APPLICATION TO THE CONNECTICUT SITING COUNCIL

FOR THE

CONSTRUCTION AND OPERATION OF A NEW 115/13.8 KILOVOLT DISTRIBUTION SUBSTATION

IN THE

CITY OF SHELTON, FAIRFIELD COUNTY, CONNECTICUT

BY

THE UNITED ILLUMINATING COMPANY

October 2012

The United Illuminating Company

TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

Overview of the Proposed Project and Project Need

To address the anticipated increased demand for electricity in the Greater Shelton Area, The United Illuminating Company (UI) proposes to construct and operate a new 115/13.8 kilovolt (kV) substation in the City of Shelton, Fairfield County, Connecticut. The proposed Shelton Substation (the “Project”) is planned to be located on a six-acre parcel of vacant, former industrial land, owned by UI, at 14 Old Stratford Road. The Project is subject to the jurisdiction of the Connecticut Siting Council (“Siting Council”). Therefore, UI is submitting to the Siting Council this Application for a Certificate of Environmental Compatibility and Public Need for the Project.

The Greater Shelton Area includes the municipalities of Shelton, Trumbull, Derby, Ansonia, and parts of the municipalities of Stratford and Orange. The proposed substation will provide both a new interconnection to the existing 115 kV electric transmission grid and a new location at which the high-voltage power from the transmission system will be “stepped down” (i.e., the voltage will be decreased and current increased) for distribution to residential, commercial, and industrial customers.

The proposed substation will supplement UI’s four existing substations that presently serve the Greater Shelton Area (i.e., the Indian Well and Ansonia substations located in the Town of Derby and the Town of Ansonia, respectively, east of the Housatonic River, and the Trap Falls and Trumbull substations, located in the City of Shelton and the Town of Trumbull, respectively, west of the Housatonic River). The results of 115/13.8 kV distribution substation capacity analyses indicate that by 2015 these four substation will not have adequate available capacity to reliably serve the customers in the Greater Shelton Area and to meet the area’s growing demands for electricity. This determination follows UI’s Transmission and Distribution Substation Design and Rating Philosophy Standard[1].

Location of Proposed Shelton Substation Site

The Shelton Substation is proposed for location on a two-acre portion of UI’s six-acre property at 14 Old Stratford Road in the City of Shelton. The six-acre property is bounded to the east by State Route 8, to the south by Old Stratford Road, to the west by Pootatuck Place, and to the north by the Far Mill River. A Connecticut Light and Power Company (CL&P) easement, occupied by 115 kV overhead transmission lines, extends across the western portion of the property. UI proposes to develop the substation on the western portion of the property, adjacent to the CL&P transmission line easement. (Refer to Figures ES-1 and ES-2.)

The property is currently vacant and is fenced. UI presently uses portions of the property for staging equipment and vehicles used in vegetation maintenance activities along its distribution and transmission lines.

[1] UI Transmission and Distribution Substation Design and Rating Philosophy Standard, Revised February 14, 2008.

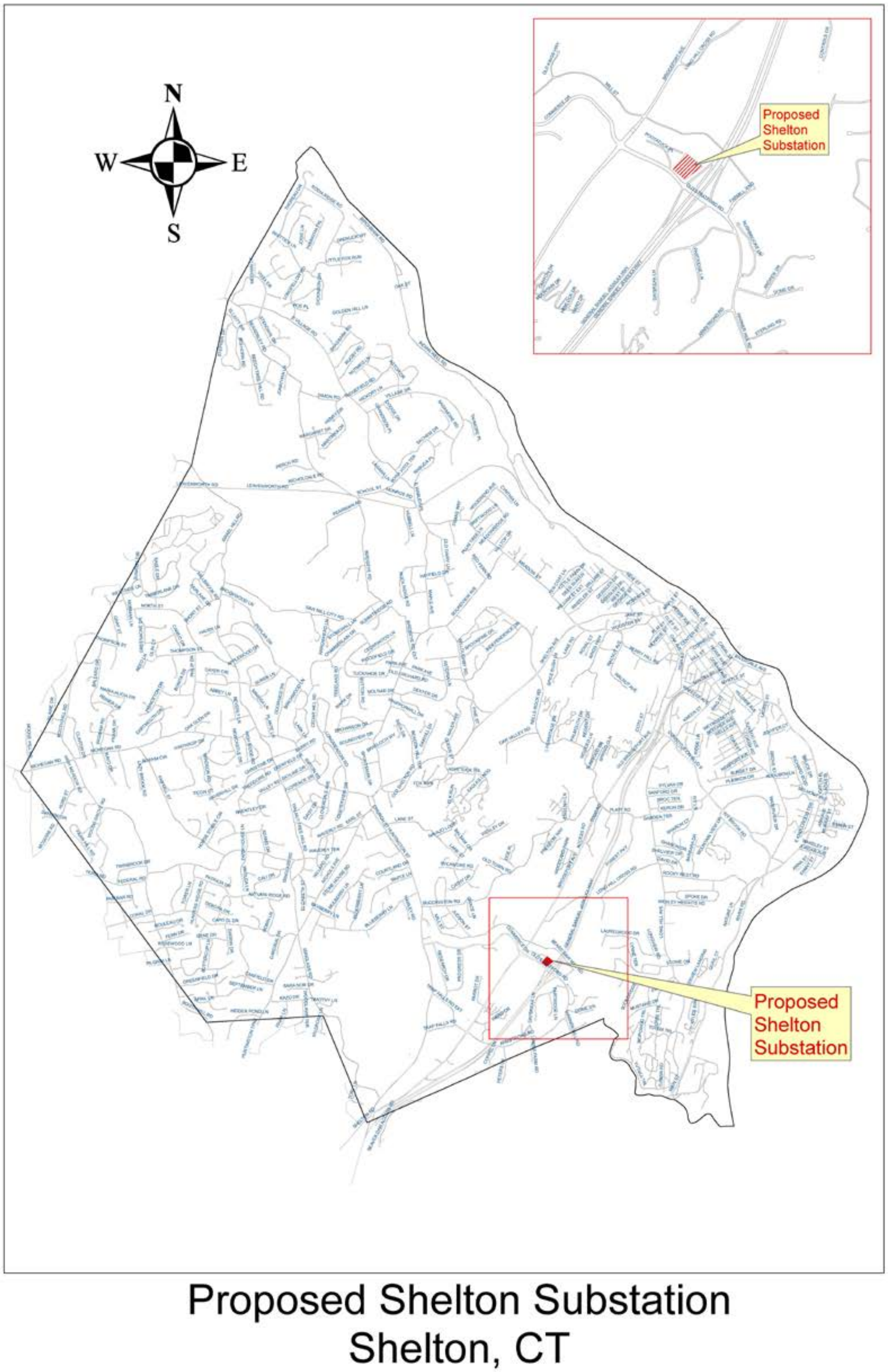


Figure ES-1: Overview Map: Proposed Shelton Substation Site

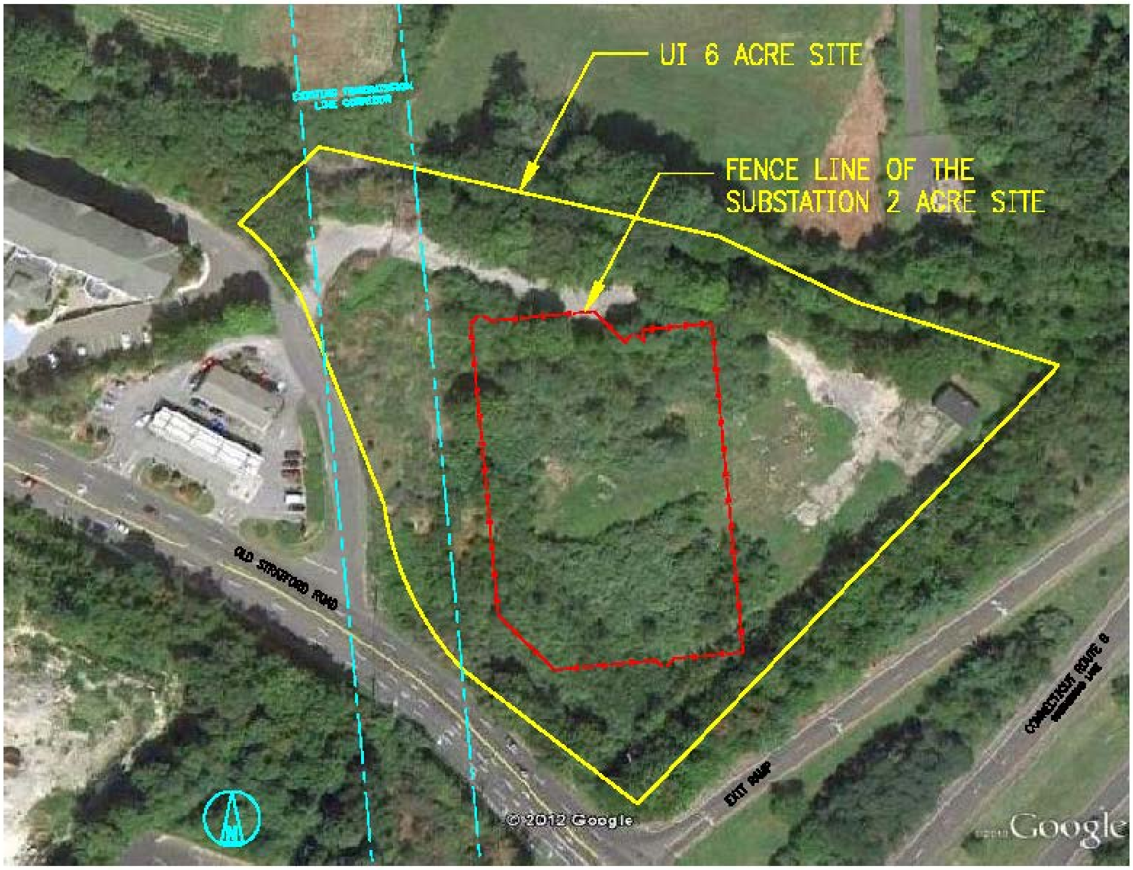


Figure ES-2: Aerial Photograph of UI Property and Substation Site at 14 Old Stratford Road

The site was historically developed for industrial purposes and, until the 1990s, was used by the Lord Corporation (Lord) for the manufacture of O-rings and seals. When used for manufacturing purposes, the majority of the property was occupied by industrial buildings, parking, and on-site access roads. The industrial facilities were removed by the late 1990s as part of an overall site remediation undertaken by Lord. Groundwater remediation and monitoring are still ongoing as part of an agreement between Lord and the State of Connecticut (Department of Energy and Environmental Protection [DEEP]). Groundwater monitoring wells are located on the eastern portion of the six-acre property.

The proposed substation site consists of previously disturbed uplands, with the exception of a 0.17-acre wetland that has developed in the last 10 to 12 years on top of a former asphalt parking area. The U.S. Army Corps of Engineers (Corps) has determined that this wetland is subject to federal jurisdiction. The wetland also meets the criteria as a state wetland. The development of the proposed substation will require the filling of this wetland as part of general site preparation work (e.g., grading, filling).

Proposed Substation Facilities

The proposed substation will be interconnected to one of the existing CL&P 115 kV transmission lines, which will be routed into the substation. Within the substation, power from the 115 kV transmission line will be stepped down to 13.8 kV for delivery to the electric distribution system in the Greater Shelton Area. The proposed substation facilities will include a 115 kV circuit breaker, disconnect switches, transformers to step down the voltage from 115 kV to 13.8 kV, two metal switchgear enclosures, and a control building. The substation also will include space to accommodate a mobile transformer for emergency conditions.

As with all UI substations, the Shelton Substation will be designed to meet or exceed the State Building Code, which takes into account seismic loading, wind loading, and snow and ice loadings, among others.

To access the proposed substation, UI will upgrade the existing access road that presently extends into the property from Pootatuck Place. The upgraded access road will be extended into the substation to provide direct ingress and egress to the station equipment and buildings.

Construction Sequencing, Schedule, and Project Costs

The general activities that will be involved in the construction of the Shelton Substation include:

- Install erosion and sedimentation control measures.
- Prepare the site for development (cut, fill, grading).
- Install substation foundations, conduits, grounding grid and distribution facilities.
- Spread trap rock.
- Install power transformers.
- Install high-voltage circuit breakers.
- Offload and set metal control enclosure and switchgear enclosures.
- Install steel structures, substation equipment, and buswork.
- Install transmission line interconnections.
- Commission the substation.
- Install asphalt access drives.
- Complete site restoration activities.
- Remove temporary erosion and sedimentation control measures after site stabilization is achieved.

No blasting will be required for the construction of the substation. Grading will be performed as needed to level the substation site for the electric transmission and distribution facilities.

The construction and testing of the substation facilities are expected to occur over a 12- to 18-month period, commencing in July 2013 and ending with an in-service date of December 2014. In general, construction hours will be scheduled from 7:00 AM to 5:00 PM, Monday through Friday, although certain critical tasks will require extended work hours. Site preparation, including grading and installation of foundations, will take place during the initial six months of construction and will involve the use of earth-moving equipment and construction vehicles. The installation and testing of substation equipment will take approximately nine months.

The estimated cost for the siting, design, and construction of the Shelton Substation and supporting infrastructure is approximately $38.3 million (in 2012 dollars).

Environmental Impact

The construction, operation, and maintenance of the proposed substation will result in generally minor impacts that will be localized to the site and the immediate vicinity of the site. Overall, the Project will result in the beneficial reuse of a portion of the former six-acre industrial site.

The substation will represent a long-term change in the current (vacant) land use of the site, but will be consistent with the historical use of the site for industrial purposes. The Project will modify on-site vegetation and wildlife habitat, as well as views of the site. In addition, the development of the substation will require the unavoidable filling of a small (0.17-acre) wetland located on the southwestern portion of the site. UI will coordinate with the involved federal and state regulatory authorities to obtain a permit for filling this wetland and to provide appropriate compensatory mitigation for the loss of this wetland habitat.

UI will implement appropriate measures to avoid, minimize, or mitigate adverse environmental effects as a result of the Project, including adherence to UI's *Soil Erosion and Sediment Control Plan* and *Spill Prevention Plan* and to conditions that may result from the Siting Council process and consultations with the Corps and the DEEP.

Electric and Magnetic Fields

Electric and magnetic fields (EMF) surround anything that generates, transmits, or uses electricity and is present in nearly every place we encounter daily, including our schools, workplaces, and homes. Typical sources of EMF in these locations include appliances, nearby distribution and transmission lines, wiring, and electric current flowing on conductive water pipes.

The EMF assessment for this Project was conducted in accordance with the Siting Council's *Application Guide for an Electric Substation Facility*[2] and fulfills requirements of the *EMF Best Management Practices (BMP) for the Construction of Electric Transmission Lines in Connecticut (EMF BMPs).*[3] In addition, the design of the substation has incorporated reasonable measures to minimize EMF consistent with the Siting Council's recommendations for transmission lines.

The highest calculated magnetic-field level at the perimeter of the Shelton Substation is less than 3% of that recommended by international health-based standards (International Committee on Electromagnetic Safety and the International Commission on Non-Ionizing Radiation Protection) for the general public and is comparable to fields that may be found in homes near major appliances. At the boundaries of the UI property where the substation will be located, the field levels will be even lower and no different from those measured today from existing sources. Where the adjacent transmission lines extend overhead on double-circuit transmission line towers in the vicinity of the proposed Shelton Substation, the magnetic-field levels are approximately 1% or less of the recommended exposure limits and electric-field levels are less than 10% of the recommended exposure limits. The substation will occupy only two acres of the six-acre UI property and EMF levels at the edge of the property will be still lower, and in most locations on the property, will be comparable to magnetic field levels produced by existing transmission and

[2] Connecticut Siting Council. Application Guide for an Electric Substation Facility. April, 2010. http://www.ct.gov/csc/lib/csc/guides/guidesonwebsite042010/elecsubstationfac0410.pdf#31224

[3] Connecticut Siting Council. Electric and Magnetic Field Best Management Practices for the Construction of Electric Transmission Lines in Connecticut. December 14, 2007. http://www.ct.gov/csc/lib/csc/emf_bmp/emf_bmp_12-14-07.doc

distribution lines. The calculated magnetic fields produced by the proposed Shelton Substation therefore will be far below recommended guidelines for exposure of the general public and will likely have no effect on the EMF levels at residences in the area, the nearest of which is more than 500 feet away.

Alternatives Evaluation Process

UI identified and evaluated various energy alternatives before determining that a new substation is needed. For example, energy system alternatives, such as improving energy efficiencies, energy conservation, or distributed generation, will not be adequate or reliable to offset the anticipated increase in load in the Greater Shelton Area. Accordingly, the "no action" alternative (i.e., not implementing any solution, including a substation) is not viable because it could have a significant adverse impact on system reliability levels and, in turn, customer satisfaction and the economic vitality of the region by increasing the risk of voltage collapse and/or rolling blackouts.

Increasing the capacity of the existing area substations was assessed, but rejected as a viable option since this would be a costly and short-term solution that would only delay the need for additional capacity in the area. Therefore, a new substation, located in the vicinity of existing 115 kV transmission lines and the State Route 8 corridor (i.e., near the load centers and west of the Housatonic River) is the preferred solution for providing long-term reliable electric service to the Greater Shelton Area.

