area of Potential Effect (see below).

Following the completion of all background research, the Area of Potential Effect was subjected to a Phase I cultural resources reconnaissance survey utilizing pedestrian survey, intensive photo-documentation, mapping, and systematic shovel testing. The field strategy was designed such that the entire Property was examined visually and photographed. During the current fieldwork effort, the Area of Potential Effect was examined using transect survey where shovel tests were situated at 30 m (100 ft) intervals along four parallel survey transects spaced the same distance apart (Figure 3). Each shovel test measured 50 cm (19.7 in) in diameter and each was excavated to a depth of 50 cmbs (19.7 inbs) or until sterile subsoil or glacial till was encountered. Each shovel test was excavated in 10 cm (3.9 in) arbitrary levels within natural strata, and the fill from each level was screened separately. All shovel test fill was screened through 0.635 cm (0.25 in) hardware cloth and examined visually for cultural material. Soil characteristics were recorded in the field using Munsell Soil Color Charts and standard soils nomenclature. Each shovel test was backfilled immediately upon completion of the archeological recordation process. Finally, the Area of Potential Effect was photographed using digital media and all man-made features and shovel test locations were mapped (Figure 3).

Curation

Consistent with the *Environmental Review Primer for Connecticut's Archaeological Resources* (Poirier 1987), following the completion and acceptance of the Final Report of Investigations, all drawings, maps, photographs, and field notes will be curated with:

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7.0 Results of the Investigation and Management Recommendations

This section presents the results of the comprehensive Phase I cultural resources reconnaissance of the Property, measuring approximately 20 ac in size, located north of Rood Avenue in Windsor, Connecticut (Figures 1 through 3). A review of the pertinent USGS 7.5' series topographic quadrangle revealed that the proposed project parcel is situated at an approximate elevation of 27.3 m (90 ft) NVGD. Prior to the initiation of any subsurface testing, representatives from Heritage Consultants, LLC conducted a pre-fieldwork archaeological assessment of the Area of Potential Effect. This was completed through an examination of previous archaeological studies and resources recorded in the region, a review of historic maps, an examination of pertinent aerial images, and a walkover of the Property.

Pedestrian survey and preliminary analysis of available historic maps and aerial imagery completed during the pre-fieldwork assessment phase of the project indicated that the Area of Potential Effect has been previously impacted by a number of natural and anthropogenic disturbances. Small-scale natural disturbances were noted during the pedestrian survey of the Property. These included soil erosion and tree throws that have disturbed localized patches of soil. In addition, disturbances to the landscape, which had been caused by housing development in the surrounding areas, and the preexisting power line corridor, were also noted during the time of survey. Because of these existing conditions, the Property was deemed to retain only a low potential to produce intact cultural deposits.

Despite the indications of previous disturbances, Heritage Consultants, LLC utilized a field methodology that was rigorous in nature in order to be sure that no potentially deeply buried cultural deposits were located within the confines of the Property. Fieldwork for this investigation consisted of pedestrian survey, systematic subsurface testing, mapping, and photo-documentation of the Area of Potential Effect. Finally, the field effort included visual reconnaissance of the Property and its immediate surroundings to ascertain whether or not historic and/or prehistoric cultural resources were positioned within or immediately adjacent to the Areas of Potential Effect. The results of this investigation are reviewed below.

During survey, a total of 10 shovel tests were excavated successfully throughout the Area of Potential Effect associated with the proposed substation footprint. Shovel tests could not be excavated throughout the majority of the proposed project parcel because of extensive areas of deadfall, heavy underbrush, previously disturbed soils, or excessively wet soils (Figure 3). During survey, it was noted that shovel test profiles varied in color and texture across the project area. Subsurface shovel testing was performed in two areas across the Property. Area 1 was located west of the existing CL&P switching station, and Area 2 was southeast of the existing switching station, (and will house the proposed substation). Three shovel tests were placed along a single survey transect in Area 1. A typical shovel test excavated within Area 1 contained two strata and it extended to a depth of 40 cmbs (15.7 inbs). Stratum I, which extended from 0 to 20 cmbs (0 to 7.9 inbs), consisted of a mixture dark reddish brown sandy loam and dark brown sandy loam. Stratum II reached from 20 to 45 cmbs (7.9 to 15.7 inbs) and it was characterized as a deposit of

reddish brown sand and gravel. In addition, 7 0f 9 shovel tests were excavated in Area 2, along 3 survey transects. A typical soil profile for shovel tests excavated within Area 2 exhibited three strata and extended to a depth of 60 cmbs (23.6 inbs). Stratum I of these shovel tests reached from 0 to 30 cmbs (0 to 11.8 inbs) and it was described as a deposit of dark reddish brown sandy loam. Stratum II reached from 30 to 50 cmbs (11.8 to 19.7 inbs) and it was classified as a layer of dark yellowish brown sandy loam. Lastly, Stratum III, which reached a terminal depth of 60 cmbs (23.6 inbs), was recorded as brown sand (which was wet in several shovel tests across Area 2). It should be noted that in addition to wetlands soils, several shovel tests in Area 2 exhibited mottled stratigraphy (indicative of past soil disturbances).

The variable nature of the soils located throughout the Area of Potential Effect confirmed the results of the existing conditions analysis in that soil disturbances are evident and ubiquitous. In addition, completion of the subsurface testing portion of the current Phase I cultural resources reconnaissance survey, which also confirmed soil disturbance on a large scale, failed to produce any evidence of cultural deposits and/or cultural features. Further, pedestrian survey of the proposed project parcel, as well as a visual reconnaissance of the region surrounding the Area of Potential Effect, indicated that no historic and/or prehistoric cultural resources were located in the immediate vicinity of the Property. Thus, it is the professional opinion of Heritage Consultants, LLC that no cultural resources will be impacted as a result of the planned substation construction, and that no additional fieldwork is recommended.