UI used an iterative process to identify feasible alternative sites for the development of the new substation. Potential locations were first identified and screened in accordance with UI's standard objectives for substation siting. UI's screening included consideration of the following guiding principles:

- Minimize the need to acquire residences and viable commercial/industrial use to accommodate substation development.

- Maintain consistency/compatibility with existing land uses and land use plans to the extent possible.

- Minimize adverse effects on sensitive environmental resources and the social environment.

- Maintain public health and safety.

- Demonstrate cost-effectiveness, while adhering to good engineering and sound environmental planning practices.

- Present the public with a clear and well-documented methodology for the identification of the proposed and alternative sites.

Key considerations in the site evaluation process were the locations of the potential sites in relation to projected areas of electric load growth in the Greater Shelton Area and to the existing transmission lines that traverse Shelton and feed the Indian Well and Trap Falls Substations, as well as the length of new transmission and distribution lines that would have to be developed to effectively interconnect the new substation to the transmission network and to UI's distribution system.

UI proposes to develop the new substation at the Old Stratford Road site. However, as part of the alternatives analysis process that led to the selection of this preferred site, UI also identified an alternative, but not preferred location for the new substation.

This alternative site would be adjacent to UI's existing Trap Falls Substation, located at 102 Armstrong Road in the southern portion of Shelton. UI does not prefer the Trap Falls site for the new substation based on cost, engineering design complexity, and potential environmental and social impacts. For example, due to the topography of the site, the development of the substation at this location would require extensive grading and other work, including forested vegetation removal.

In addition, the substation would be located close to residential areas and would pose significant distribution line construction challenges. Due to underground facilities congestion on Armstrong Road, use of this site hinders the future expandability of distribution infrastructure to support additional potential future load. Overall, the development of the new substation at the Trap Falls site also would be approximately 20% more costly than the development of the substation at the preferred Old Stratford Road site.

I. FORM OF THE APPLICATION

I.A Purpose of the Application

In this Application, The United Illuminating Company ("UI") is requesting that the Connecticut Siting Council ("Siting Council") issue a Certificate of Environmental Compatibility and Public Need ("Certificate") for the construction and operation of a new 115/13.8 kilovolt (kV) substation on a portion of a six-acre property at 14 Old Stratford Road in the City of Shelton, Fairfield County (the "Substation" or "Shelton Substation"). UI owns the six-acre property, which was formerly an industrial property and is now vacant. The proposed Shelton Substation (also referred to as "the Project") will occupy approximately two acres of the six-acre property (Appendix A includes a map of the Project location and Substation Site Plans). The substation is needed to reliably serve the customers in the Greater Shelton Area (i.e., Shelton, Trumbull, Derby, Ansonia, and parts of the municipalities of Stratford and Orange) ("service area") and meet the area's growing demands for electricity. The proposed substation will supplement UI's four existing substations that presently serve the Greater Shelton Area.[4]

I.B Statutory Authority

UI is making this Application pursuant to the Public Utility Environmental Standards Act, Section 16-50g *et seq*. of the Connecticut General Statutes (Conn. Gen. Stat.) and Section 16-50j-1 *et seq*. of the Regulations of Connecticut State Agencies (RCSA). This Application follows the Siting Council's *Application Guide for an Electric Substation Facility* (April 2010).

I.C Legal Name and Address of Applicant

UI is a specially chartered Connecticut corporation. UI's name and permanent place of business are:

The United Illuminating Company
157 Church Street
New Haven, CT 06506

Mailing Address: 157 Church Street
New Haven, CT 06506

Telephone: 800.722.5584

Internet Address: The United Illuminating Company website
www.uinet.com

[4] I.e., the Indian Well and Ansonia Substations located in the Town of Derby and the Town of Ansonia, respectively, east of the Housatonic River, and the Trap Falls and Trumbull Substations, located in the City of Shelton and the Town of Trumbull, respectively, west of the Housatonic River.

I.D Applicant's Contacts

Correspondence and other communications with regard to the Shelton Substation Project are to be addressed to, and notices, orders, and other papers may be served upon the following individuals:

Applicant Contacts:

Bruce L. McDermott, Esq.
UIL Holdings Corporation
157 Church Street
New Haven, CT 06506
Contact numbers:
203.499.2422 (Telephone)
203.499.3664 (FAX)
bruce.mcdermott@uinet.com

Loni S. Gardner, Esq.
UIL Holdings Corporation
157 Church Street
New Haven, CT 06506
203.499.2362 (Telephone)
203.499.3664 (FAX)
loni.gardner@uinet.com

Mr. Richard J. Reed
Vice President – Engineering & Project Excellence
The United Illuminating Company
180 Marsh Hill Road
Orange, CT 06477
203.926.4500 (Telephone)
203.926.4664 (FAX)
rich.reed@uinet.com

Mr. Antonino Buccheri
The United Illuminating Company
UIL Holdings Corporation
180 Marsh Hill Road
Orange, CT 06477
203.926.5244 (Telephone)
203.926.4664 (FAX)
tony.buccheri@uinet.com

II. FORMAL REQUIREMENTS

II.A Proof of Service

The undersigned hereby certifies, in accordance with Conn. Gen. Stat. § 16-50l(b), and RCSA § 16-50j-12(d), that copies of UI's Application for a Certificate of Environmental Compatibility and Public Need to build an electric substation in Shelton, Connecticut, will be served via hand-delivery or mailed by first class mail, postage prepaid, on October 1, 2012, to the following:

Mayor Mark A. Lauretti
City Hall, Room 202
54 Hill Street
Shelton, CT 06484

Richard D. Schultz, AICP, Planning & Zoning Administrator
City Hall, Room 303
54 Hill Street
Shelton, CT 06484

Ruth Parkins, Chairperson
Planning and Zoning Commission
54 Hill Street
Shelton, CT 06484

Teresa Gallagher, Conservation Agent
City of Shelton
Conservation Commission & Trails
54 Hill Street
Shelton, CT 06484

John R. Cook, Wetland Administrator
City of Shelton
Inland Wetlands & Watercourses Commission
City Hall, Room 303
54 Hill St.
Shelton, CT 06484

Gary Zahornaski, Chairman
Inland Wetlands & Watercourses Commission
54 Hill St.
Shelton, CT 06484

Mayor John A. Harkins
2725 Main Street
Stratford, CT 06615

Gary Lorentson, Planning & Zoning Administrator
Planning & Zoning
Rooms 113 & 118
Stratford Town Hall
2725 Main Street
Stratford, CT 06615

Christopher Silhavey, Chairman
Zoning Commission
Stratford Town Hall
2725 Main Street
Stratford, CT 06615

Brian Bidolli, Acting Executive Director
Greater Bridgeport Regional Council
Bridgeport Transportation Center
525 Water Street
Bridgeport, Connecticut 06604

Dr. Floyd Lapp, Executive Director
South Western Regional Planning Agency
888 Washington Boulevard, 3rd Floor
Stamford, Connecticut 06901

George Jepsen, Attorney General
Office of the Attorney General
55 Elm Street
Hartford, CT 06106

Kevin Kelly, Senator 21st District
Legislative Office Building, Room 3400
Hartford, CT 06106

Edwin A. Gomes, Senator 23rd District
Legislative Office Building, Room 3200
Hartford, CT 06106-1591

Jason Perillo, State Representative
113th Assembly District
Connecticut House Republican Office
Legislative Office Building, Room 4200
Hartford CT 06106

Laura Hoydick, State Representative
120th Assembly District
Connecticut House Republican Office
Legislative Office Building, Room 4200
Hartford, CT 06106

Tony Backer, State Representative
121st Assembly District
Legislative Office Building, Room 2102
Hartford, CT 06106-1591

Lawrence Miller, State Representative
122nd Assembly District
Connecticut House Republican Office
Legislative Office Building, Room 4200
Hartford CT 06106

John Zbell, Chairman
Planning Commission
Stratford Town Hall
2725 Main Street
Stratford, CT 06615

Brian Carey, Chairman
Conservation Department
2725 Main St.
Stratford, CT 06615

Bill McCann, Chairman
Inland Wetlands & Watercourses Commission
Stratford Town Hall
2725 Main St.
Stratford, CT 06615

Arthur H. House, Chairman
Public Utilities Regulatory Authority
10 Franklin Square
New Britain, CT 06051

Benjamin Barnes, Secretary
Office of Policy and Management
450 Capitol Avenue
Hartford, CT 06106

Catherine Smith, Commissioner
Department of Economic and Community Development
505 Hudson Street
Hartford, CT 06106

James P. Redeker, Commissioner
Department of Transportation
2800 Berlin Turnpike
Newington, CT 06111

Daniel T. Forrest
Deputy State Historic Preservation Officer
Historic Preservation & Museum Division
Commission on Culture and Tourism
One Constitution Plaza
Hartford, CT 06103

Reuben F. Bradford, Commissioner Department of Emergency Management and Homeland Security
25 Sigourney Street, 6th Floor
Hartford, CT 06106-5042

John Wellinghoff, Chairman
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Curt Spalding, Regional Administrator
EPA New England Headquarters – Region 1
5 Post Office Square, Suite 100
Boston, MA 02109-3912

Susan Lee
United States Army Corps of Engineers
Regulatory Division, New England District
696 Virginia Avenue
Concord, MA 01742-2751

Wendi Weber, Northeast Regional Director
U.S. Fish & Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035-9589

Daniel C. Esty, Commissioner
Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

Dr. Jewel Mullen, Commissioner
Department of Public Health
410 Capitol Avenue
Hartford, CT 06134

Barbara C. Wagner, Chair
Council on Environmental Quality
79 Elm Street
Hartford, CT 06106-5127

Steven K. Reviczky, Commissioner
Department of Agriculture
165 Capitol Avenue
Hartford, CT 06106

By: ______________________

Mr. Antonino Buccheri
Senior Project Manager
UIL Holdings Corporation
180 Marsh Hill Road
Orange, CT 06477

II.B Notice to Community Organizations and Affected Water Company

In accordance with the Siting Council's *Application Guide for an Electric Substation Facility* (April 2010), UI has made reasonable efforts to provide notice of the Application to affected community groups including Chambers of Commerce, land trusts, environmental groups, trail organizations, historic preservation groups, advocacy groups for protection of rivers within the watershed of the proposed facility that have been identified by the municipality where the facility is proposed to be located or that have registered with the Council to be provided notice, and any affected water company that would provide water to, or be within the watershed affected by, the proposed substation. Accordingly, the undersigned certifies that the attached form of the letter providing notice of the Application was mailed by Federal Express on September 20, 2012, to:

Aquarion Water Company of Connecticut
600 Lindley Street
Bridgeport, CT 06606-5044

Mary Dean, Executive Director
Stratford Chamber of Commerce
Bridgeport Regional Business Council
10 Middle Street, 14th Floor
Bridgeport, CT 06604

Mr. Bill Purcell
Valley Chamber of Commerce
10 Progress Drive
Shelton, CT 06484

Mr. Joe Welsh, President
Shelton Land Trust
P.O. Box 2276
Shelton, CT 06484

Ms. Tracy Tate
Historical Society
P.O. Box 2155
70 Ripton Road
Shelton, CT 06484

Mr. Bob Gesullo
Housatonic River Estuary
23 Wicklow Lane
Shelton, CT 06484

Mr. Jim Ryan
SEDC
475 Howe Avenue
Shelton, CT 06484

Ms. Mary Ellen Samultuski
Derby/Shelton Rotary
P.O. Box 224
Shelton, CT 06484

Mr. Jack Walsh, President and COO
Valley United Way
54 Grove Street
Shelton, CT 06484

Frank Yaworowski
Shelton Community Lions Club
44 Huntington Plaza
Shelton, CT 06484

By: Antonino Buccheri

Mr. Antonino Buccheri
Senior Project Manager
UIL Holdings Corporation
180 Marsh Hill Road
Orange, CT 06477

September 20, 2012

VIA FEDEX

[Name]
[Street Address]
[City, CT Zip Code]

Re: Notice to Potentially Affected Community Groups and Water Company Regarding Proposed Substation in Shelton, Connecticut

Dear [___________]:

In accordance with the Connecticut Siting Council's ("Council") Electric Substation Facility Guidelines (April 2010), The United Illuminating Company ("UI") is providing you with notice of UI's intent to submit an application to the Council for a Certificate of Environmental Compatibility and Public Need to construct and operate a new 115,000/13,800-volt electric substation and associated facilities at 14 Old Stratford Road in the City of Shelton, Connecticut ("Project"). UI anticipates filing the application on or about October 1, 2012. Attached is the notice of the petition that will appear in *The Connecticut Post* on September 21 and 23, 2012.

Additional information about this Project may be obtained from:

The United Illuminating Company
P.O. Box 1564
157 Church Street
New Haven, CT 06506
1-800-7CALLUI (1-800-722-5584)
www.uinet.com

Once filed, a copy of the application can also be reviewed at the City of Shelton Town Hall, the Town of Stratford Town Hall, or at the Council's offices in New Britain, CT.

Very truly yours,

Richard J. Reed
Vice President
Engineering and Project Excellence

II.C Public Notice

The undersigned hereby certifies, in accordance with Conn. Gen. Stat. § 16-50l(b) that the Notice of Application to the Connecticut Siting Council was published in *The Connecticut Post* on September 21, 2012 and September 23, 2012, as follows:

> NOTICE OF SITING COUNCIL APPLICATION. Pursuant to Connecticut General Statutes § 16-50l(b) and the Regulations of Connecticut State Agencies § 16-50l-1(e), notice is hereby given that on or about October 1, 2012, The United Illuminating Company ("UI") will file an application with the Connecticut Siting Council ("Council"), 10 Franklin Square, New Britain, CT, for the issuance of a Certificate of Environmental Compatibility and Public Need to construct and operate a new electric substation and associated facilities in the City of Shelton, Fairfield County, Connecticut ("Project"). The Project is needed to ensure reliable electric service to customers in the Greater Shelton Area (which includes the municipalities of Shelton, Trumbull, Ansonia, Derby, and portions of Stratford and Orange). The Project is needed to serve the increased demand for electricity that is expected to occur over the next 10 years in the Greater Shelton Area. The Project will be located at UI-owned 14 Old Stratford Road in Shelton immediately west of State Route 8. Details on the Project will be included in UI's application to the Council. Interested persons may obtain copies of the application from:
>
> The United Illuminating Company
> 180 Marsh Hill Road, Orange, CT 06477
> 1-800-7CALLUI (1-800-722-5584), www.uinet.com
>
> A copy of the application will also be available at the Council's office, 10 Franklin Square, New Britain, CT 06051, telephone 860-827-2935, www.ct.gov/csc.

By: Antonino Buccheri

Mr. Antonino Buccheri
Senior Project Manager
UIL Holdings Corporation
180 Marsh Hill Road
Orange, CT 06477

II.D Notice to Abutting Landowners

The undersigned hereby certifies that on September 20, 2012, in accordance with Conn. Gen. Stat. § 16-50l(b), the attached form of a letter providing notice of the Application of UI for a Certificate of Environmental Compatibility and Public Need to build an electric substation in Shelton, Connecticut, was provided via certified mail, return receipt requested to the owners of property that abuts the location of either the proposed substation at 14 Old Stratford Road, Shelton, Connecticut, or the alternative site for the substation at 102 Armstrong Road, Shelton, Connecticut. Table II-1 lists the property owners to whom the notice was provided.

By: ____________________

Mr. Antonino Buccheri
Senior Project Manager
UIL Holdings Corporation
180 Marsh Hill Road
Orange, CT 06477

Table II-1
List of Property Abutters: Proposed Shelton Substation Site at 14 Old Stratford Road and Alternative Substation Site at Trap Falls Substation (102 Armstrong Road), City of Shelton

Abutters: 14 Old Stratford Road	Abutters: 102 Armstrong Road
City of Shelton Re: Map 29 Lot 2, Beard Sawmill Road 54 Hill Street Shelton, CT 06484	Connecticut Light and Power Company Re: Map 19 Lot 8, Armstrong Road Property Tax Dept. P.O. Box 270 Hartford, CT 06141
Royal B. Wells, Est. of Louisa Wells Re: Map 29 Lot 3, Beard Sawmill Road 34 Blueberry Lane, Shelton, CT 06484	Connecticut Light and Power Company Re: Map 19 Lot 7, Armstrong Road Property Tax Dept. P.O. Box 270 Hartford, CT 06141
Edith B. and Nathaniel S. Wells Re: Map 29 Lot 7, Old Stratford Road 656 Bridgeport Avenue, Shelton, CT 06484	Vladimir & Almaz Orduz Re: Map 19 Lot 6, 86 Armstrong Road 86 Armstrong Road Shelton, CT 06484
Edith B. and Nathaniel S. Wells Re: Map 39 Lot 7, 656 Bridgeport Avenue 656 Bridgeport Avenue, Shelton, CT 06484	Ralph & Rosemarie Zullo Re: Map 19 Lot 10, 118 Armstrong Road 118 Armstrong Road Shelton, CT 06484
680 Bridgeport Avenue LLC Re: Map 29 Lot 4, 680 Bridgeport Avenue 656 Bridgeport Avenue, Shelton, CT 06484	Miguel & Maria Maldonado Re: Map 19 Lot 28, 27 Partridge Lane 27 Partridge Lane Shelton, CT 06484
Widewaters New Castle LLC Re: Map 29 Lot 5, 25 Old Stratford Road 5786 Widewaters Pky, Dewitt, NY 13214	Samir & Swati Bidja Re: Map 19 Lot 57, 128 Armstrong Road 128 Armstrong Road Shelton, CT 06484
Welkin Inc. Re: Map 29 Lot 6, 18 Old Stratford Road 34 Blueberry Lane, Shelton, CT 06484	Sergio & Elisabete Esteves Re: Map 19 Lot 53, 103 Armstrong Road 103 Armstrong Road Shelton, CT 06484
City of Shelton- Open Space Re: Map 19 Lot 3, Armstrong Road 54 Hill Street Shelton, CT 06484	Gilman & Patricia Lebelle Re: Map 19 Lot 54, 99 Armstrong Road 99 Armstrong Road Shelton, CT 06484
	Doo Keun & Hong Yoon Kim Re: Map 10 Lot 3, 95 Armstrong Road 95 Armstrong Road Shelton, CT 06484

September 20, 2012

Certified Mail/Return Receipt Requested

[Name]
[Street Address]
[City, CT Zip Code]

Re: Notice to Property Owners Abutting Proposed Substation in Shelton, Connecticut

Dear [___________]:

Pursuant to Connecticut General Statutes Section 16-50l(b), The United Illuminating Company ("UI") is providing you with notice of UI's intent to submit an application to the Connecticut Siting Council ("Council") for a Certificate of Environmental Compatibility and Public Need to construct and operate a new 115,000/13,800-volt electric substation and associated facilities at 14 Old Stratford Road in the City of Shelton, Connecticut ("Project"). UI anticipates filing the application on or about October 1, 2012.

UI is providing you notice of the filing of the application with the Council because you are either an owner of property that abuts the location of the Project or the alternative site for the Project, which is located at 102 Armstrong Road in the City of Shelton, Connecticut. Attached is the notice of the petition that will appear in *The Connecticut Post* on September 21 and 23, 2012.

Additional information about this Project may be obtained from:

The United Illuminating Company
P.O. Box 1564
157 Church Street
New Haven, CT 06506
1-800-7CALLUI (1-800-722-5584)
www.uinet.com

Once filed, a copy of the application can also be reviewed at the City of Shelton Town Hall, the Town of Stratford Town Hall, or at the Siting Council's offices in New Britain, CT.

Very truly yours,

Richard J. Reed
Vice President
Engineering and Project Excellence

III. PROJECT OVERVIEW AND NEED

III.A Need

The proposed Shelton Substation is needed to serve the increased demand for electricity that is expected to occur over the next 10 years in the Greater Shelton Area, and to eliminate a voltage collapse risk and possible rolling blackouts during contingency conditions at Indian Well Substation. The load growth in this area is expected to materialize mainly in the southern portion of the City of Shelton and the southeastern portion of the Town of Trumbull. The proposed Shelton Substation will supplement UI's existing substations in the Greater Shelton Area.

The Greater Shelton Area includes the municipalities of Shelton, Trumbull, Ansonia, Derby, and portions of Stratford and Orange. This area is served by four substations (Trap Falls, Indian Well, Ansonia, and Trumbull), which transform (step down) the electric power carried by regional 115 kV transmission lines to appropriate levels for distribution to residential, commercial, and industrial consumers. These four substations principally serve Shelton, Ansonia, Derby, and Trumbull.

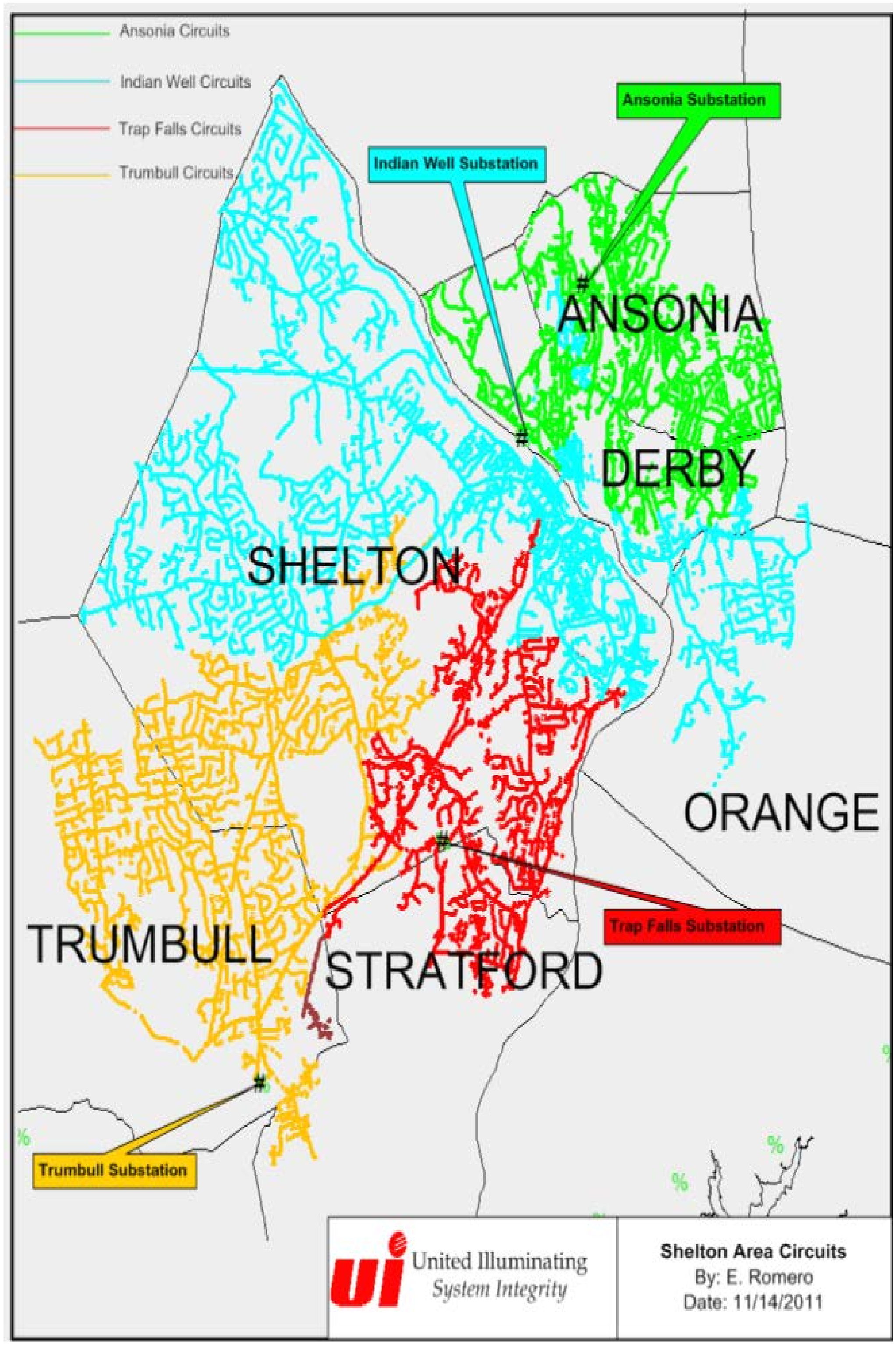
Figure III-1 illustrates the locations of these substations and the associated distribution circuits in the Greater Shelton Area supplied by each.

UI's *Shelton Area Capacity Analysis* (May 2008, Revised April 2012; refer to Appendix F) provides detailed information concerning the need for the proposed Shelton Substation. The following summarizes the principal findings of this analysis.

Based on 2006 summer peak load data and UI's 2008 - 2017 Ten-Year Plan (TYP) and its associated 90/10 Substation Level Load forecast model,[5] the Greater Shelton Area was projected to experience a combined load growth of nearly 60 megavolt amperes (MVA) over the five years from 2009 to 2013. Approximately 71% of this new load is attributable to three large commercial customers that were to be located within the area served by the Trap Falls and Indian Well substations.

5 Ten-Year Transmission & Substation Infrastructure Planning Study 2008-2017, June 2, 2008.

Figure III-1: Location of Substations and Distribution Circuits: Greater Shelton Area



A Capacity Needs Assessment study for this area was completed in 2007 and revised in early 2008.[6] The study concluded that significant 115/13.8 kV substation capacity shortfalls would occur in the Greater Shelton Area soon after the 2010 peak and that these shortfalls could best be met by adding new 115/13.8 kV substation capacity in the area. However, due to the economic downturn in the latter years of the last decade, the projected load growth did not materialize as expected, and the need for additional capacity in the area was delayed.

The most recent update of UI's Ten-Year Plan (2012 – 2021 TYP[7]) and its associated 90/10 Substation Level Forecast indicate that there will be a capacity need in the Greater Shelton Area by the 2015 summer peak. Specifically, the Greater Shelton Area is projected to experience a combined load growth of nearly 37 MVA over the next 10 years. This load growth is composed of 13 MVA from specific new loads in the area as identified by UI's Economic Development Department and 24 MVA from the total ambient load growth of all four substations in the area as identified by UI's econometric model.

Based on the results of a voltage stability study performed by UI Transmission Planning and Quanta Technology,[8] the capacity rating for Indian Well Substation decreased by 25.5 MVA. As a result, Indian Well Substation exceeds its new voltage stability rating during high load (summer) periods. Short-term operational procedures have been implemented at Indian Well Substation in order to mitigate voltage collapse risks during high load levels. However, if a contingency condition occurs during high load periods, UI may be required to implement load shedding and/or rolling blackouts in order to avoid voltage collapse at this substation. Therefore, the risk associated with this temporary operational procedure should be eliminated as soon as possible.

To serve the anticipated increase in demand for electricity, UI expects to use all the available capacity of the four existing substations and to transfer distribution load between these substations to the extent possible. However, by 2015, these distribution load transfer solutions are expected to be exhausted. Indian Well Substation will remain above its rating while Trap Falls and Trumbull Substations are projected to be above 85% of their capacity rating as illustrated by the data in Table III-1.

[6] Shelton Area Capacity Analysis, May 2, 2008, by System Integrity (Revised April 2012).
[7] Ten-Year Transmission & Substation Infrastructure Planning Study 2012-2021.
[8] Voltage Stability Need Analysis Report November 6, 2009, rev 0 by UI Transmission Planning and Quanta Technology (Revised April 2012).

Table III-1: Shelton Regional Load Forecast

Shelton Region Load Forecast - Ten Year Plan Base Case 2011 - 2020											
Load Schedule in MVA											
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Ansonia	39.12	41.74	42.52	43.54	44.23	44.50	44.46	44.48	44.54	44.78	45.09
Indian Well	56.52	53.71	54.64	58.44	59.66	60.34	60.56	60.84	61.21	61.81	62.51
Trap Falls	66.03	68.87	69.37	70.65	72.18	73.72	75.24	76.68	78.22	79.65	81.12
Trumbull	35.82	47.88	51.48	54.55	56.19	57.06	57.57	57.70	57.84	58.04	58.25
Total	**197**	**212**	**218**	**227**	**232**	**236**	**238**	**240**	**242**	**244**	**247**
Substation Ratings in MVA											
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Ansonia	**59.01**	**59.01**	**59.01**	**59.01**	**59.01**	**59.01**	**59.01**	**59.01**	**59.01**	**59.01**	**59.01**
85% of Rating	50.16	50.16	50.16	50.16	50.16	50.16	50.16	50.16	50.16	50.16	50.16
95% of Rating	56.06	56.06	56.06	56.06	56.06	56.06	56.06	56.06	56.06	56.06	56.06
Indian Well*	**49.00**	**49.00**	**49.00**	**49.00**	**49.00**	**49.00**	**49.00**	**49.00**	**49.00**	**49.00**	**49.00**
85% of Rating	41.65	41.65	41.65	41.65	41.65	41.65	41.65	41.65	41.65	41.65	41.65
95% of Rating	46.55	46.55	46.55	46.55	46.55	46.55	46.55	46.55	46.55	46.55	46.55
Trap Falls	**76.78**	**76.78**	**76.78**	**76.78**	**76.78**	**76.78**	**76.78**	**76.78**	**76.78**	**76.78**	**76.78**
85% of Rating	65.26	65.26	65.26	65.26	65.26	65.26	65.26	65.26	65.26	65.26	65.26
95% of Rating	72.94	72.94	72.94	72.94	72.94	72.94	72.94	72.94	72.94	72.94	72.94
Trumbull	**64.78**	**64.78**	**64.78**	**64.78**	**64.78**	**64.78**	**64.78**	**64.78**	**64.78**	**64.78**	**64.78**
85% of Rating	55.06	55.06	55.06	55.06	55.06	55.06	55.06	55.06	55.06	55.06	55.06
95% of Rating	61.54	61.54	61.54	61.54	61.54	61.54	61.54	61.54	61.54	61.54	61.54
Total	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**250**
Total Area Load	197	212	218	227	232	236	238	240	242	244	247
Total Area Capacity	250	250	250	250	250	250	250	250	250	250	250
95% of Capacity	237	237	237	237	237	237	237	237	237	237	237
85% of Capacity	212	212	212	212	212	212	212	212	212	212	212
Total Area % Load	79.1%	85.0%	87.4%	91.0%	93.1%	94.4%	95.3%	96.0%	96.9%	97.9%	99.0%
*Denotes a substation whose rating changed from thermal to voltage limiting as determined a transmission voltage stability											
Legend:	(yellow)	Load is greater than or equal to 85%, but less than 95% of the substation or region's capacity.									
	(orange)	Load is greater than or equal to 95%, but less than 100% of the substation or region's capacity.									
	(red)	Load is greater than 100% of the substation or region's capacity.									

UI's Transmission and Distribution Substation Design and Rating Philosophy Standard states that construction of new capacity should be considered as a "solution to area capacity needs where the coincident peak load of two or more area substations having distribution ties has reached 85% of their summer normal capacity rating after exhausting all possible load transfers." In accordance with this standard, this situation also requires that UI take action.

There is an imminent capacity need at Indian Well Substation as the data in Table III-1 indicates. In an effort to relieve Indian Well Substation, permanent distribution load transfer projects have been implemented in the last three years from Indian Well Substation to other area substations. Additional load transfer projects have been identified in the next two years to transfer load from Indian Well Substation to Ansonia Substation, which is the only substation in the area that has adequate available capacity. In addition to the permanent distribution load transfers, temporary distribution load transfers from Indian Well Substation to Trap Falls Substation and Trumbull Substation have also been identified to mitigate the risk of voltage collapse at Indian Well Substation during high load periods. However, by 2015, these distribution load transfer solutions will be exhausted; Indian Well Substation cannot be relieved any further and thus exceeds its rating due to the load growth in the area.

By 2015, the area load is projected to reach approximately 93% of the available substation capacity. The 7% of available capacity can be quickly absorbed by new large customers moving into the area or existing major customers adding significant load.[9] Therefore, a 115/13.8 kV substation capacity addition is required to be in place by the 2015 summer peak in the Greater Shelton Area to permanently address the voltage collapse risk at Indian Well Substation and to meet the load growth of the area. The recommended capacity addition is necessary to enable UI to provide safe and reliable service to customers in the coming years.

III.B Benefits of the Substation

The proposed Project will provide a new substation in proximity to the portions of the Greater Shelton Area (i.e., along the State Route 8 corridor in southern Shelton and southeastern Trumbull) where the most load growth is expected in the near future. The new substation will also eliminate the risk of voltage collapse at Indian Well Substation and allow the four existing area substations to operate with adequate capacity with future load growth in the area.

III.C Alternative Energy and Capacity Solutions Considered

As options for addressing the capacity need in the Greater Shelton Area, UI identified and evaluated 10 potential solutions, as follows (refer to Appendix G for detailed alternatives analyses):

1. No Action
2. Distribution Load Transfers
3. Implement Conservation and Load Management Programs
4. Install Distribution Interconnected Generation (DG)
5. Replace (Increase Size of) Transformers at Indian Well and/or Trap Falls Substations
6. Install a Single 40 MVA 115 / 13.8 kV Transformer Distribution Substation along the Existing 115 kV Transmission Corridor
7. Install a New Third 115/13.8 kV Transformer at the Existing Trap Falls Substation Site
8. Install a New Third 115/13.8 kV Transformer at the Existing Trumbull Substation Site

[9] UI has a contractual agreement with an existing area customer to supply 8 MVA of additional load, and UI can be obligated immediately to service this load.

9. Install a New Third 115/13.8 kV Transformer and 13.8 kV Switchgear at Site Adjacent to Trap Falls Substation

10. Build a New 115/13.8 kV Distribution Substation

These potential distribution solutions were evaluated based on economics and system performance (capacity, availability, and reliability), as well as engineering considerations. The following section summarizes the analyses of the above-referenced alternatives.