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FIGURES

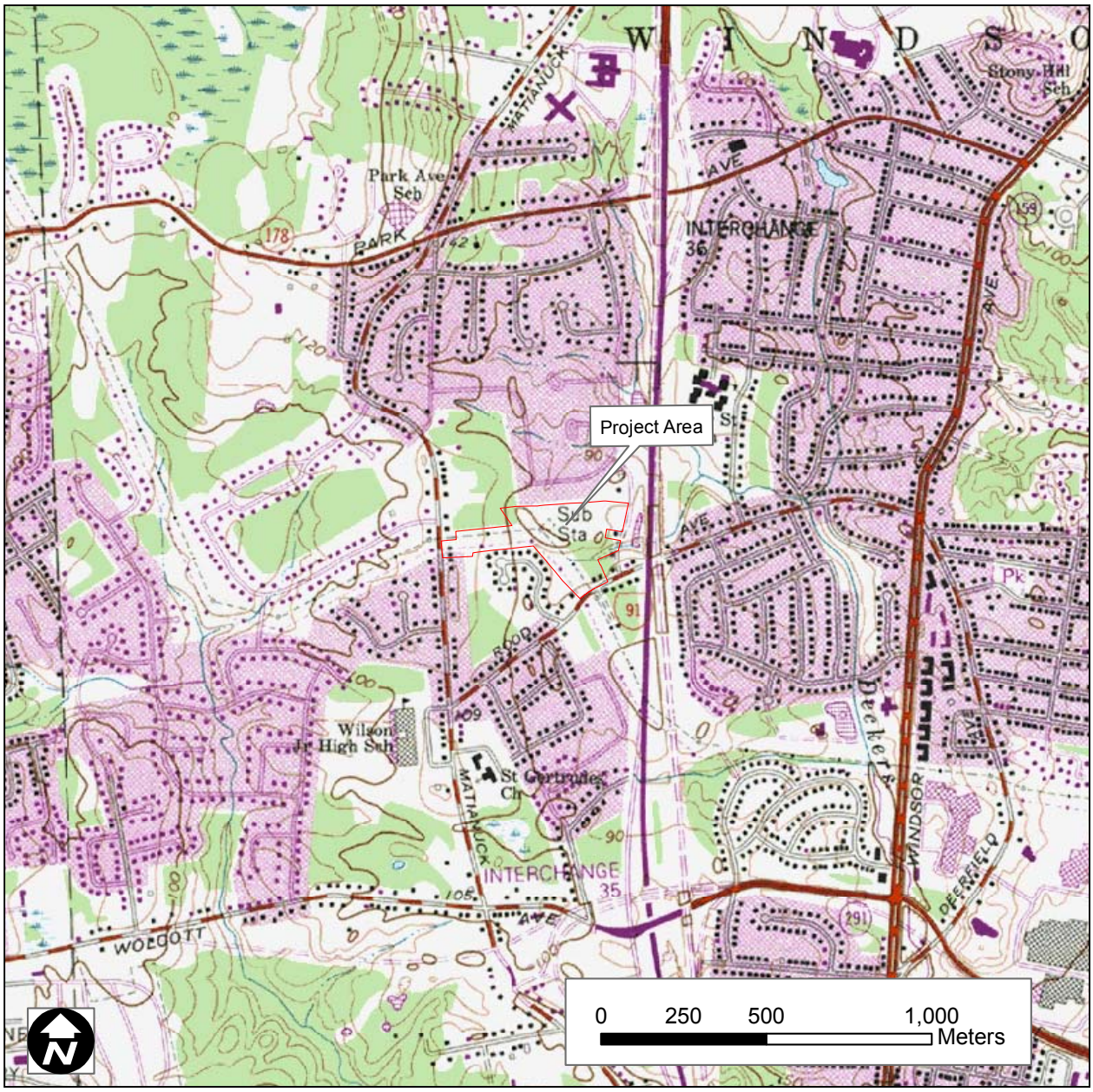

Figure 1. **Excerpt from a USGS Topographic Quadrangle depicting the location of the Areas of Potential Effect.**

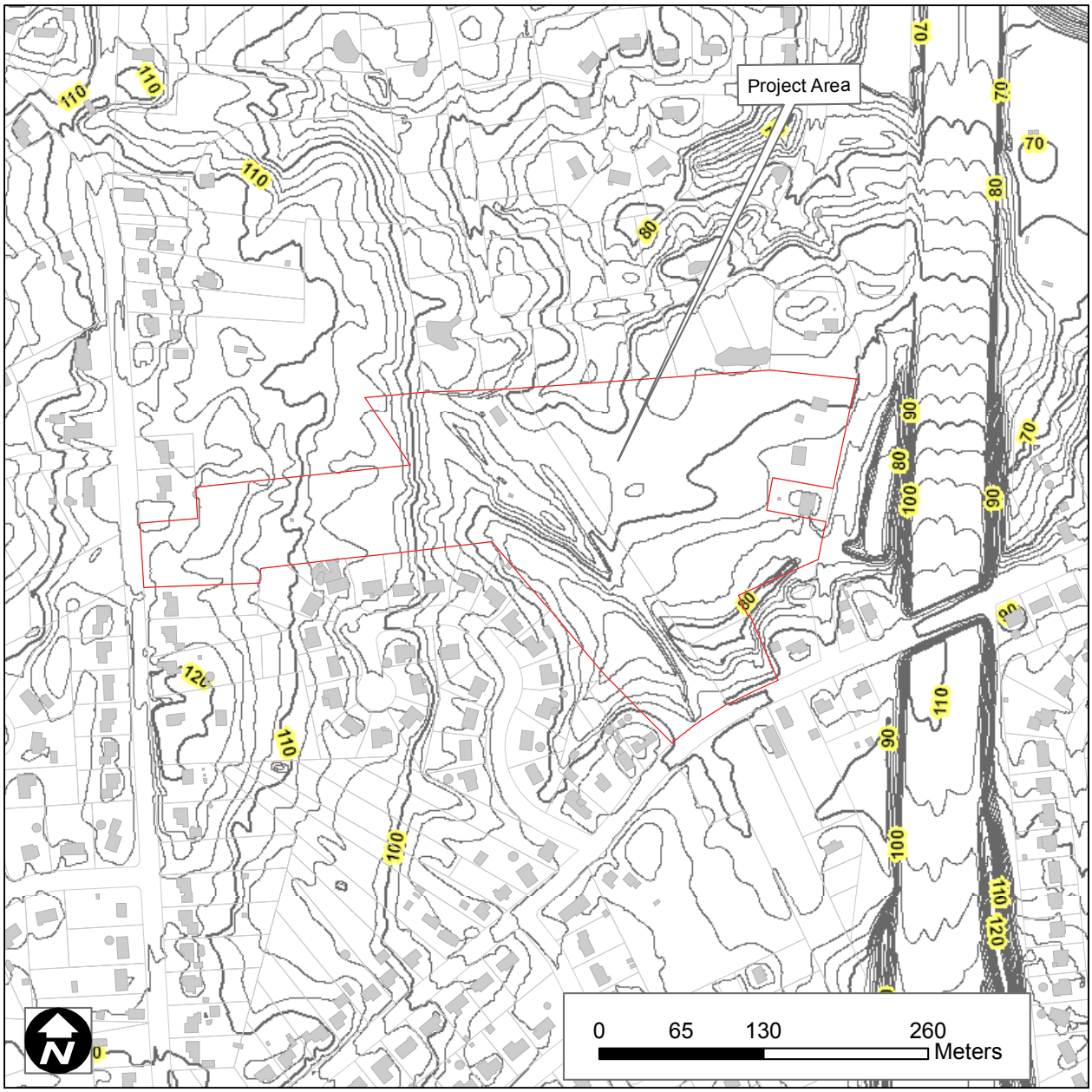

Figure 2. **A digital map depicting the topography situated within the Areas of Potential Effect, and its immediate surroundings.**