In the “No Action” alternative, UI would accept the risks and consequences associated with this option, including the possibility of shedding load during a transmission line contingency at Indian Well Substation or upon loss of a substation transformer during summer peak periods. Accepting the risk associated with the “No Action” option is not advisable and should be rejected due to the significant adverse impact on system reliability levels and, in turn, customer satisfaction and the economic vitality of the region.

The “Distribution Load Transfers” alternative is not sufficient to keep Indian Well Substation below its rating and, as mentioned before, feasible load transfer options will be exhausted after the 2014 summer peak. Distribution Load Transfers should only be considered as a stopgap measure and a short-term alternative.

Conservation and Load Management (C&LM) programs are designed to reduce total energy usage on a utility’s system by improving the efficiency with which energy is used by customers. UI has long been a proponent of the benefits of C&LM activities and has developed a full complement of C&LM programs as part of Connecticut’s restructured electric markets. However, C&LM programs typically account for approximately 10 to 12 MVA per year system-wide, which is less than 1 MVA per substation on average and less than 1% of the total system peak load for a given year. The load reductions obtained from C&LM programs are usually canceled out by the system “background” growth. Future opportunities exist to increase the load reductions achieved by C&LM programs, but the reductions are expected to be marginal. Therefore, this alternative does not provide sufficient capacity to accommodate the significant projected load growth identified in the Greater Shelton Area over the next 10 years.

Distribution Interconnected Generation (DG) applications refer to technologies that are typically connected to a utility’s distribution system at or near the point of consumption. These DG units may vary from small solar panels on residences to multi-megawatt combined heat and power generators installed at commercial and industrial facilities. DGs could potentially be utilized to displace substation loading in some applications. However, because of the lack of diversification at the substation level (small number, if any, of large DGs installed per substation), UI does not include the peak-reducing capability of the existing larger DG units for its substation level forecast. This lack of diversification at each substation amplifies the reliability impact of each individual DG unit to its respective substation.

Furthermore, UI must provide backup service to these sources in case the DG units are not available. UI's backup service may be required at any time, including during system peak conditions. Therefore, UI cannot rely on these units operating at all times and must take this into account for capacity planning purposes. Supplying the growing load in the area with DGs would require a significant number of units to achieve the sufficient, reliable capacity with the required diversity.

The remaining potential alternative solutions were eliminated from consideration since they represent costly, short-term capacity solutions that would not be sufficient to meet the long-term future capacity needs of the area. They also pose various technical issues, including increased reliability risks to the customers in the area, inadequate physical space and layout restrictions at the current substation sites, adherence to proper clearances to existing facilities, and risk of prolonged customer outages during construction due to prolonged use of contingency measures.

This evaluation concluded that the construction of a new 115/13.8 kV distribution substation in the Greater Shelton Area would best meet the long-term capacity needs of the area safely and reliably. Two different sites were identified through a Site Selection Study and evaluated from an engineering perspective as potential locations for a new substation in this area. The alternative site evaluation process is discussed in greater detail in Section IX and in the site selection study presented in Appendix H.

IV. DESCRIPTION OF PROPOSED FACILITY

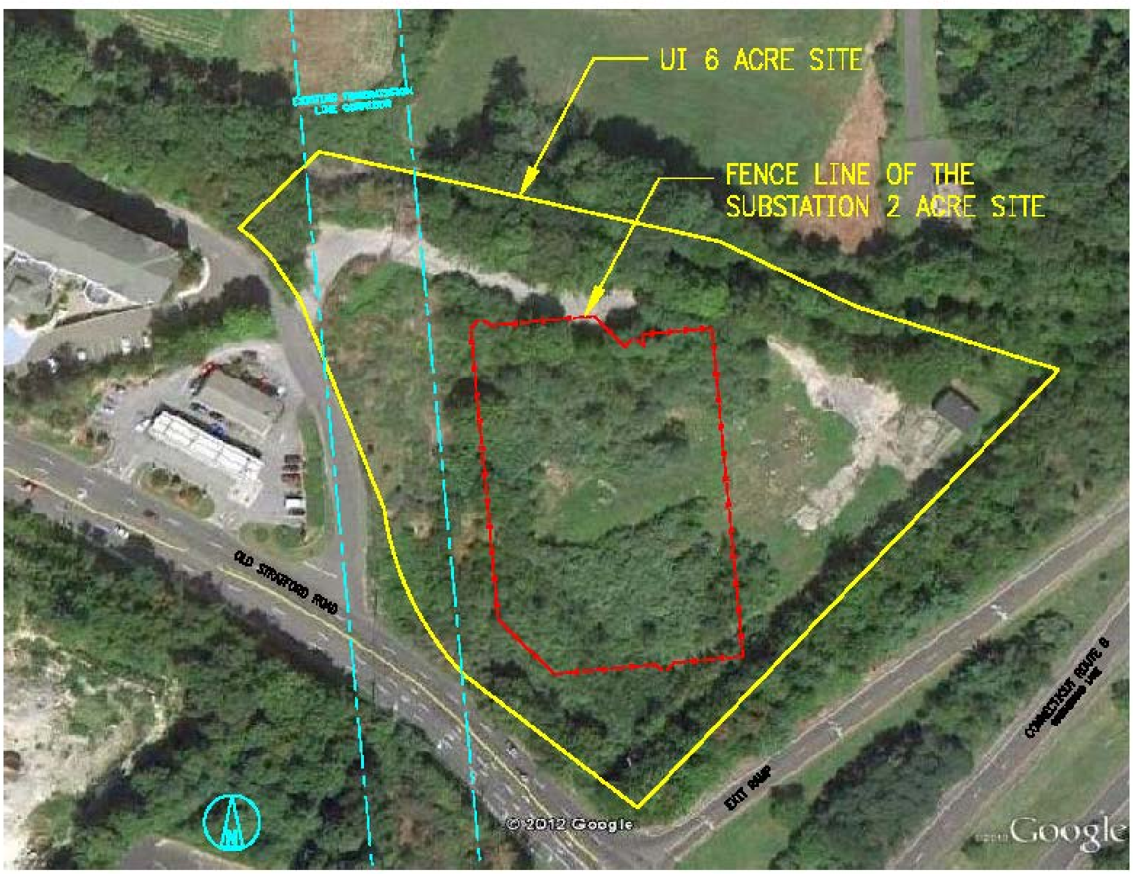
IV.A Project Location, Land Requirements, and Access

Site Location

The Shelton Substation is proposed for location on a two-acre portion of a six-acre parcel of UI property at 14 Old Stratford Road in the City of Shelton. The property is identified by the Shelton Assessor's Office as Lot 29-8. UI purchased the property in December 2009.

Figure IV-1 illustrates the location of the property, which is bounded to the east by State Route 8, to the south by Old Stratford Road, to the west by Pootatuck Place, and to the north by the Far Mill River. A Connecticut Light and Power Company (CL&P) easement, occupied by 115 kV overhead transmission lines, extends across the western portion of the property. Appendix A includes a U.S. Geological Survey map of the proposed site and vicinity, as well as site photographs.

Figure IV-1: General Property Location



Source: Google Maps, April 2012

The property is currently vacant and is fenced. UI presently uses portions of the property for staging equipment and vehicles used in vegetation maintenance activities along its distribution and transmission lines.

The site was historically developed for industrial purposes and until the 1990s was used by the Lord Corporation (Lord) for the manufacture of O-rings and seals. When used for manufacturing purposes, the majority of the property was occupied by industrial buildings, parking, and on-site access roads. The industrial facilities were removed by the late 1990s as part of an overall site remediation undertaken by Lord. Groundwater remediation and monitoring are still ongoing as part of an agreement between Lord and the State of Connecticut. Groundwater monitoring wells are located on the eastern portion of the six-acre property.

Appendix A includes a historical aerial photograph of the site, illustrating the industrial facilities that were previously developed on the site. Section IV.B provides additional details about the history of the site.

Land Requirements and Access

The proposed substation will be located on two acres of the six-acre UI-owned site. The substation will be located on the central portion of the site, just east of and adjacent to the existing CL&P overhead transmission line corridor. This corridor is presently occupied by four 115 kV lines, three of which are in operation (refer to Appendix A, Site Plan).

The substation will occupy an irregularly shaped area of 84,848 square feet (measuring approximately 367 feet by 247 feet at its longest dimensions, or approximately two acres). When developed as a substation, this area will be covered with a trap rock surface and surrounded by an eight-foot-high chain link fence, topped with one foot of barbed wire (three strands).

The substation will be accessible via the existing access road to the property, which is located off Pootatuck Place. Existing on-site roads will be improved or extended to provide access directly to the substation. The remaining portions of the six-acre site will not initially be developed, but some areas may be used for staging or parking during the construction of the proposed substation.

IV.B Site History and Environmental Remediation

The proposed Shelton Substation site at 14 Old Stratford Road is a former industrial site that was remediated pursuant to Lord's consultations with and approvals from the Connecticut Department of Environmental Protection (DEP; now the Connecticut Department of Energy and

Environmental Protection [DEEP]). As described below, groundwater monitoring and remediation wells remain on the eastern portion of the site.

Prior to 1939, the site was owned by the State of Connecticut and appeared to be vacant land. From 1939 to 1953, the site was owned by one or various members of the George family and was either vacant or used for residential purposes. In 1953, the site was purchased by Nichols Engineering, Inc. (Nichols) from Adelaide George. From 1953 to 1978, Nichols manufactured O-rings, seals, and shock mountings. Lord bought out Nichols in 1978 and paved portions of the site for a parking lot in 1981. From 1978 to 1993, the Lord Corporation Seal Division manufactured on-site the same products as Nichols.

Lord's Plant No. 1 was used for the manufacturing of elastomers and elastomer-to-metal products. Various hazardous substances were used in this process. Specifically, the hazardous substances used at the plant included paint-related products, tetrachloroethene (PCE), and methylene chloride (MC). Bulk PCE was received in aboveground (ASTs) and underground storage tanks (USTs) and was used in degreasers. Waste PCE was drummed and moved into accumulation areas, first at an evaporation shed and later at the solvent storage building. MC was received in USTs and used to dissolve rubber and adhesive. Waste MC was handled in the same manner as waste PCE. Drummed adhesive was thinned with methyl isobutyl ketone (MIBK) or xylene (XYL) in the cement storage area. Waste solvents (MIBK and XYL) and adhesives were handled in the same manner as waste PCE. No. 4 fuel oil was received in four USTs and burned in the facility boiler.

Lord's Plant No. 1 was closed in 1993. On behalf of Lord, in 1997, ARCADIS Geraghty and Miller performed environmental studies at the site and designed, built, and operated a groundwater remediation system. In 1999, Lord demolished the former Plant 1 main building, disposed of the building slab, and excavated all accessible soil with contaminants present above standards (from the PCE AST area and the UST area) for off-site disposal. The USTs at the site were originally closed in place, but these tanks subsequently were also removed as part of the excavation effort.

Currently, the in-well sparging groundwater remediation system is in operation at the site, and groundwater and surface water are monitored on a quarterly basis. In addition, in 2005, the DEP issued an Underground Injection Control (UIC) permit authorizing Lord to discharge dilute food-grade molasses to a series of nine wells into groundwater in order to promote bacteria that will degrade existing chlorinated solvent contamination. This process is ongoing, pursuant to the DEP UIC permit. These groundwater remediation efforts continue to be performed by ARCADIS on behalf of Lord.

IV.C Description of Proposed Substation Facilities

The proposed substation will be located on the western portion of the six-acre site, adjacent to CL&P's existing 115 kV transmission line corridor. One of the existing 115 kV lines will be routed into the station. Within the substation, power from this transmission line will be stepped down to 13.8 kV for delivery to the electric distribution system in the Greater Shelton region. As illustrated on the Site Plan and Drawings in Appendix A, the proposed substation facilities will include:

- A 115 kV circuit breaker.
- Six 115 kV disconnect switches.
- Two 50 MVA power transformers to step down the voltage from 115 kV to 13.8 kV.
- A position to accommodate a temporary, mobile transformer for emergency conditions.
- Two metal switchgear enclosures, each approximately 44 feet long, 14.5 feet wide, and 14 feet high, which will be installed to provide for the switching equipment, relaying and control equipment.
- A metal control enclosure (building for equipment protection), approximately 66 feet long by 28 feet wide by 14 feet high, which will be installed at the north end of the substation. This enclosure will be designed to house the protective relaying and control equipment as well as the battery and charger associated with the transmission and distribution equipment.

As with all UI substations, the Shelton Substation will be designed to meet or exceed the State Building Code, which takes into account seismic loading, wind loading, and snow and ice loadings, among others.

CL&P's existing transmission lines are routed north to south across the western portion of the Project site. The centerline of the easternmost line is approximately 15 feet west of the western boundary of the proposed substation site. On the UI property, the existing transmission line will be rerouted into the substation by installation of four new steel monopoles.

The four new steel monopoles, which will be installed to connect the substation to the existing transmission line, will be similar in height to the 81-foot-tall lattice tower transmission structures that support CL&P's 115 kV transmission lines. The interconnections between the substation and the new transmission line poles will be accomplished by installing two new line-terminal structures (approximately 48 feet in height) within the substation.

To access the proposed substation, UI will upgrade the existing access road that presently extends into the site from Pootatuck Place. The upgraded access road will have a travel surface of approximately 20 feet, and will be extended into the substation to provide direct ingress and egress to the station equipment and buildings.

Development of the proposed substation will require protective relay system changes within the existing control enclosures at remote substations. These upgrades are required for the safe and proper operation of the proposed substation. To provide protective relay communications, a fiber optic cable will be installed along an existing overhead distribution line between the proposed substation and the Trap Falls Substation (approximately 0.8 mile away) and between the proposed substation and a splice location on a wood distribution pole on the corner of Old Stratford Road and Bridgeport Avenue in Shelton.

IV.D Facility Service Life

The substation equipment and supporting infrastructure are estimated to have a service life of approximately 40 years and will be capable of capacity increases during that time. An area within the substation fence line has been allotted to accommodate infrastructure expansion during the facility's service life.

V. PROPOSED CONSTRUCTION AND OPERATION/MAINTENANCE PROCEDURES

The Shelton Substation will be constructed, operated, and maintained in full compliance with the standards of the National Electrical Safety Code, any conditions of the Siting Council's approval of the Project, and good utility practice.

V.A Construction Procedures

Before any construction activities occur, UI will prepare a Development and Management Plan ("D&M Plan"), which will be submitted to the Siting Council for approval. The D&M Plan will include Construction Best Management Practices, which are designed to minimize or eliminate potential adverse environmental effects that may result from construction activities.

The D&M Plan will 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 will also provide contact information should questions or concerns arise during construction or operation of the facility.

V.A.1 Substation Construction Sequence

The general tasks and sequence of construction for the substation and the 115 kV line interconnection between the substation and CL&P's 115 kV transmission line include:

- Install erosion and sedimentation control measures.
- Prepare the site for development (cut, fill, grading).
- Install substation foundations, conduits, grounding grid, and distribution facilities.
- Spread trap rock.
- Install power transformers.
- Install high-voltage circuit breakers.
- Offload and set metal control enclosure and switchgear enclosures.
- Install steel structures, substation equipment, and buswork.
- Install transmission line interconnections.
- Commission the substation.

- Install asphalt access drives.
- Complete site restoration activities.
- Remove temporary erosion and sedimentation control measures after site stabilization is achieved.

As an initial step in the construction sequence, clean fill will be imported to replace topsoil and compressible materials that prevent proper structural support and to bring the surface elevation of the substation above the 100-year floodplain as designated by the Federal Emergency Management Agency (FEMA). (Refer to the Site Plan in Appendix A and to the discussion below regarding Floodplain Management for details regarding the FEMA floodplain.)

No blasting will be required for the construction of the substation. Grading will be performed as needed to level the substation site for the electric transmission and distribution facilities.

Temporary erosion and sediment controls will be deployed during the earthwork and construction phases of the Project in accordance with the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control*, and as depicted on approved Project site plans. UI's contractor will inspect and maintain the temporary erosion and sediment control measures throughout the construction phase of the Project, removing sediment from the erosion control measures as needed on a weekly basis and within 24 hours after each storm event, and disposing of sediments in an upland area, such that sedimentation will not occur into water resources.

In addition, UI's contractor will be fully responsible for sequencing construction activities such that earth materials are exposed for a minimum of time before they are covered, seeded, or otherwise stabilized to prevent or minimize the potential for erosion. Upon completion of construction and establishment of permanent groundcover, the contractor will remove and dispose of erosion control measures and remove sediment and debris from areas where control measures were used.

The substation site will be graded to contain and treat stormwater runoff on the UI property via a containment basin. The remainder of the stormwater will infiltrate through the gravel base of the substation.

Upon completion of construction activities, all disturbed/exposed areas on the site that are not otherwise developed, graveled, or paved will be stabilized with topsoil and seeded with a New

England conservation/wildlife mix to establish a cover of native grasses, forbs, wildflowers, and legumes that will provide both soil stability and wildlife habitat value. Erosion and sedimentation controls will remain in place until final site stabilization is achieved.

The substation will include two 50 MVA transformers that will contain insulating (mineral) oil. The transformer equipment will each have secondary containment designed to hold 110% of a transformer's fluid capacity and accidental spill prevention measures in place. UI will install a petro barrier gravity drain system, similar to other UI substations, to assist in minimizing the potential for inadvertent oil discharges from the containment. Further, a transformer low oil level alarm that is integral to the system will be monitored remotely and will notify UI in the event of an abnormal condition. Periodic inspections of the oil containment system will be performed by UI personnel to verify proper functioning of the systems.

Floodplain Management

At the proposed Shelton Substation site, the FEMA published 1% annual chance flood elevation is 115 feet, based on the National Geodetic Vertical Datum of 1988 (NAVD88). The 1% annual chance flood is also referred to as the base flood or 100-year flood. The site is in an AE Zone and a regulatory floodway exists along the northern portion of UI's property, along the Far Mill River, but outside of the proposed substation site.

The original floodplain delineation of the Far Mill River was prepared in 1977. The portion of Far Mill River from Means Brook upstream to Isinglass Reservoir was remodeled in 1998 and published in 2000. Means Brook enters the Far Mill River approximately two miles upstream of the subject site. The 2010 Fairfield County Flood Insurance Study (FIS) republished the 2000 floodplain delineation. The FEMA hydraulic model for the Far Mill River channel reach at the proposed substation site dates to the original analysis in 1977, making it more than 35 years old.

UI commissioned Milone & MacBroom, Inc. (MMI) to complete hydraulic modeling of the site and proposed improvements. Using the FEMA model as the base, MMI ran FEMA Effective Duplicate and Existing Conditions models of the lower reach of the Far Mill River. Based on the model updates and revisions made by MMI, the 1% chance flood elevation through the Project site is predicted to be elevation 113.6 feet NAVD88, rather than the 115 feet shown by FEMA. One of the largest factors influencing the reduction in flood elevation is the fact that the 1977 model included the Lord industrial building, which was formerly located on the site. The demolition of this building represents a significant reduction in floodplain encroachment.

The substation design incorporates grading, filling, and concrete foundation extensions to elevate the electrical equipment above the elevation of the 1% annual chance floodplain as predicted by MMI. Specifically, the proposed substation design raises the site to an average top-of-rock elevation of 113.75 feet. At this elevation, foundations and platforms for critical electrical structures and substation control and equipment enclosures will be designed such that the equipment or finished floors will be a minimum of one foot above the MMI predicted flood elevation. The estimated fill quantity to raise the existing grade to the 113.75 foot elevation is 15,000 cubic yards.

Stormwater Management Approach

The stormwater system for the proposed substation will consist of a network of five catch basins with grates at grade to collect runoff throughout the site. The catch basins will transport runoff via corrugated high-density polyethylene (CHDPE) piping.

The catch basin and piping network will gravity drain the collected runoff to a stormwater retention basin, which is proposed for location south of the substation (refer to the Site Plan in Appendix A). The basin will have 3:1 side slopes and will be sized to retain the first inch of rainfall (defined as the "Water Quality Volume" in the *Connecticut Stormwater Quality Manual*). The basin will drain via direct soil percolation, with the bottom area sized for an appropriate infiltration rate given the soil type found on-site. In order to keep the post-development flows less than the pre-development flows, the basin will have a vertical standpipe installed that will serve as the outlet structure for the excess runoff. The standpipe will be made out of CHDPE and will have a drop in grate attached on the inlet end to keep the pipe clean from debris. The pipe will transfer the excess runoff into the drainage swale located along the southeast border of the site.

For excessive storm events, a 10-foot-wide broad-crested weir will be constructed in the southeast corner of the retention basin. The weir will be rip-rap lined and will disperse runoff into the adjacent drainage swale.

General Construction Work Hours and Schedule

All construction activities will be conducted in accordance with the D&M Plan as approved by the Siting Council. The construction and testing of the substation facilities are expected to occur over a 12- to 18-month period. In general, construction hours will be scheduled within a window from 7:00 A.M. to 5:00 P.M., Monday through Friday. Site preparation, including grading and installation of foundations, will take place during the initial six months of construction and will involve the use of earth-moving equipment and construction vehicles.

The installation and testing of substation equipment will take approximately nine months. These activities will involve the use of cranes to unload and install structural elements and large equipment.

The installation of the 115 kV line and substation terminal structure, interconnection of the supply lines to the substation, and connections to the distribution system will require that critical transmission and/or distribution equipment be taken temporarily out of service. As a result, this work will be scheduled for off-peak electrical demand hours and coordinated with the City of Shelton. To complete these interconnections as efficiently as possible with minimal outage disruptions, work will have to be performed continuously, including outside of normal work hours.

V.A.2 Distribution Line Connections

To deliver power from the substation into UI's distribution system in the Shelton region, new distribution circuits will be installed from the substation to interconnect with the existing distribution network both north and south of the substation. These distribution circuits will consist of duct lines and splicing chambers, which will be buried beneath local roads.

The distribution circuit get-away from the Shelton Substation will consist of two PVC underground duct lines that will extend from the substation to two new splicing chambers that will be located beneath Old Stratford Road. One duct line will exit the substation site through the property in front of (i.e., south of) the substation directly onto Old Stratford Road, while the other duct line will exit the site to the west of the substation onto Pootatuck Place and will continue to Old Stratford Road.

From the splice chambers on Old Stratford Road, new distribution duct lines will be aligned:

- For approximately 1,150 feet northwest beneath Old Stratford Road to an interconnection with UI's existing distribution system located beneath Bridgeport Avenue.
- For approximately 800 feet southeast beneath Old Stratford Road to the east side of the State Route 8 bridge crossing on Old Stratford Road.

In addition to the new distribution duct lines, an estimated eight new splicing chambers will be required within Old Stratford Road and Bridgeport Avenue. Underground laterals will also be installed from these new splicing chambers along Old Stratford Road to allow the new cables to rise to open wire or aerial cable.

V.B Operation and Maintenance Procedures

The Shelton Substation will be operated and maintained in accordance with standard UI protocols, in conformance with all required industry standards.

The substation will be equipped with measures to ensure continued service in the event of outages or faults in transmission or substation equipment. Continued reliability will 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.

In the event that an energized line or substation equipment fails, protective relaying equipment will immediately remove the failed line or equipment from service, thereby protecting the public and the remaining equipment within the substation. Protective relaying equipment will be provided to automatically detect abnormal system conditions (e.g., a faulted overhead transmission line) and will send a protective trip signal to circuit breakers to isolate the faulted section of the transmission system. The protective relaying schemes will include fully redundant primary and backup equipment so that a failure of one scheme will 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 24/7 remote control and equipment monitoring at UI System Operations Center, will be housed in a weatherproof, environmentally controlled electrical equipment enclosure.

UI considers Institute of Electrical and Electronics Engineers (IEEE)/ American National Standards Institute (ANSI) and National Fire Protection Association (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. UI also trains its employees and the local fire department on the safe methods to deal with a substation fire. The control enclosure will be locked and equipped with fire extinguishers, as well as smoke detectors that will be monitored from a remote location. Smoke detection will automatically activate an alarm at the UI System Operations Center, and the system operators will then take appropriate action.

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

UI will install oil-spill containment reservoirs around the proposed transformers. The oil-spill containment reservoirs will be sized with sufficient capacity to contain a spill in the event of an inadvertent release of oil. UI plans to install a petro barrier gravity drain system, similar to containment systems installed at other UI substations.

Traffic Considerations

The substation will be designed for remote operation, with personnel on site only for periodic inspections, maintenance, and (as needed) emergency work. Permanent access to the property will be via the established gate from Pootatuck Place. An on-site access road will be extended into the substation to facilitate the movement of maintenance equipment and access to the control building.

V.C Physical Site Security and Energy Security

The Shelton Substation will occupy an approximately two-acre area within the six-acre UI-owned property. UI's entire six-acre property is presently fenced and gated; the majority of the UI property will remain fenced after the substation is developed, but the perimeter fence will be relocated farther back from the property boundary in some locations.

The substation also will be protected with additional security measures. An eight-foot-high chain link fence topped with one foot of barbed wire (three strands) will enclose the substation yard to prevent unauthorized access. The substation yard will also be gated and locked. All gates will be padlocked at the end of the workday during construction activities and at all times once the substation is in service. Appropriate signs will be posted at the substation fence and gates, alerting the general public of the presence of high-voltage facilities.

Should the substation equipment experience a failure, protective relaying will immediately remove the affected equipment from service, thereby protecting the public and the equipment. Other devices installed within the substation will constantly monitor the equipment to alert UI of any abnormal or emergency situations.

VI. EXISTING ENVIRONMENTAL CONDITIONS

This section describes the environmental resources on and in the vicinity of the proposed site (at 14 Old Stratford Road) for the location of the new Shelton Substation. This environmental information is intended to characterize the present conditions on the site and to facilitate an understanding of the Project's potential environmental effects and the measures to mitigate such effects (as detailed in Section VII).

The Appendix A maps and drawings illustrate the environmental resources on and in the vicinity of the proposed substation site, including:[10]

- Residential, commercial, and industrial uses.
- Municipal zoning classifications.
- Vegetative community types.
- Wetlands and watercourses.
- The floodplain boundary along the Far Mill River (100-year and 500-year) as identified by FEMA.
- Major existing infrastructure facilities, including overhead transmission lines and roads.
- General locations of on-site groundwater monitoring wells (part of the ongoing remediation program associated with the previous use of this former industrial site).

To compile information concerning the existing environmental conditions, UI researched published information regarding current land use, future land use patterns, and natural and cultural resources, and also commissioned biological and soil surveys to delineate water resources and vegetative communities on the site. In addition, UI consulted with federal, state, and local agencies, including the U.S. Army Corps of Engineers (Corps), the DEEP, the Connecticut State Historic Preservation Office (SHPO), and the City of Shelton. Copies of correspondence with agencies regarding the Project are included in Appendix B.

[10] Note: In the immediate vicinity of the proposed substation site, there are no designated public recreational, scenic, or open space areas; parks or forests; group homes, hospitals, schools; hunting or wildlife management areas; or public water supplies. One day care, Tutor Time, is located in the Split Rock Plaza, approximately 0.3 mile southwest of the site on top of the rock bluff south of Old Stratford Road. Further, the proposed substation site is not within the designated coastal boundary or within any state or nationally designated heritage areas.

VI.A Topography, Geology, and Soils

The proposed substation site is located within the southern portion of the Western Uplands, near the Coastal Slope physiographic province. The topography on the site is relatively level, with elevations of approximately 100 to 110 feet above sea level. In general, the topography has been modified by past development, including the former use of the site for industrial purposes and the associated installation of parking areas and access roads.

Connecticut's bedrock geology has a direct effect on landscape forms because of the rocks' different resistances to weathering and erosion. The proposed substation site is located within the Western Uplands geologic terrain, where granitic gneisses and schists predominate. Bedrock beneath the proposed substation site consists of medium-grained schists in the Trap Falls Formation.

The surficial (unconsolidated) materials that overlie bedrock in Connecticut consist of deposits from the continental glaciers that covered New England at least twice during the Pleistocene Ice Age. In the vicinity of the substation site, these deposits are classified as glacial till, the most common type of deposit, which was laid down directly by glacier ice and consists of a matrix of sand, silt, and clay with variable amounts of stones and large boulders. The till is generally less than 10 to 15 feet thick.

The U.S. Department of Agriculture ("USDA"), Natural Resources Conservation Service ("NRCS"[11]) maps soil types and produces countywide soils surveys. The *Soil Survey of Fairfield County* provides information concerning soil characteristics, including depth to bedrock, slope, drainage, and erosion potential; soils information is also mapped and available via Connecticut Environmental Conditions Online (CTECO); http://www.cteco.uconn/edu).

The soils on the proposed substation site have been altered due to previous industrial development. The upland soil on the site is characterized as an Udorthent. This soil unit consists primarily of man-made or disturbed cut and/or filled areas that are not wet, with slopes ranging from 0% to 8%. The fill on the site is primarily earthen materials, with inclusions of concrete, bricks, wood, metals, plastic, and glass. Portions of the site also include small areas of well-drained loamy soils and non-soil impervious areas (e.g., paved road, parking lot). There are no mapped hydric soils on the site.

[11] The NRCS was formerly the Soil Conservation Service (SCS).

However, in the southwestern portion of the site, a small wetland (approximately 7,200 square feet or 0.17 acre) has formed over old asphalt pavement. This wetland, which is characterized by four to 12inches of earthy soil and geologic materials, is perched on top of the asphalt. The wetland is believed to have been created over the past 10 to12 years (subsequent to the removal of the industrial buildings on the site) as a result of water and sediment runoff from adjacent upland areas, including from Old Stratford Road. The soils in the small wetland meet the criteria as an Aquent, which consists primarily of man-made or disturbed cut and/or fill areas that are wet. The wetland is discussed in greater detail in Section VI.B.

VI.B Water Resources and Water Quality

Water resources include wetlands, watercourses (streams, rivers), and groundwater. The Far Mill River, which flows into the Housatonic River, constitutes the northern boundary of UI's six-acre property, whereas the eastern boundary of the property is adjacent to Black Brook, a tributary to the river. Wells Brook, which is located northwest of the property, flows into the Far Mill River from the north, just northwest of the UI property boundary. In addition, the property includes a small wetland, which is perched on top of asphalt, and supports some wetland plants. The UI property is not located within Connecticut's coastal boundary.

The proposed substation site will encompass a two-acre area on the western portion of UI's property. Except for the small wetland, the substation site will be situated within upland areas.

Surface Water Resources

The proposed substation site does not encompass any watercourses. The site is located within the Housatonic River Basin, one of eight major drainage basins in Connecticut. The DEEP maintains detailed water resources information concerning each drainage basin and promotes watershed management efforts to improve water quality.

Connecticut has established Water Quality Standards and Classifications, which identify the water quality management objectives for each stream and are central to the state's clean water program. Updated Water Quality Standards and Classifications were adopted by DEEP in February 2011. Overall, Connecticut's water quality policies are to protect surface and groundwater from degradation; restore degraded surface waters to conditions suitable for fishing and swimming; restore degraded surface groundwater to protect existing and designated uses; and provide a framework for establishing priorities for pollution abatement. Water use goals have been established for surface waters, coastal/marine surface waters, and groundwater.

In the vicinity and downstream of the proposed substation site, the Far Mill River is identified as Class B, which indicates that the watercourse is suitable for the support of fish and wildlife habitat, recreation, navigation, and water supply for agriculture and industry. Upstream reaches of the river are classified as A, which indicates that designated uses are habitat for fish and wildlife and other aquatic life and wildlife, potential drinking water supplies, recreation, navigation, and water supply for industry and agriculture. Black Brook also is designated as Class A.

The boundaries of the Far Mill River, Black Brook, and the small wetland on the site were delineated in relation to UI's six-acre property and the proposed substation site during field studies conducted in August 2009. The purpose of these studies, which were performed as part of a due diligence effort prior to UI's purchase of the property, was to determine whether any federal or state jurisdictional wetlands and watercourses are located on the property. The results of these field investigations are described in the *Wetlands and Watercourses Report* included in Appendix C and illustrated on the substation site plan maps in Appendix A.

State wetlands include all poorly drained and alluvial (floodplain) soil types. Federal jurisdictional wetlands are defined based on the presence of three parameters, in accordance with the methods specified in the Corps' *1987 Wetland Delineation Manual*, as updated and amended by the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (Version 2.0; January 2012). The wetland delineation on the proposed substation site pre-dates the Corps' *Regional Supplement*. However, based on consultations with the Corps, the methods used to delineate the wetland in 2009 remain consistent with current Corps guidance. Wetland functions and values were assessed as detailed in the Corps' *The Highway Methodology Workbook Supplement: Wetland Functions and Values*.

On the proposed substation site, the single small wetland (totaling 7,200 square feet) is located in a shallow depression on top of an asphalt area, which – based on the review of historical aerial photographs – was formerly a paved parking lot for the Lord Corporation's industrial facility. The building was demolished prior to 1999 as part of the site remediation effort (refer to discussion in Section IV.B for details regarding the site history). A review of historical drawings of the Lord Corporation facility indicates that a catch basin was located in the vicinity of the existing wetland.

The wetland supports emergent and scrub-shrub vegetation (predominantly wool grass, soft-stemmed bulrush, soft rush, *Carex spp*., nut sedge, cattail, purple loosestrife, jewelweed, pussy willow, and green bulrush). Since the 2009 wetland delineation, vegetation within the wetland was mowed in conjunction with UI's use of the vacant site for staging equipment needed to respond to power outage emergencies associated with Tropical Storm Irene (August 2011) and the October 2011 snowstorm.

Consultations with the Corps, including a preliminary jurisdictional determination and field visit conducted by Corps personnel in late August 2012, indicate that the wetland meets the definition of a federal jurisdictional wetland, although it was recently created and is maintained solely by intermittent runoff from Old Stratford Road, is perched over asphalt, and is isolated from any adjacent watercourses. Further, it is likely that water seeps through the asphalt and that, in the absence of any substation development activities, as the asphalt cracks and deteriorates over time, water runoff will not remain in this area to support wetland soils or vegetation. Because the wetland contains hydric soils, it also meets the criteria as a Connecticut wetland.[12] Copies of correspondence received from the Corps, including the jurisdictional determination, are included in Appendix B.