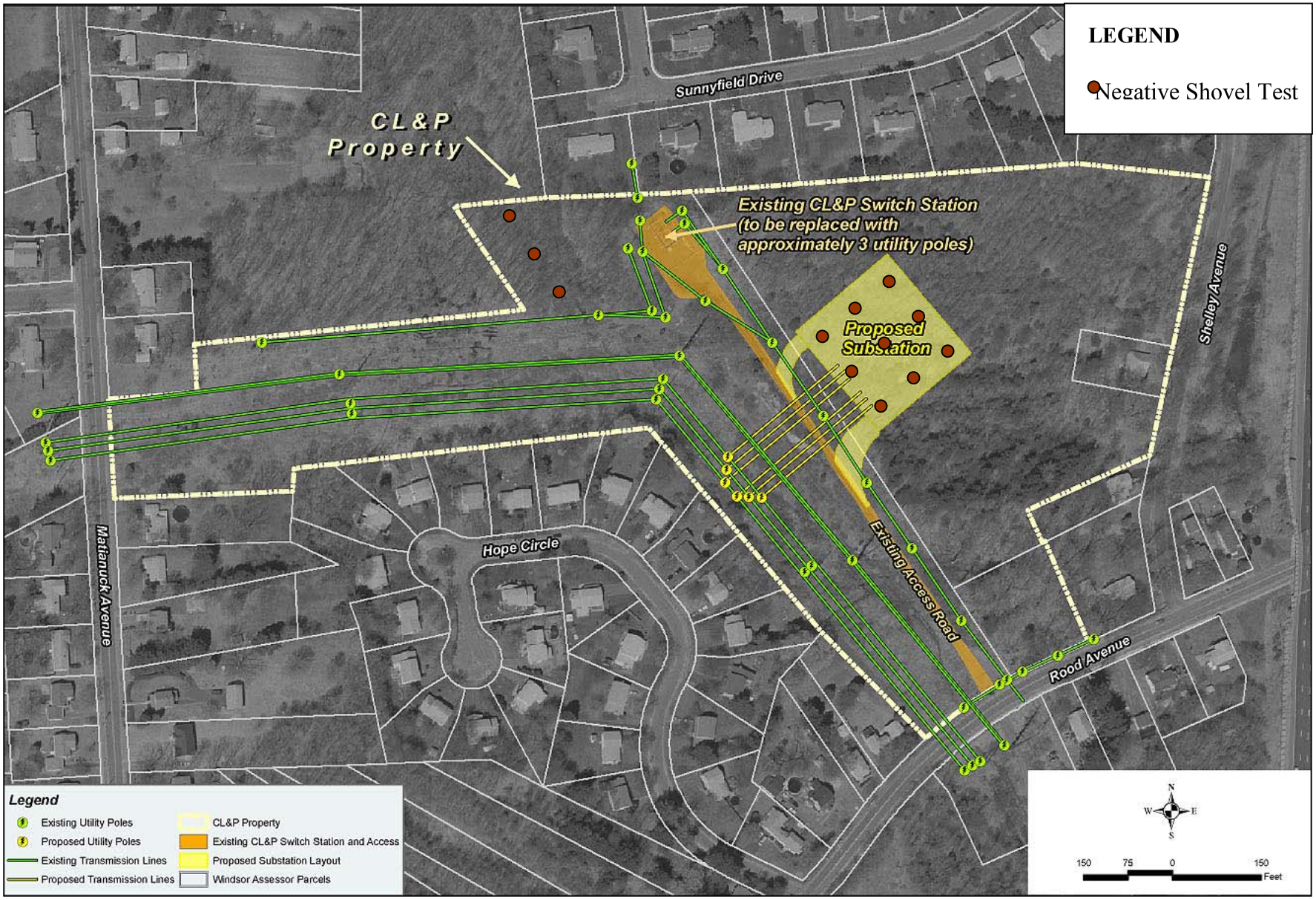

Figure 3. **Location and configuration of the proposed Rood Avenue Substation and associated facilities.**

Figure 4. **An overview photograph, depicting the location of the Areas of Potential Effect. Note the ferns in the foreground, which denote wet soils.**

Figure 5. **An overview photograph, depicting the location of the Areas of Potential Effect.**

Figure 6. **An overview photograph, depicting the location of the Areas of Potential Effect.**

Figure 7. **An overview photograph, depicting the location of the Areas of Potential Effect.**

Figure 8. **An overview photograph, depicting the existing substation located off of Rood Avenue.**

Figure 9. **An overview photograph, depicting the extant dirt and gravel access driveway.**