Groundwater Resources

Based on the latest available (March 2011) DEEP data, groundwater at the proposed Shelton Substation site is classified as GB. Class GB designated uses are industrial process water and cooling water, as well as base flow for hydraulically connected water bodies. Class GB groundwater is presumed not suitable for human consumption without treatment. The Class GB designation at the proposed substation site reflects the past industrial use of the property and the resultant ongoing groundwater remediation and monitoring program (refer to Section IV.B for further information).

In the majority of the City of Shelton, groundwater resources are classified as GA (existing private and potential public or private supplies of water suitable for drinking without treatment and base flow for hydraulically connected surface water bodies). However, groundwater in the northwestern portion of the City, as well as in the vicinity of Trap Falls Reservoir, is classified as GAA/GAAs (i.e., designated uses for existing or potential public water supply suitable for drinking without treatment and base flow for hydraulically connected surface water bodies).

[12] Connecticut wetlands are delineated solely based on soils.

The Aquarion Water Company provides potable water for Shelton. The Trap Falls Reservoir, located approximately one mile northwest of the proposed substation site, is a major surface water source. The Housatonic Well Field, located along the Housatonic River in the northern portion of Shelton, also is a significant source of potable water. No designated aquifer protection areas[13] are located on or near the proposed substation site.

Flood Zones

FEMA, which classifies flood zones for insurance and floodplain management purposes, has prepared maps that designate certain areas according to the frequency of flooding. An area within the 100-year flood designation is expected to flood at least once every 100 years. As illustrated on the maps in Appendix A, portions of the proposed substation site are situated within the 100- and 500-year FEMA floodplain boundaries along the Far Mill River. Refer to Section V.A.1 for additional floodplain information.

VI.C Biological Resources

Vegetation and Wildlife

Although previously developed for industrial purposes (including buildings and paved areas), the proposed substation site is presently characterized predominantly by a mix of mowed herbaceous and scrub-shrub vegetation that has opportunistically recolonized the site. Autumn olive is a predominant species in unmowed areas. In addition, vegetation along CL&P's overhead 115 kV Right-of-way (ROW) is managed to prevent the growth of woody species that will conflict with transmission line operation (i.e., vegetation along the ROW consists of scrub-shrub species).

Mature hardwood and ornamental trees extend along the northern boundary of UI's property (adjacent to the Far Mill River), as well as immediately outside the eastern property boundary (adjacent to Black Brook and State Route 8). These forested riparian corridors are dominated by mature trees of red maple, black locust, blue beech, red oak, tamarack, ash, hemlock, American beech, witch hazel, black birch, and shagbark hickory. Vegetation in the areas to the west of the UI property, which are developed for commercial purposes (e.g., hotel, retail), consist of ornamental landscaping and lawn areas. The property immediately north of the Far Mill River consists of agricultural fields.

[13] An Aquifer protection area is the critical area in a stratified drift aquifer that provides water to a public water supply well. Approximately 121 aquifer protection areas, including those in the City of Shelton, have been designated around the state for individual wells or groups of wells that serve more than 1,000 people, in accordance with Sections 22a-354a through 22a-354bb of the Connecticut General Statutes.

Wildlife inhabiting the site and site vicinity can be expected to be adapted to the habitats in agricultural, wooded riparian corridors, and suburban areas. Certain species have distinct habitat preferences and are found only in certain areas, whereas others are more or less cosmopolitan in their distribution within the various habitats available.

The species inhabiting these areas can be expected to be tolerant of human disturbance. Such wildlife species may include raccoons, woodchucks, and birds (e.g., Canada geese, robins, house sparrows, and the numerous species that frequent feeders). Other common urban wildlife species such as crows, rats, and other small rodents are often abundant in these habitats. Some wildlife species are dependent on human activity to thrive, such as birds that nest almost exclusively in human structures (e.g., chimney swift, barn swallow, purple martin). Herptiles tend to be scarce in urban-type habitats because they are typically less tolerant of human activity than birds or mammals. There are no wildlife management areas, state forests, parks, or other special wildlife use areas in the vicinity of the proposed substation site.

Fisheries

The Far Mill River is a freshwater watercourse that supports brook, rainbow, and brown trout populations. The DEEP Inland Fisheries Division stocks the river with these species of trout. However, the river is not designated as a trout management area, and there is no public access to the river from UI's property.

Amphibians

The small, isolated wetland located on the southwestern portion of the site (principally beneath the CL&P transmission lines) developed after the relatively recent removal of the Lord Corporation's industrial facilities and was created by sediment and runoff from drainage along Old Stratford Road. Field surveys of this wetland were performed in August 2009, outside of the amphibian breeding period. However, because the property was formerly used exclusively for industrial purposes, it is unlikely that the site supported any amphibian breeding. Further, no indications of amphibian breeding were evident during other field inspections of the wetland in 2011 and 2012.

Threatened, Endangered, and Special Concern Species

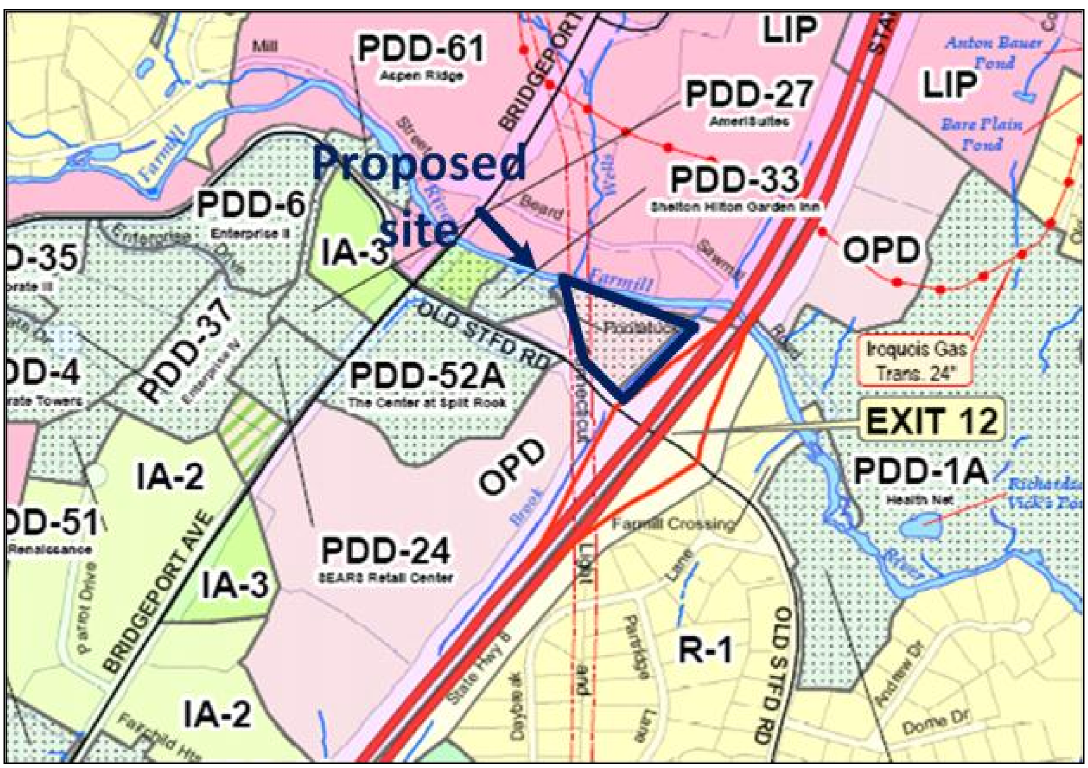
A review of the DEEP Natural Diversity Data Base (NDDB) map (December 2011) for the City of Shelton shows that there are no known locations of federal- or state-listed threatened, endangered, or special concern species on or in the immediate vicinity of the proposed substation site. Direct consultations with the NDDB confirmed this (refer to NDDB correspondence in Appendix B).

VI.D Land Use, Zoning, Land Use Plans, and Recreation

<u>Existing Land Uses and Zoning</u>

The two-acre substation site is located in the southeastern portion of Shelton. This brownfield property consists of vacant land that was formerly developed for industrial purposes. Lands surrounding UI's six-acre property consist of transportation corridors (i.e., State Route 8, Old Stratford Road, Pootatuck Place), the CL&P 115 kV transmission line ROW, the Far Mill River and farmland, and commercial uses. The commercial uses are concentrated along Old Stratford Road and Bridgeport Avenue and consist of a variety of retail uses, a hotel, gas station, and offices.

The proposed substation site is zoned as OPD (Office Park District) with a Special Development Area (SDA) overlay, as shown on the excerpt from the City of Shelton zoning map (refer to Figure VI-1). Public utility substations are a permitted use in the OPD under Section 23 of the *Zoning Regulations of the City of Shelton, Connecticut (amended August 1, 2011)* (refer to Bulk Filing of Municipal Documents).



Source: City of Shelton Zoning Map, February 2010

Figure VI-1: Zoning Classifications on and in Vicinity of Project Site

Nearby areas are zoned for LP (Light Industrial Park; areas to the north of the Far Mill River); OPD (to the northeast across State Route 8); PDD (Planned Development District, including the Hilton Garden Hotel and The Center at Split Rock commercial areas); and IA-3 (industrial; parcels along Bridgeport Avenue). Residential areas (zoned R-1) are located southeast of the site, southeast of State Route 8.

There are no community facilities (e.g., hospitals, schools) in the vicinity of the proposed substation site. The closest municipal facility is a city pumping station, which is located north of the site, adjacent to the Far Mill River and State Route 8 (off Beard Sawmill Road).

Land Use Plans

The state, the regional Council of Governments, and the City of Shelton have developed plans to guide land conservation and development. The primary state-level plan is the *Conservation and Development Policies Plan for Connecticut: 2005-2010 (C&D Plan)*.[14] In this plan, the proposed substation site is identified as within a growth area along portions of Shelton's State Route 8 corridor.

The *2008 Strategic Plan of Conservation and Development*, which was prepared by the Valley Council of Governments, provides a coordinated plan for the municipalities within the planning region (i.e., Ansonia, Derby, Seymour, and Shelton). This regional plan identifies areas along the State Route 8 corridor in Shelton, including the proposed substation site, for future industrial and managed growth.

On the municipal level, land use and open space objectives are defined in Shelton's 2006 *Plan of Conservation and Development.* This plan identifies the area in the vicinity of the proposed substation site as an "office and industrial node" and encourages business development to support the city's role as a regional employment center, while also promoting the planned preservation of greenway corridors, 100-year floodplains, agricultural lands, and other environmental resources. In the city's Future Land Use Plan (contained within the 2006 *Plan of Conservation and Development),* the anticipated use of the proposed substation site is characterized as office/light industrial.

[14] According to the state Office of Policy and Management (OPM), this state C&D Plan, which was adopted in 2005, will remain current until 2013. The OPM recently issued a public draft of the 2013-2018 C&D Plan, which shows the proposed substation site and most of the surrounding region as a priority growth area.

Further, the plan specifically states that the city should support the electric transmission utilities' efforts to address regional demand and reliability issues and also to size utility capacity, including electric facilities, to accommodate anticipated local needs and desired development patterns. Ensuring adequate utility capacity is identified as a high priority for guiding future economic development in the City of Shelton.

In the open space component of the *Plan of Conservation and Development*, the Far Mill River is identified as a conceptual greenway corridor, extending from the city's boundary with Monroe to the Housatonic River. However, the economic development plan identifies the corridor along State Route 8 and Bridgeport Avenue for general regional corporate or corporate park use.

<u>Recreational Resources</u>

There are no designated scenic resources, parks, or other open space areas located on or in the vicinity of the proposed substation site. However, the entire Far Mill River, extending from Monroe to the Housatonic River, was identified in the city's 1993 *Open Space Plan* as a conceptual greenway corridor. The Far Mill River is one of seven such greenways recognized by the city. According to the city's *Open Space Plan*, conceptual greenways are areas of special interest, within which the city may prioritize open space purchases and review proposed developments for potential impacts to the greenway.

The closest designated open space parcels, as identified in the City of Shelton's 2009 *Open Space Plan*, are located approximately 0.25 mile south of the site, along the Far Mill River south of State Route 8 (the 6.3-acre Well Spring Estates property) and a 0.9-acre parcel along Beard Sawmill Road. Other designated open space is located along the river between Bridgeport and Huntington avenues, northwest of the proposed substation site.

VI.E Visual and Aesthetic Characteristics

As a former industrial "brownfields" property, the proposed substation site has no scenic value. Further, except for the wooded riparian corridors along the Far Mill River and Black Brook, the visual landscape in the vicinity of the UI property is dominated by a mix of commercial, utility, and transportation features, including State Route 8 and Old Stratford Road, the overhead CL&P 115 kV transmission lines, the multi-story hotel, and recent commercial/retail uses abutting Old Stratford Road and Bridgeport Avenue. Appendix A includes photographs that illustrate the visual environment on and in the vicinity of the site.

VI.F Transportation and Utilities

The proposed substation site is readily accessible via Pootatuck Place, a local access road that extends north from Old Stratford Road. State Route 8, which is located directly to the southeast of the site, is accessible via the Old Stratford Road interchange (Exit 12). Bridgeport Avenue (State Route 714) is a major arterial that extends north to south through Shelton, paralleling State Route 8 and approximately 0.2 mile to the north of the proposed substation site. Other major regional highways, including Interstate 84, Interstate 95, and the Merritt Parkway (State Route 15) are accessible from State Route 8 as well as from the local road network.

CL&P’s Devon-Stevenson 115 kV overhead transmission line ROW extends north to south across the western portion of the proposed substation site. This ROW is approximately 110 feet wide and is occupied by three active transmission lines. In addition, a fourth line is located within the ROW, but is not presently in service.

A municipal sewer line also extends across the western portion of the site. This sewer line is buried across the proposed site, but spans the Far Mill River. A municipal sewage pump station is located approximately 0.2 mile north of the site, across the Far Mill River.

VI.G Cultural (Archaeological and Historic) Resources

As a result of past industrial development, surficial and subsurface materials on the entire proposed substation site have been previously disturbed. As a result, there is no potential for the site to encompass intact buried archaeological sites. Further, areas near the site have been extensively developed for transportation or commercial purposes (e.g., Old Stratford Road, State Route 8, CL&P’s transmission line corridor, and retail/hotel uses) and do not contain any standing structures of historic importance.

A review of the National and State Registers of Historic Places indicates that there are no designated standing historic structures in the vicinity of the proposed substation site. Further, in December 2011, UI submitted correspondence to the Connecticut State Historic Preservation Office (SHPO)[15] concerning the proposed substation. The SHPO confirmed that the development of the substation will have no adverse effect on cultural resources (refer to correspondence with the SHPO included in Appendix B). Additionally, in September 2012, UI submitted correspondence to the respective Tribal

[15] The SHPO is part of the Connecticut Department of Economic and Community Development, Offices of Culture and Tourism, Historic Preservation and Museum Division.

Historic Preservation Officers (THPO) of the Mohegan Tribe and the Mashantucket Pequot Tribal Nation for the purpose of confirming that the proposed substation will not result in any adverse effects on Native American resources.[16] The Mashantucket Pequot Tribal Nation has confirmed that the proposed substation does not appear to have any impact to potentially significant religious and cultural resources for the Mashantucket Pequot Tribe (refer to correspondence to the THPO included in Appendix B). UI has not yet received the Mohegan Tribe's response.

VI.H Air Quality, Noise, and Lighting

<u>Air Quality</u>

Ambient air quality is affected by emissions from both mobile sources (e.g., automobiles, trucks) and stationary sources (e.g., manufacturing facilities, power plants, and gasoline stations). Naturally occurring pollutants, such as radon gas, also affect air quality. In addition to emissions from sources within the state, Connecticut's air quality is significantly affected by pollutants that are emitted in states located to the south and west, and then transported into Connecticut by prevailing winds.

The DEEP monitors ambient air quality in the state. Air quality conditions are assessed in terms of compliance with national standards for selected "criteria" pollutants, as well as conformance with regulations governing the release of toxic or hazardous air pollutants.

The state is designated as either in attainment or in non-attainment with respect to National Ambient Air Quality Standards for six criteria air pollutants: particulate matter < 10 micrometers in diameter (PM_{10}), particulate matter <2.5 micrometers in diameter ($PM_{2.5}$), sulfur dioxide, ozone, nitrogen dioxide, carbon monoxide, and lead. Currently, Connecticut is in compliance with the standards for all criteria pollutants but the ozone and $PM_{2.5}$ NAAQS. Shelton is within the southwestern portion of the state that is designated as non-attainment for both of these standards.

Connecticut has a variety of programs aimed at reducing air pollutant emissions. For example, state regulations (RCSA 22a-174-18) prohibit vehicles of all kinds from unnecessary idling for more than three minutes.

[16] Correspondence with the respective Tribes was made in connection with requirements for a Category 2 General Permit Application to the Corps.

Noise

To assess the existing sound environment in the vicinity of the proposed substation site, UI commissioned a noise survey. This survey was performed in October 2011. The results of this survey are presented in Appendix D and summarized below.