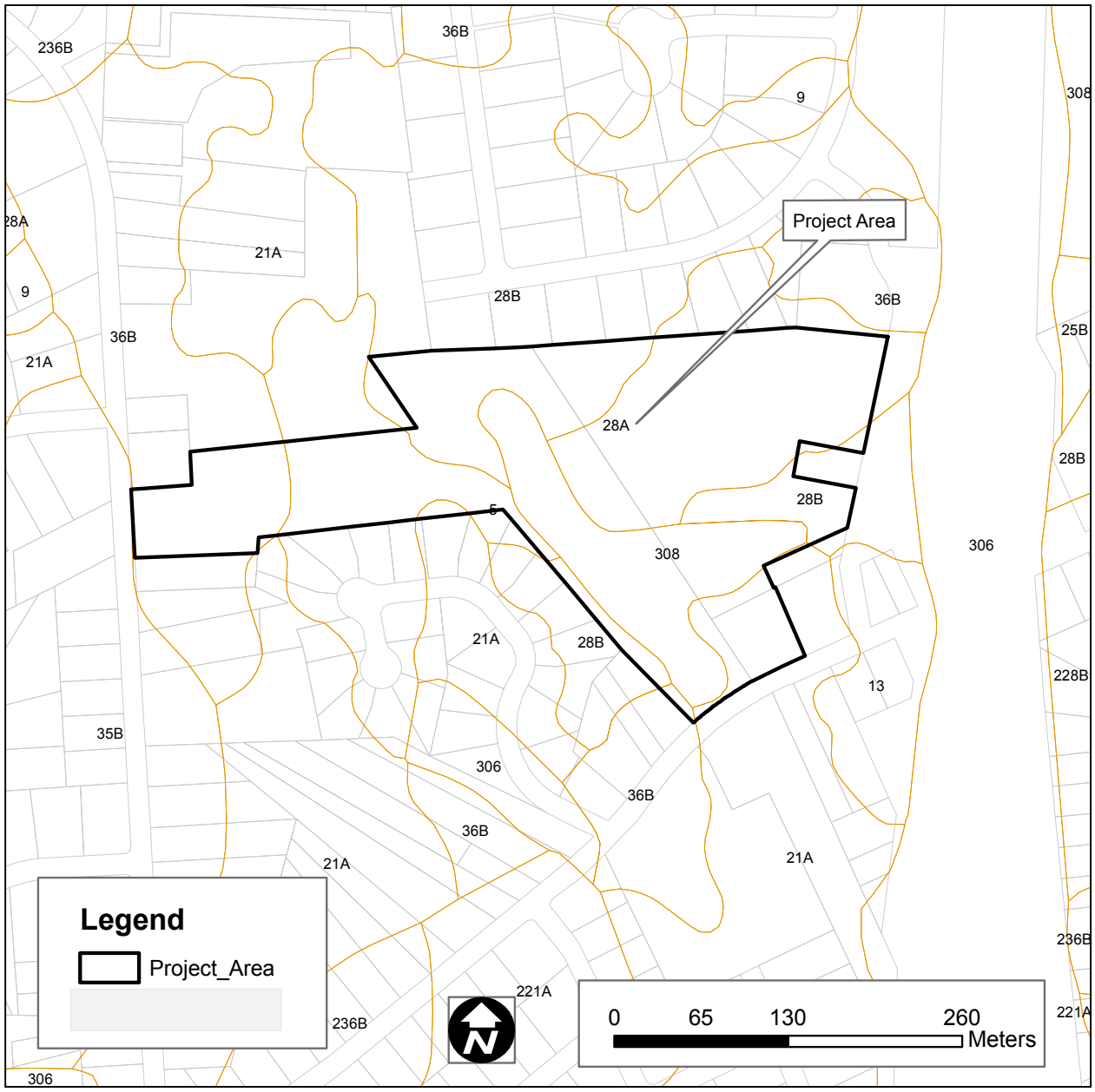

Figure 10. **A digital map depicting all of the recorded soil types situated within the immediate vicinity of the Areas of Potential Effect (Note: 308 = Udorthents - Smoothed, 5 = Wilbraham Silt Loam, 21A = Ninigret & Tisbury Soils, 28A/B = Elmridge Fine Sandy Loam, and 36B = Windsor Loamy Sand).**

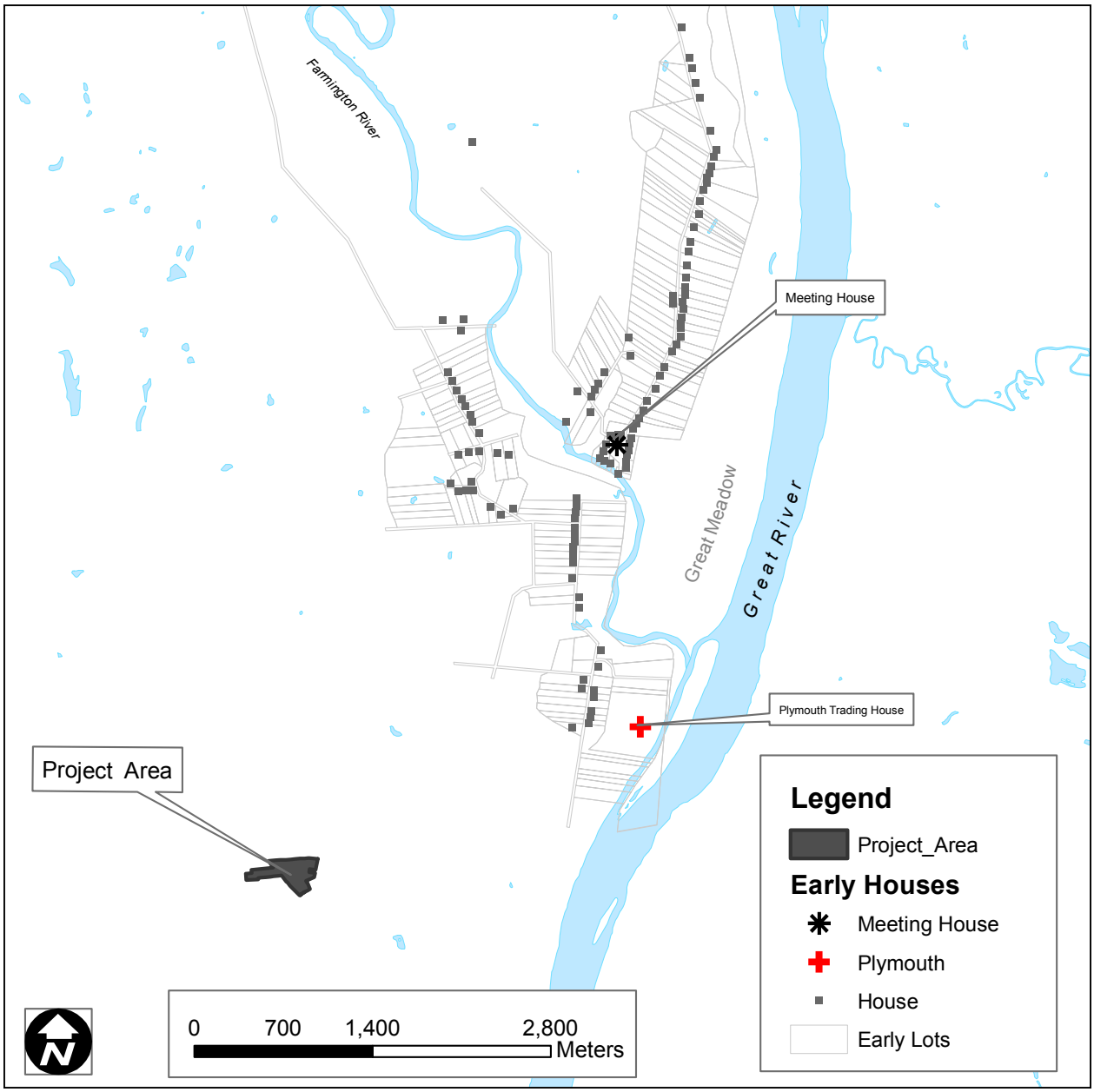

Figure 11. **A digital map depicting the Areas of Potential Effect, and a portion of Windsor as it appeared in 1650.**

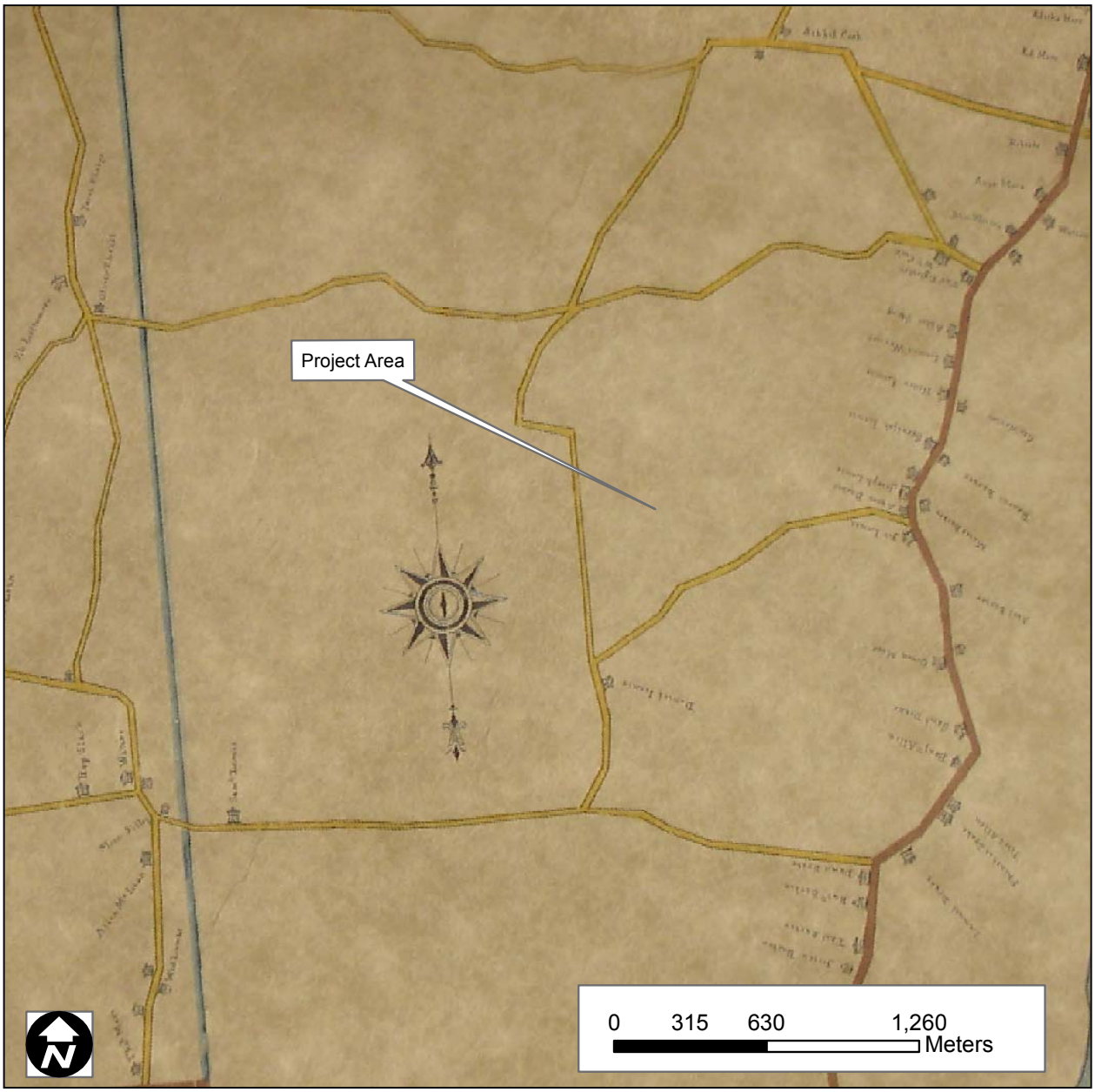

Figure 12. **Excerpt from a 1798 historic map depicting the location of the Areas of Potential Effect.**

Figure 13. **Excerpt from an 1855 historic map depicting the location of the Areas of Potential Effect.**

Figure 14. **Excerpt from an 1869 historic map depicting the location of the Areas of Potential Effect.**

Figure 15. **A 1928 aerial photograph depicting the location of the Areas of Potential Effect.**

Figure 16. **A 1934 aerial photograph depicting the location of the Areas of Potential Effect.**