Existing noise levels in the vicinity of the proposed substation site are influenced by the proximity to State Route 8 and Old Stratford Road. Noise levels vary throughout the day and are influenced by the volume of vehicular traffic on these roads, as well as the activities associated with the nearby commercial uses and occasional helicopter and fixed-wing aircraft overflights. Table VI-1 *(Typical Noise Levels Associated with Different Indoor and Outdoor Activities)* lists typical sound levels associated with different types of environments and activities.

There are no residences in the immediate vicinity of the substation site. The closest residence is at 26 Beard Sawmill Road, approximately 470 feet north of the substation property boundary.

For the baseline noise survey, noise measurements were recorded at three locations in the vicinity of the substation property: (1) Entrance to the Lower Route 8 Pump Station; (2) Northwest corner of Bridgeport Road and Bear Sawmill Road; and (3) Pootatuck Place near gated entrance to proposed substation site. These three locations were selected to represent the typical sound environment in the vicinity of the site; that is, a suburban mixed-used area with significant traffic noise.

The results of the survey determined that the hourly background A-weighted sound pressure levels (dBA) at three locations ranged from 42 to 62 dBA during the daytime and nighttime hours. These levels reflect the hourly background sound levels. Throughout the day, the ambient sound levels were occasionally higher due to transient, short-term events such as vehicle traffic, aircraft flyovers, truck traffic, nearby commercial/retail activities, etc.

Table VI-1
Typical Noise Levels Associated with Different Indoor and Outdoor Activities

SOUND PRESSURE LEVEL (dBA)	SUBJECTIVE EVALUATION	COMMON OUTDOOR ENVIRONMENT OR SOURCE	COMMON INDOOR ENVIRONMENT OR SOURCE
140	Deafening	Jet aircraft at 75 ft	
130	Threshold of pain	Jet aircraft during takeoff at a distance of 300 ft	
120	Threshold of feeling	Elevated Train	Hard rock band
110	Extremely Loud	Jet flyover at 1000 ft	Inside propeller plane
100	Very Loud	Power mower, motorcycle at 25 ft, auto horn at 10 ft,	
90	Very Loud	Propeller plane flyover at 1000 ft, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately Loud	Diesel truck (40 mph) at 50 ft	Inside auto at high speed, garbage disposal, dishwasher
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner, electric typewriter
60	Moderate	Air-conditioner condenser at 15 ft, near highway traffic	General office
50	Quiet		Private office
40	Quiet	Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence (without TV. and stereo)
20	Very quiet	Rustling leaves	Quiet theater, whisper
10	Just audible		Human breathing
0	Threshold of hearing		

Source: Adapted by Black & Veatch from *Architectural Acoustics*, by David M. Egan (1988) and *Architectural Graphic Standards*, by Ramsey and Sleeper (1994).

The State of Connecticut has noise regulations (RCSA 22a-69-1 to 22a-69-7.4) that define daytime and nighttime noise periods, classify noise zones based on land use, and identify noise standards for each zone. Table VI-2 (*State of Connecticut and City of Shelton Noise Control Regulations by Emitter and Receptor Land Use Classification)* summarizes Connecticut's noise zone standards by receptor noise classification. In general, the regulations specify that noise emitters must not cause the emission of excessive noise so as to exceed the allowable noise levels on a receptor's land. As Table VI-2 shows, the allowable noise levels vary by type of noise emitter and type of noise receptor; for example, an industrial noise emitter (such as a substation) is allowed a 70 dBA level on other industrial receptors, but only a 61 dBA (daytime) level on residential areas.

The City of Shelton's noise ordinance, which was adopted in 2007, generally parallels the state noise regulations, except that the City defines daytime hours as 7:30 AM to 9:00 PM instead of 7:00 AM to 9:00 PM (refer to Table VI-2).

Table VI-2
State of Connecticut and City of Shelton Noise Control Regulations by Emitter and Receptor Land Use Classification

Noise Emitter Class	**Noise Receptor Class**			
	C: Industrial	**B: Generally Commercial**	**A: Residential Day**	**A: Residential Night**
C: Industrial	70 dBA	66 dBA	61 dBA	51 dBA
B: Generally Commercial	62 dBA	62 dBA	55 dBA	45 dBA
A: Residential	62 dBA	55 dBA	55 dBA	45 dBA

Definitions:

City
Day = 7:30 AM (City) to 9:00 PM
Night = 9:00 PM to 7:30 AM

State:
Day = 7:00 AM to 10:00 PM
Night = 10:00 PM to 7:00 AM

Lighting

The proposed substation site is located in a busy, well-lit suburban area. Parking lot and commercial lighting is evident along Old Stratford Road, as well as from the various office, retail, and restaurant uses located along Bridgeport Avenue.

VII. POTENTIAL ENVIRONMENTAL EFFECTS AND MITIGATION MEASURES

This section discusses the potential environmental effects that will result from the construction and operation of the proposed Shelton Substation and the measures that UI has identified to avoid, minimize, or mitigate such effects. Overall, the proposed substation will result in the beneficial redevelopment of this former industrial “brownfields” site. The principal environmental effects will be associated with construction, and generally will be localized to the site, minor, and short-term.

The construction and operation of the substation will represent a long-term change in the current (vacant) land use of the site, but will be consistent with the historical use of the site for industrial purposes. The Project will modify on-site vegetation and wildlife habitat, as well as views of the site. In addition, the development of the substation will require the unavoidable filling of the small wetland located on the southwestern portion of the site.

In general, however, these changes will be localized to the site and the immediate vicinity of the site. Further, UI will implement measures to avoid, minimize, or mitigate adverse effects, as appropriate, based on standard UI procedures, the results of the Siting Council process, and the conditions of the Corps’ and other approvals required for the Project.

The substation will be designed, constructed, and operated to avoid or minimize adverse effects to the groundwater monitoring well system that is located on the eastern portion of UI’s property and to any ongoing efforts to remediate groundwater affected by the past industrial use of the property.

VII.A Topography, Geology, and Soils

The construction and operation of the Project will not affect geologic conditions. Because the site is relatively flat and has been historically used for industrial purposes, minimal grading of existing on-site soils is expected to be required. No blasting will be required. However, additional soils and fill materials will be imported to the site to raise the average elevations of the substation above the 100-year floodplain, as well as to establish an appropriate base for the substation equipment and ground grid.

UI will deploy soil erosion and sedimentation controls around work areas to minimize the potential for sedimentation or stormwater runoff, and will implement a *Soil Erosion and Sediment Control Plan* for construction activities. Particular care will be taken to avoid runoff into the Far Mill River and Black Brook. UI will adhere to the requirements of the *General Permit for the Discharge of Stormwater and Dewatering Wastewaters Associated with Construction Activities* (*General Permit*), issued by the DEEP.

VII.B Water Resources and Water Quality

The construction and operation of the Project will not directly affect any watercourses (i.e., either the Far Mill River or Black Brook). However, portions of the substation will be located within the Far Mill River 100-year and 500-year floodplain boundaries.

In addition, all of the small 7,200-square-foot (0.17-acre) wetland located in the southwestern portion of the site (under and in the vicinity of the CL&P transmission line corridor) will be directly or indirectly affected by the development of the substation. UI investigated options for avoiding this wetland, but all such options would require either additional impacts to the groundwater monitoring wells that are established on the eastern portion of the site or modifications to the substation ground grid. Therefore, UI will apply to the Corps for a permit to fill the wetland and will coordinate with the Corps and other involved federal and state agencies (including DEEP) regarding appropriate compensatory mitigation.

The construction and operation of the Shelton Substation will not affect either the Far Mill River or Black Brook. The forested riparian area along the Far Mill River, which generally abuts the existing access road on the UI property, will not be affected by the development of the substation. With the exception of the 0.17-acre wetland, construction activities will be confined to upland areas of the property

Black Brook, which has been channelized, is located adjacent to the eastern UI property boundary within a forested area near State Route 8. Substation construction activities will not occur on this portion of the UI property, which is east of the on-site groundwater monitoring well field.

During the construction of the substation, areas of disturbed soils and spoil piles will be protected with appropriate erosion and sedimentation controls in order to avoid the potential for sedimentation into the Far Mill River or Black Brook. Construction activities will conform to

UI's *Soil Erosion and Sediment Control Plan* and *Spill Prevention Plan*, as well as the requirements of the DEEP *General Permit*. Appropriate spill prevention, control, and countermeasure procedures will be implemented during construction (to minimize the potential for inadvertent spills or leaks from construction equipment and to define procedures to promptly clean up any spills that do occur) and during operation of the facility (e.g., to avoid or minimize the potential for spills or leaks from substation equipment).

Based on hydraulic analysis of the Far Mill River in the vicinity of the UI property and the substation design, the substation is not expected to affect the flood storage capacity of the floodplain. Refer to Section V.A.1 for additional information.

VII.C Biological Resources

The development of the Shelton Substation will involve the removal of all existing vegetation within the footprint of the proposed substation facilities. The scrub-shrub and herbaceous vegetative communities that currently characterize portions of the site will be replaced by the substation yard, and the wildlife species that presently utilize the site will be displaced.

In addition, vegetation will be affected on portions of the UI property that will be used for substation construction staging and support. Such herbaceous or scrub-shrub vegetation will be cut or mowed as needed to allow construction staging.

The development of the substation will represent a long-term conversion of two acres to industrial use, whereas the other portions of the UI property used for construction staging will only be affected temporarily. Such staging areas will be restored and allowed to revegetate after the completion of substation work activities.

Overall, the impacts of the Project on vegetation and wildlife will be minor. Other herbaceous and scrub-shrub communities are present in the vicinity of the site and can be expected to provide habitat for the displaced wildlife species. Further, the site was historically developed for industrial purposes (i.e., the Lord Corporation facility) and thus the wildlife habitat that does exist is relatively newly established. In addition, over the past year, UI's vegetation management contractors have been using portions of the property for equipment and vehicle staging. As a result, while the development of the substation will represent a long-term change in on-site vegetation and wildlife, the overall effect will be minor and localized.

The forested vegetation along the Far Mill River and Black Brook will not be affected by the development of the substation. As a result, no adverse effects to the species of fish and wildlife that utilize the river corridor are expected to occur. Similarly, vegetative buffers along Old Stratford Road and Pootatuck Place will be retained to the extent possible and also will continue to provide bordering wildlife habitat.

The small, isolated wetland on the site will be affected directly by the development of the substation. However, the wetland was relatively recently created and consists of soils that have been deposited over an asphalt area (likely a former parking area associated with the former manufacturing use of the site). It is expected that as the asphalt cracks and degrades over time, this area will not hold water sufficient to sustain wetland soils or vegetation. Further, vegetation within the wetland was recently mowed, and therefore the wetland does not provide any significant habitat for wildlife.

Based on a review of the DEEP NDDB maps, and as confirmed by correspondence from the NDDB (refer to Appendix B), no designated threatened, endangered, or special concern species will be affected by the Project.

VII.D Land Use, Zoning, Land Use Plans, and Recreation

The proposed substation will result in the conversion of the existing, vacant brownfields site to productive utility use. The substation also will be consistent with the historical use of the site (for industrial purposes), as well as with existing zoning and state, regional, and local land use plans. Indeed, public utility substations are a permitted use in the OPD under Section 23 of the *Zoning Regulations of the City of Shelton, Connecticut (amended August 1, 2011)* (refer to Bulk Filing of Municipal Documents).

Due to its location within UI's property (i.e., adjacent to Old Stratford Road, Pootatuck Place, the Far Mill River, and State Route 8), the substation will be effectively isolated from nearby commercial uses. The substation will generally be consistent with other utilities in the area, including the sewage pumping station located to the northeast of the site (across the Far Mill River) and the CL&P ROW that traverses the western portion of the site.

The proposed substation will not affect any designated or planned recreational uses. The site is owned by UI, was previously used for industrial purposes, and is presently fenced and gated. Thus, the site does not currently afford any access to the Far Mill River. The City of Shelton has designated the river as a "conceptual greenway corridor" and a trail is identified as located along the northern bank of the river, opposite UI's property. However, the construction and operation of the proposed substation will not affect the riparian corridor along the Far Mill River and thus will not affect the use of this trail (if developed) for recreational purposes.

VII.E Visual and Aesthetic Characteristics

The proposed substation will represent a change in the current visual environment. To evaluate potential views associated with the proposed substation, UI commissioned All-Points Technology Corporation, P.C. (APT) to conduct a visibility analysis. This analysis, which is provided in Appendix E, included a combination of predictive computer modeling and field evaluations. Visual simulations of the proposed substation under "leaf off" (winter type) conditions also were performed.

The visibility analysis determined that year-round views of the substation would be limited to a modest geographic footprint due to the relatively short height of the proposed facilities and the intervening topography and mature vegetation in the Project area. Year-round views would be confined to locations on and within the immediate vicinity of the site and would extend approximately 500 feet south and west.

VII.F Transportation and Utilities

The construction and operation of the Project will not result in any significant adverse effects on transportation or utility systems. Overall, the Project will improve the reliability of the regional electric distribution system.

The substation site is readily accessible from the local and regional highway network, and is adjacent to CL&P's 115 kV overhead transmission lines. The development of the substation will improve UI's distribution system with additional 13.8 kV circuits in the Shelton area, thereby affording UI customers more reliable and increased supplies of electricity. The Project will not affect any existing municipal utilities.

The construction of the Project will have a minor and short-term effect on vehicular traffic on the local roads leading to the site, particularly Old Stratford Road and Pootatuck Place. At times during construction, localized traffic congestion may occur when heavy construction equipment or large components are transported to the site, as well as when construction workers travel to and from the site. However, these effects, if any, will be limited to the immediate vicinity of the site and will be minor. Parking and laydown areas in support of the substation construction activities are expected to be located on UI's six-acre property. Overall, due to the site's proximity to multi-lane, major transportation routes (i.e., adjacent to State Route 8 Exit 12 and near Bridgeport Avenue), the effects on local traffic congestion are expected to be minimal.

The operation of the substation will not require full-time on-site personnel and thus will not result in any long-term effects on traffic.

VII.G Cultural (Archaeological and Historic) Resources

No cultural resource sites (archaeological or historical) or standing historic structures are known to exist on or in the immediate vicinity of the proposed substation site. All construction activities associated with the proposed substation will be in areas previously developed for industrial use, where soils have already been extensively disturbed. As a result, the potential for encountering intact, previously unrecorded, significant archaeological resources is negligible, and no adverse effects on cultural resources are expected to occur. In correspondence dated June 28, 2012, the SHPO concurred that the Project, as presently planned, will have no significant adverse effects on cultural resources. In correspondence dated September 12, 2012, the Mashantucket Pequot Tribe confirmed that the Project does not appear to have any impact to potentially significant religious and cultural resources for the Mashantucket Pequot Tribal Nation (refer to correspondence to the THPO included in Appendix B).

VII.H Air Quality, Noise, and Lighting

The development of the proposed substation will result in short-term and localized effects on air quality as a result of emissions from construction equipment and related vehicles. Localized noise impacts also will occur as a result of construction equipment movements and general construction activities. In addition, some modifications to the ambient sound environment will occur as a result of the operation of the substation.

Air Quality

The construction of the substation will require the movement of construction equipment, as well as site preparation activities (e.g., grading, filling) that will create vehicular air emissions and dust. Emissions from construction equipment and vehicles will be minimized by proper maintenance and by limiting unnecessary idling. Dust emissions will be controlled by applying water or equivalent materials to exposed soils on the site, as necessary.

Noise

The construction of the Shelton Substation will cause temporary increases in sound levels on and in the vicinity of UI's property as a result of activities such as the operation of construction equipment and vehicles. However, because the Project is located adjacent to a commercial area, Old Stratford Road, and State Route 8, these temporary increases in noise will generally be consistent with other uses in the vicinity.

There are no sensitive receptors (e.g., schools, residential neighborhoods) in the immediate vicinity of the site. Further, typical construction activities are expected to occur during daylight hours, between 7:00 AM and 5:00 PM, Monday to Friday.

After the substation is placed in service, infrequent impulse noise will be generated from switching and circuit breaker opening and closing. The impulse noise levels and steady-state transformer noise levels will not exceed the levels permitted by the City of Shelton's noise control regulations during normal operating conditions. Based on the results of the noise study (refer to Appendix D), the operation of the substation will cause less than perceptible increases to the ambient sound level at the nearest noise-sensitive receptor (i.e., a residence located 470 feet from the property boundary). Further, the sound levels associated with the substation will not exceed the limits for adjacent noise classes identified in the City of Shelton noise ordinance and in State noise regulations.

Lighting

The construction of the proposed substation may require some security lighting that may be visible from nearby commercial areas or from adjacent portions of Old Stratford Road and Pootatuck Place.

During operation, the substation will have low-level lighting for safety and security purposes. The illumination from these lights will be visible only in the immediate vicinity of the substation, such as along Old Stratford Road near the site and from Pootatuck Place. Other types of lighting will be used only for work at night under abnormal or emergency conditions.

VII.I Effects of Project on Environmental Site Remediation

The development of the Shelton Substation will not affect the ongoing groundwater remediation associated with the former industrial use of the site. In fact, the substation design takes into consideration the location of the existing groundwater wells and the preservation of the access that is required to periodically reach the wells for monitoring and molasses injection purposes.