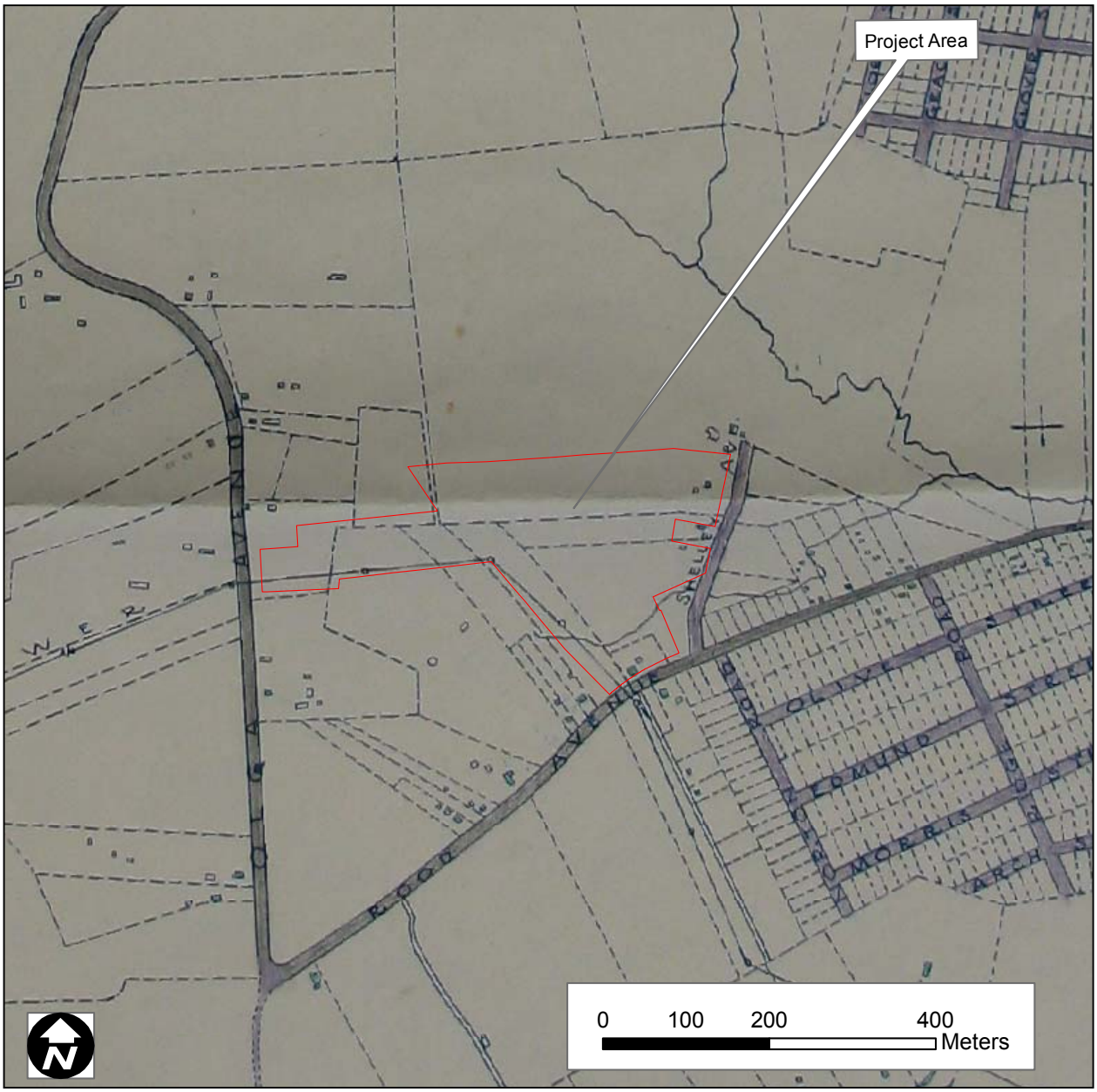

Figure 17. **A 1934 map depicting the location of the Areas of Potential Effect.**

Figure18. **A 1951 aerial photograph depicting the location of the Areas of Potential Effect.**

Figure 19. **A 1957 aerial photograph depicting the location of the Areas of Potential Effect.**

Figure 20. **A 1970 aerial photograph depicting the location of the Areas of Potential Effect.**

Figure 21. **A 1995 aerial photograph depicting the location of the Areas of Potential Effect.**

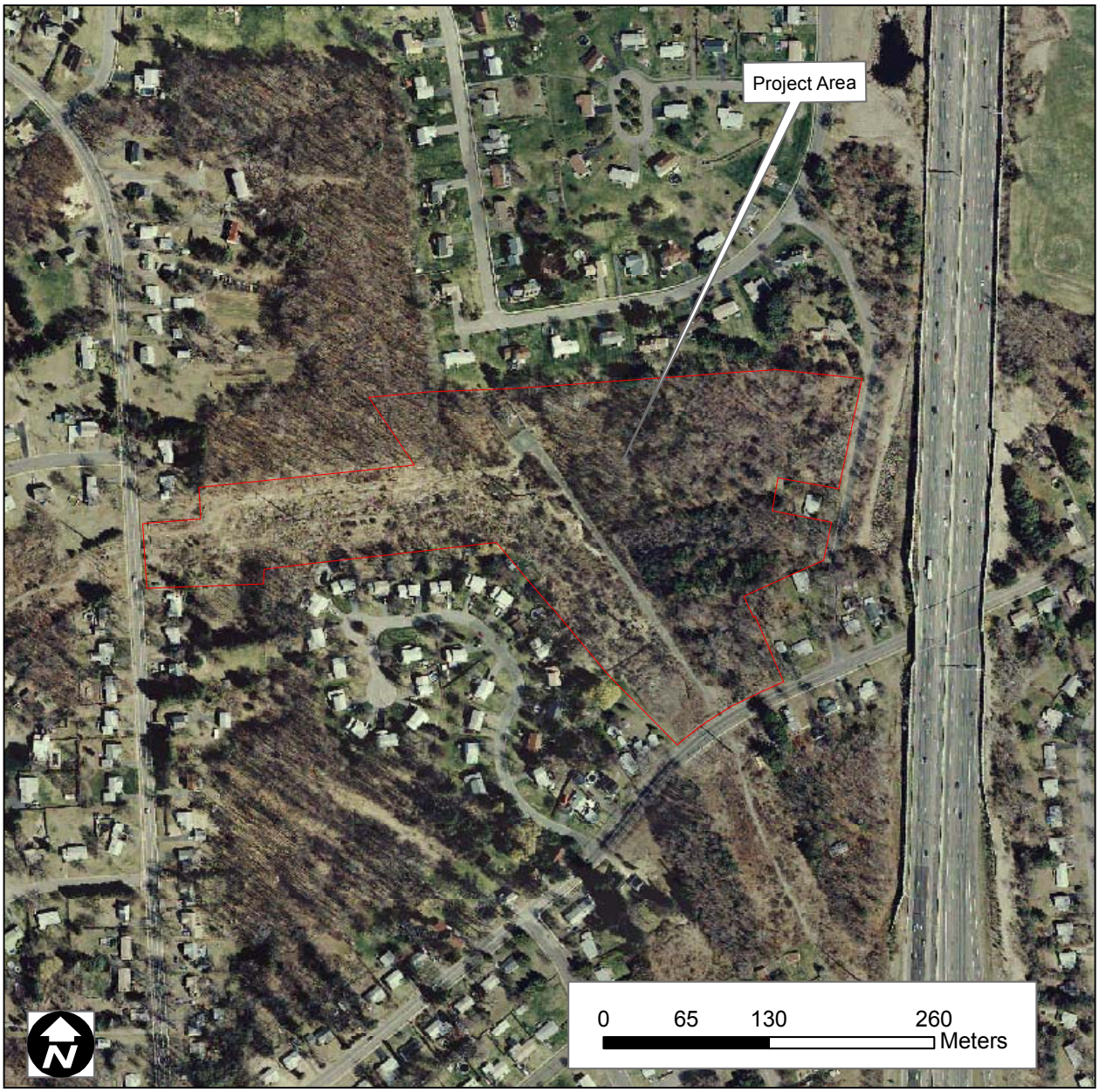

Figure 22. **A 2003 aerial photograph depicting the location of the Areas of Potential Effect.**

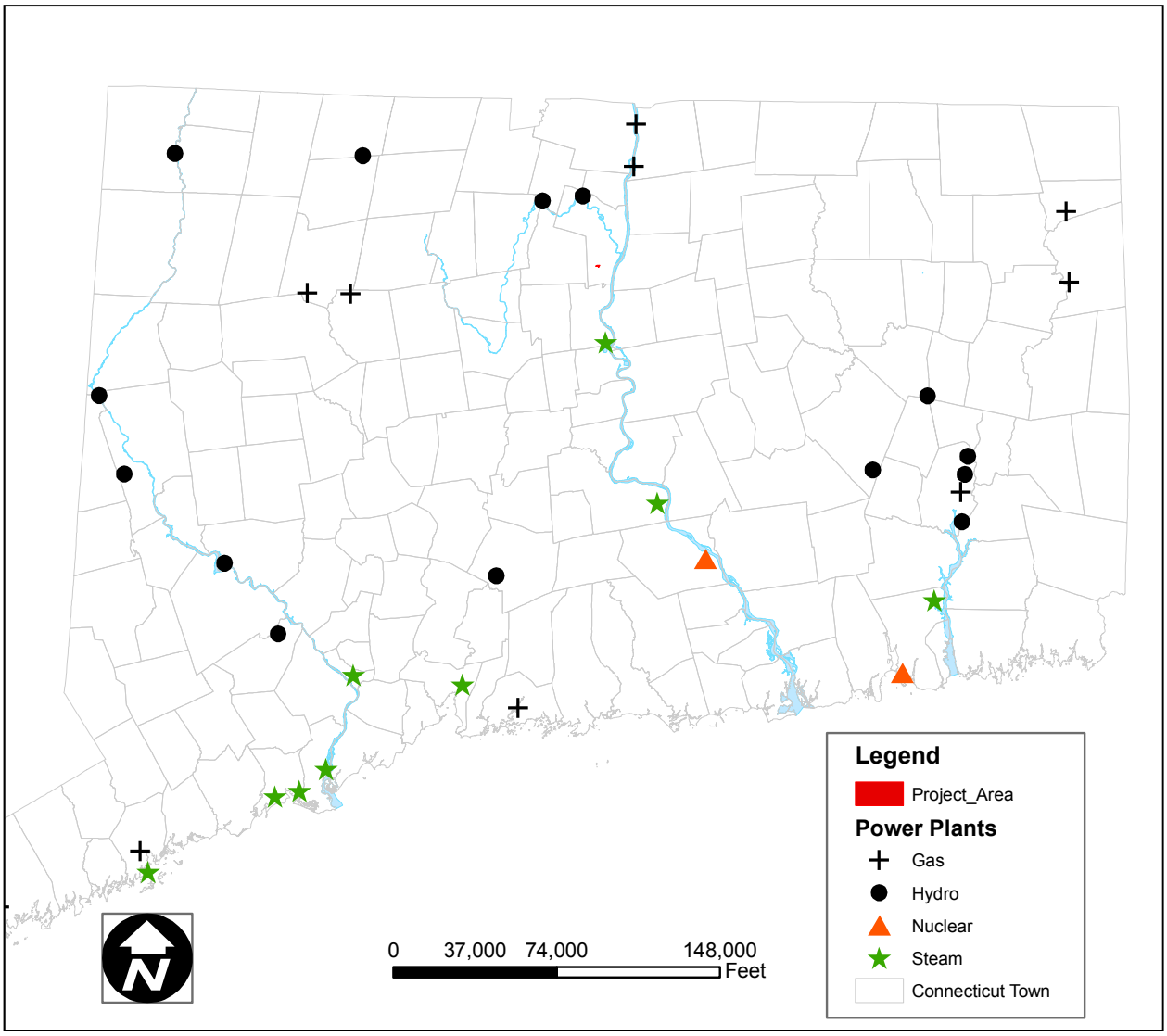

Figure 23. **A digital map of Connecticut, which depicts all of the power plants in the state.**

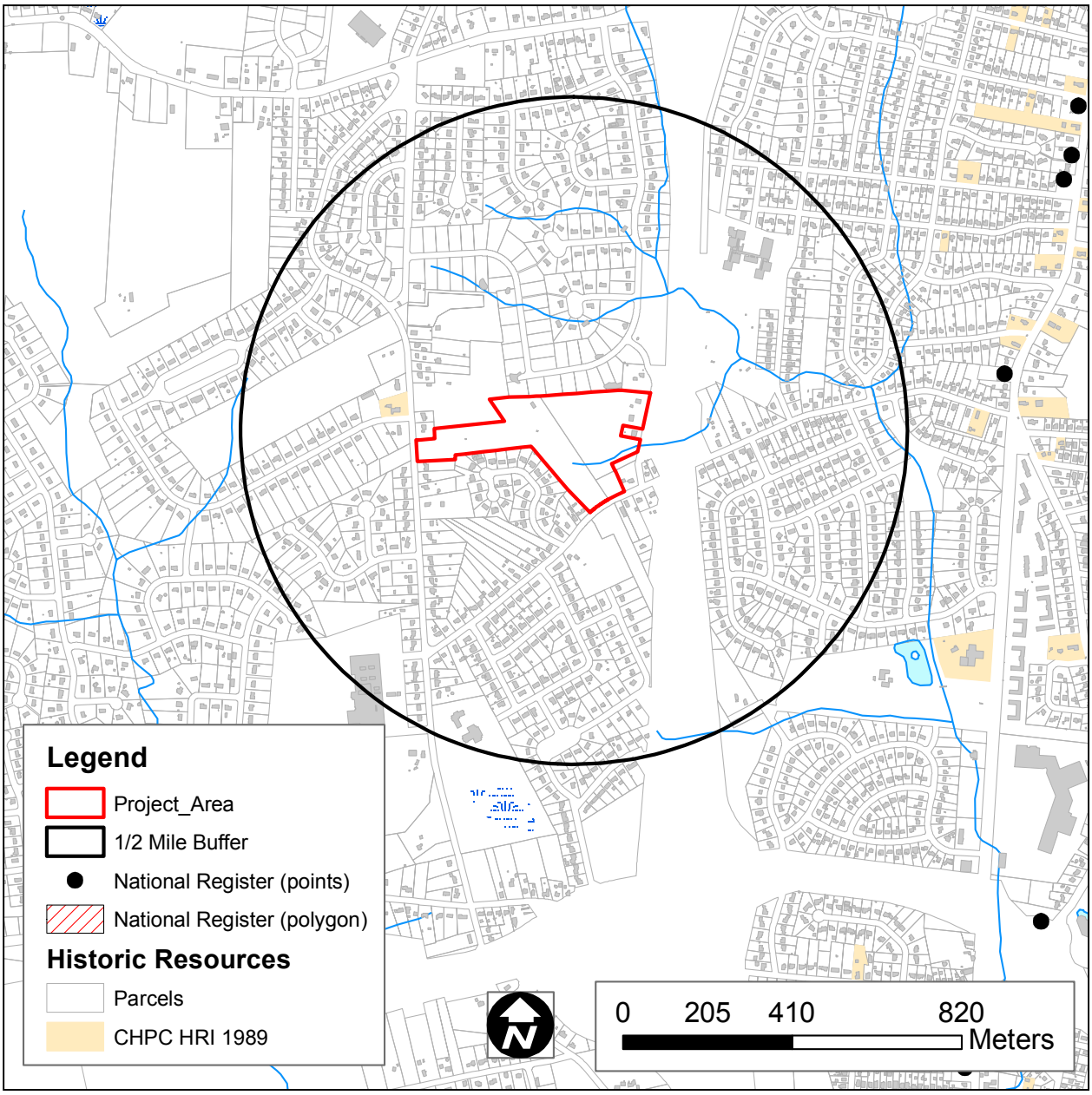

Figure 24. **A digital map depicting all of the National Register of Historic Places properties situated within the immediate vicinity of the Areas of Potential Effect.**

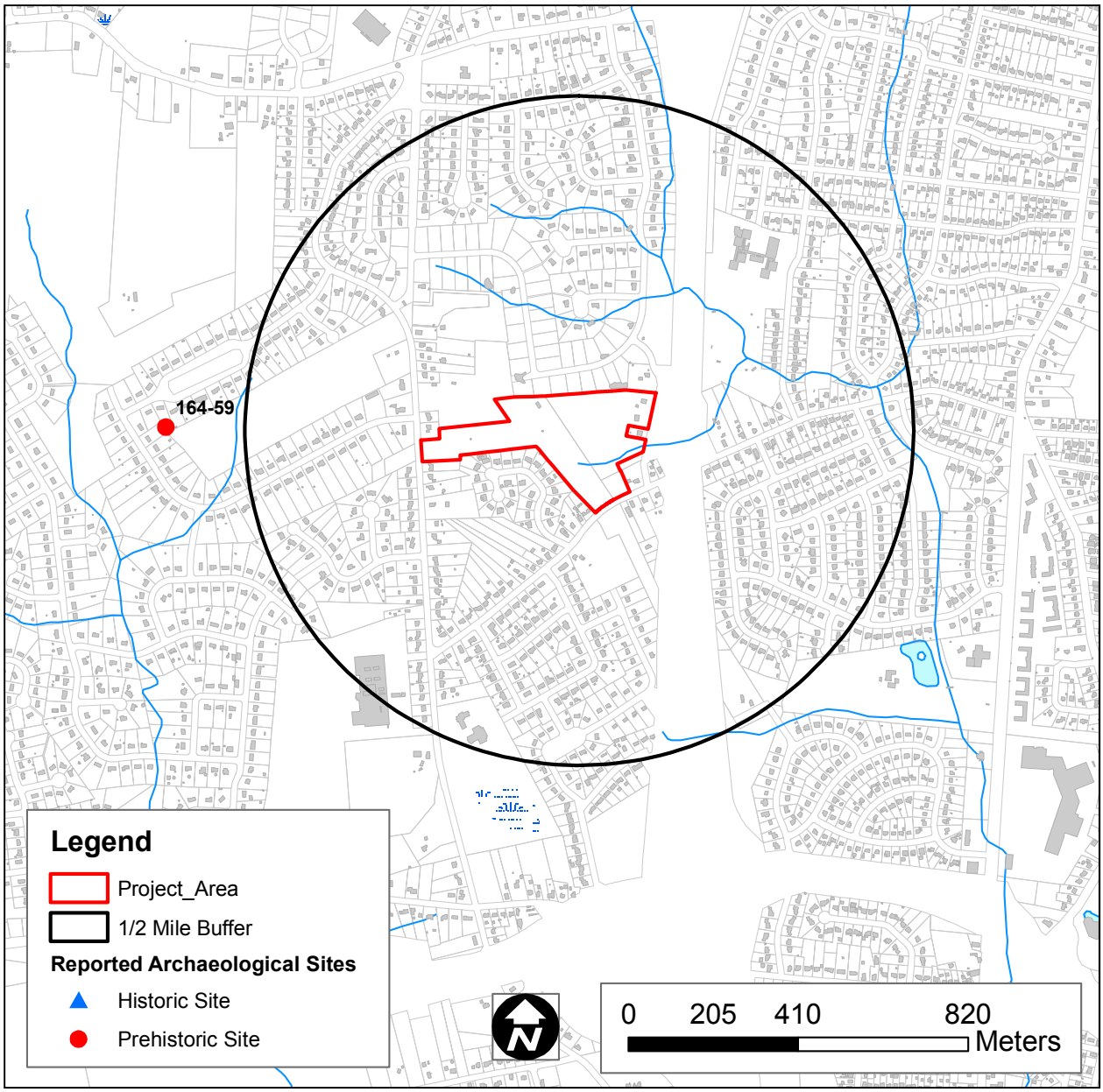

Figure 25. **A digital map depicting all of the previously identified archaeological sites situated within the immediate vicinity of the Areas of Potential Effect.**