In addition, UI consulted with the former property owners and conducted a due diligence analysis prior to the purchase of the six-acre property in 2009. The substation will be developed on portions of the former industrial site that have already undergone remediation. Substation construction activities will not adversely affect active groundwater monitoring wells[17] or the ongoing groundwater remediation effort that is being performed on behalf of Lord.

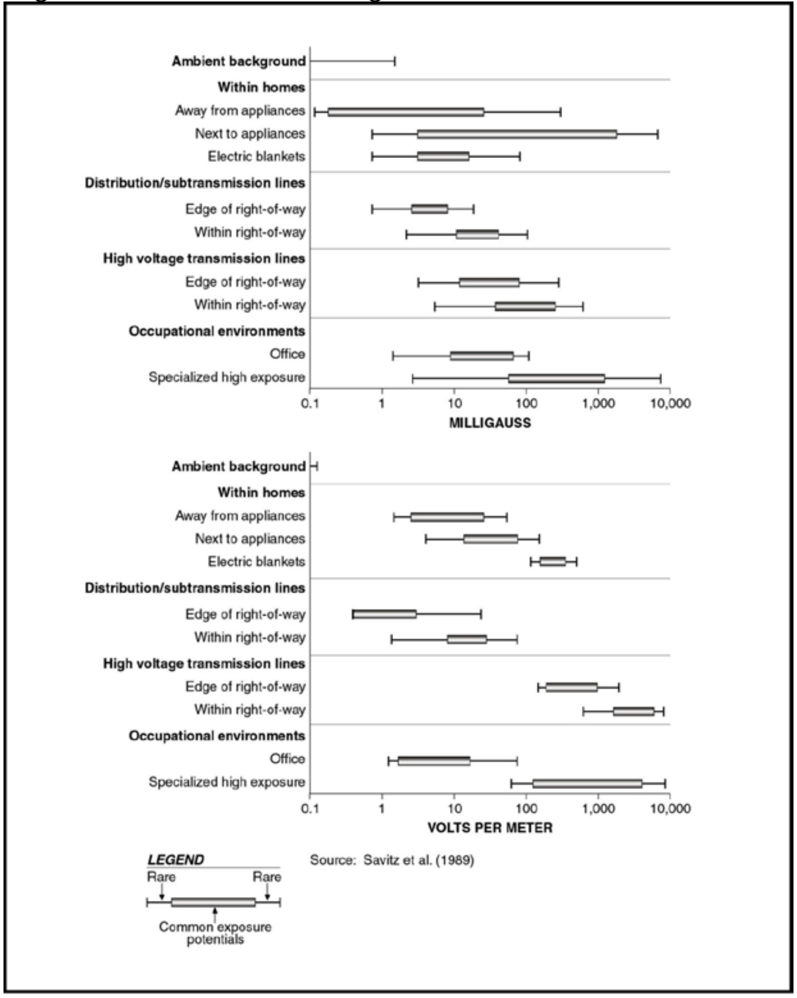
[17] Some groundwater wells will be relocated outside the substation site prior to the start of substation construction.

VIII. ELECTRIC AND MAGNETIC FIELD CONSIDERATIONS

Introduction

Electric and magnetic fields (EMF) surround anything that generates, transmits, or uses electricity. EMF is present in nearly every place we encounter daily, including our schools, workplaces, and homes. Typical sources of EMF in these locations include appliances, nearby distribution and transmission lines, wiring, and electric current flowing on conductive water pipes. Figure VIII-1 depicts typical magnetic-field levels measured in residential and occupational environments, compared to levels measured on or at the edge of transmission line ROW.

Figure VIII-1: Electric and magnetic field levels in the environment



Magnetic Fields. The current flowing in the conductors of a substation bus-line or an overhead transmission line generates a magnetic field near the conductor. The strength of Project-related magnetic fields in this report is expressed as magnetic flux density in units of milligauss (mG), where 1 Gauss (G) = 1,000 mG. In the case of alternating current (AC) transmission lines, these currents (and thus magnetic fields) vary in direction and magnitude with a 60-Hertz (Hz) cycle. Since load current—expressed in units of amperes (A)—generates magnetic fields around the conductors, measurements or calculations of the magnetic field present a "snapshot" for the load conditions at only one moment in time. On a given day, throughout a week, or over the course of months and years, the magnetic-field level can change depending upon the patterns of power demand on the bulk transmission system.

Electric Fields. The voltage on the conductors of transmission lines generates an electric field in the space between the conductors and to ground. Many objects are conductive—including fences, shrubbery, and buildings—and thus shield electric fields. Electric fields within the Shelton Substation therefore are not calculated since they are likely to be blocked by the substation fence. In addition, the buried distribution lines will not be a source of 60-Hz electric fields above ground, since electric fields are confined by the cables' conductive sheath and armor, as well as blocked by the surrounding soil and duct bank. In this report, electric-field levels are calculated beneath the transmission lines and are expressed in units of kilovolts per meter (kV/m), 1 kV/m is equal to 1,000 volts per meter (V/m).

Assessment of EMF for the Shelton Substation

Substations are less common EMF sources than distribution lines but nevertheless, substations of varying sizes can be found in many communities. For this Project, UI proposes to construct a new substation that will take electricity from an existing, adjacent 115-kV transmission line and convert it to 13.8 kV for distribution in the surrounding Greater Shelton area.

An EMF assessment of the potential effects of the Shelton Substation was performed by Exponent. Exponent's complete report is provided in Appendix I, including EMF measurements of the existing electrical facilities at the proposed site, as well as modeling of the proposed substation itself and adjacent transmission lines. The results of these analyses are summarized below.

EMF Measurements and Modeling of Overhead Transmission Lines

Measurements of EMF levels from existing sources (the overhead transmission lines) at the proposed boundaries of the Shelton Substation were taken to assess pre-construction conditions. Magnetic- and electric-field measurements were performed on July 13, 2012 and July 27, 2012, respectively and are discussed in greater depth in the attached Appendix I. The highest magnetic field in the vicinity of the substation was approximately 27 mG and was measured beneath an overhead distribution line. The adjacent transmission lines produced a measured magnetic-field level between 15 and 20 mG, and an electric-field level of 1.97 kV/m at the center of the ROW.[18] Post-construction modeling of the EMF levels from the transmission lines are consistent with these measurements and are presented in Appendix I.

Substation Modeling Results

A separate model was used to assess the post-construction magnetic-field levels due to sources within and nearby the proposed substation itself. The results of this analysis are presented as magnetic-field profiles around the perimeter of the proposed two-acre substation site, and are based on information regarding the types of substation equipment, as well as the locations of the 115 kV transmission line interconnection and 13.8 kV duct lines. The calculated magnetic-field levels around the perimeter of the proposed substation are depicted in Figure VIII-2 for average- and peak-load conditions. Tables VIII-1 and VIII-2 summarize the maximum, average, and minimum magnetic-field values along the four edges of the substation perimeter, as well as for distances of up to 100 feet from the substation fence. At a distance of 100 feet from the substation perimeter (away from the transmission line ROW) the calculated EMF levels are similar to or lower than those measured or calculated for pre-construction conditions.

[18] At the edge of the ROW the measured electric-field level was approximately 0.27 kV/m.

Figure VIII-2: Calculated Magnetic-Field Profile around the Perimeter of the Proposed Substation for both Average and Peak Loading

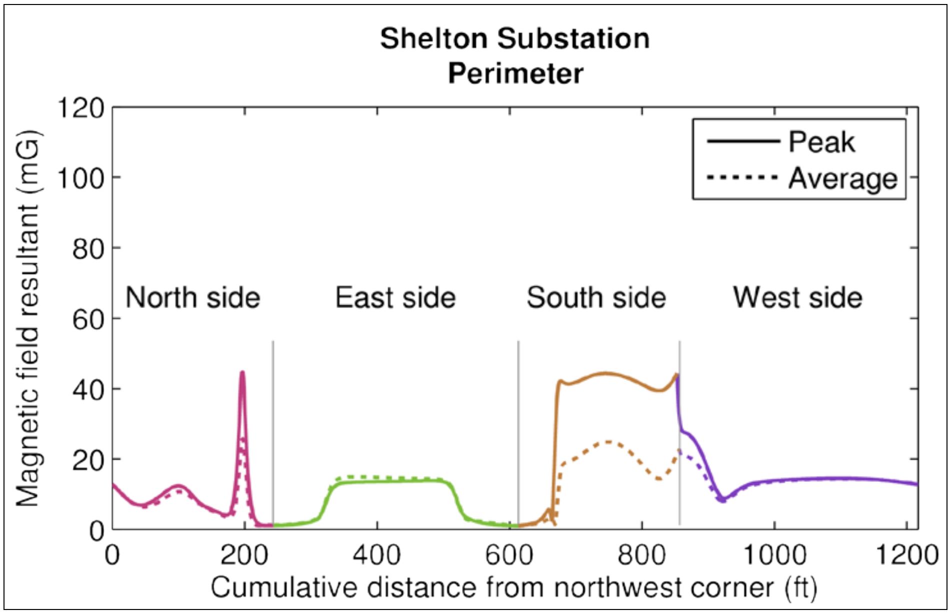


Table VIII-1: Calculated magnetic-field levels (mG) around the perimeter of the Shelton Substation for both average and peak loading

	Average Loading			Peak Loading		
Profile	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**
North Side	25.8	7.5	1.2	44.7	9.2	1.1
East Side	14.9	8.7	1.0	13.9	8.2	1.0
South Side	24.9	15.8	1.0	44.3	32.6	1.0
West Side	22.8	13.8	8.1	44.3	15.1	8.9

Table VIII-2: Calculated magnetic-field levels (mG) at distances of 25, 50, and 100 feet from the edge of the Shelton Substation for peak loading

Perpendicular Profile	25 feet	50 feet	100 feet
1) North Side	2.7	1.9	1.6
2) East Side	1.6	0.5	0.3
3) South Side	20.7	18.7	16.4
4) West Side	20.2	13.8	3.6

Consistency with Connecticut Siting Council Policies

Neither the federal government nor Connecticut has enacted standards for magnetic fields or electric fields from power lines or other sources at power frequencies. Several other states have statutes or guidelines that apply to fields produced by new transmission lines, but these guidelines are not health based. For example, New York and Florida have limits on EMF that were designed to limit fields from new transmission lines to levels characteristic of the fields from existing transmission lines.

More relevant EMF assessment criteria include the exposure limits recommended by scientific organizations. These exposure limits are included in guidelines developed to protect health and safety and are based upon reviews and evaluations of relevant health research. These guidelines include exposure limits for the general public recommended by the International Committee on Electromagnetic Safety (ICES) and the International Commission on Non-Ionizing Radiation Protection (ICNIRP) to address health and safety issues (ICES, 2002; ICNIRP, 2010).

In a June 2007 Factsheet, the World Health Organization included recommendations that policy makers should adopt international exposure limit guidelines, such as those from ICNIRP or ICES (Table VIII-3), for occupational and public exposure to EMF.

Table VIII-3. ICNIRP and ICES guidelines for EMF exposure

	Exposure (60 Hz)	
	Electric Field	Magnetic Field
ICNIRP		
Occupational	8.3 kV/m	10 G (10,000 mG)
General Public	4.2 kV/m	2 G (2,000 mG)
ICES		
Occupational	20 kV/m	27.1 G (27,100 mG)
General Public	5 kV/m*	9.040 G (9,040 mG)

*Within power line rights-of-way, the guideline is 10 kV/m under normal load conditions.

The Siting Council has published a guide for applications for Certificates of Environmental Compatibility and Public Need for electric substations that addresses EMF (2010). The guide calls for information to be provided on a number of topics, including public health and safety in Section I.1, and on EMF specifically in Section L, where information supporting the consistency of the proposed facility with the Siting Council's EMF Best Management Practices (BMP) for transmission lines (2007) is to be provided.

Interdisciplinary panels of scientists formed by national and international scientific agencies are good sources of information and guidance for governments and the public; these panels have evaluated the scientific research related to health and power-frequency EMF. Research on this topic varies widely in its approach but the general scientific consensus of the health agencies reviewing this research is that at levels associated with the operation of the proposed substation, associated lines, or other common sources of EMF in our environment there is no support for the conclusion that EMF causes any long-term, adverse health effects. This consensus has not changed since the Siting Council's most recent EMF BMPs were published as indicated in the conclusions of the Swedish Radiation Protection Authority (SSI, 2008), the Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR, 2009), ICNIRP (2010), and the European Health Risk Assessment Network on Electromagnetic Fields Exposure (EFHRAN, 2010).

While neither the Siting Council nor the above cited national and international health and scientific agencies have concluded that electric or magnetic fields pose a health hazard, the Siting Council has embraced policies that would tend to minimize public exposure to ensure that a "proposed facility would not pose an undue safety or health hazard"[19] and have advocated "the use of effective no-cost and low-cost technologies and management techniques on a project-specific basis to reduce MF [magnetic field] exposure to the public while allowing for the development of efficient and cost-effective electrical transmission projects." [20]

The EMF assessment for this Project was conducted in accordance with the Siting Council's *Application Guide for an Electric Substation Facility* and fulfills requirements of the Siting Council's *EMF Best Management Practices (BMP) for the Construction of Electric Transmission Lines in Connecticut* (EMF BMP).

[19] Connecticut Siting Council. Application Guide for an Electric Substation Facility. April, 2010. http://www.ct.gov/csc/lib/csc/guides/guidesonwebsite042010/elecsubstationfac0410.pdf#31224

[20] Connecticut Siting Council. Electric and Magnetic Field Best Management Practices for the Construction of Electric Transmission Lines in Connecticut. December 14, 2007. http://www.ct.gov/csc/lib/csc/emf_bmp/emf_bmp_12-14-07.doc

The design of the substation has incorporated reasonable measures to minimize EMF consistent with the Siting Council's recommendations for transmission lines, including:

- The substation and related construction is to be designed to meet or exceed the requirements of the National Electrical Safety Code (NESC).
- The proposed site does not abut statutory facilities defined in Public Act No. 04-246 and no additional buffer beyond that called for by the NESC and standard utility design and practice is required.
- The substation is located adjacent to the existing 115-kV 1560/1570/1580/1590 transmission line ROW and the length of the interconnecting transmission line is very short.
- One adjacent transmission line is currently de-energized, however, UI is conscientiously looking toward the future and has chosen a conductor phasing arrangement for the four transmission lines to minimize EMF levels at the edge of the ROW.
- While the substation will be an additional source of EMF, the field levels produced will be consistent with the range of EMF associated with the existing sources— the adjacent overhead transmission and distribution lines—and will decrease rapidly with distance. At buildings adjacent to the site, the magnetic field-levels will be similar to or lower than those produced by ordinary distribution lines (NIEHS, 2002).
- The substation is located on two acres of a six-acre property significantly increasing the distance between the substation and residences in the area, the nearest of which is more than 500 feet away.
- The new 13.8 kV distribution circuits will exit the substation in an underground ductbank. The close proximity of the conductors within this ductbank will help to minimize the magnetic field above ground and totally shield the electric field as compared to an above-ground line.

Comparing Figure VIII-1 to the results discussed above, the calculated magnetic-field levels in the vicinity of the Shelton Substation are comparable in magnitude to the magnetic-field levels encountered in the vicinity of typical distribution lines and in homes and workplaces. Additional measures to reduce magnetic fields have been evaluated but have been determined not to be cost-effective especially considering that calculated magnetic fields from the proposed substation are quite low and will not appreciably change outside the boundaries of the UI property and existing transmission line ROW.

The highest calculated magnetic-field level at the perimeter of the Shelton Substation fence is less than 3% of that recommended for the general public by international health-based standards (ICES and ICNIRP) and is comparable to fields that may be found in homes near major appliances. Where the 1560, 1570, 1580 and 1590 transmission lines extend overhead on double-circuit transmission line towers in the vicinity of the Shelton Substation, the magnetic-field levels are approximately 1% or less of recommended exposure limits and electric-field levels are less than 10% of the recommended exposure limits.

The substation will occupy only two acres of the six-acre UI property and EMF levels at the edge of the property will be still lower, and in most locations on the property, will be comparable to magnetic field levels produced by existing transmission and distribution lines. The calculated magnetic fields produced by the proposed Shelton Substation therefore will be far below recommended guidelines for exposure of the general public and will likely have no effect on the EMF levels at residences in the area, the nearest of which is more than 500 feet away.

References

European Health Risk Assessment Network on Electromagnetic Fields Exposure (EFHRAN). Risk Analysis of Human Exposure to Electromagnetic Fields. Report D2 of the EFHRAN project, July 2010.

International Commission on Non-Ionizing Radiation Protection (ICNIRP). ICNIRP Statement—Guidelines for limiting exposure to time-varying electric and magnetic fields 1 Hz to 100 kHz. Health Phys 99: 818-836, 2010.

Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) for the Directorate-General for Health & Consumers of the European Commission. Health Effects of Exposure to EMF. January 2009.

Swedish Radiation Protection Authority (SSI). Recent Research on EMF and Health Risks: Fifth annual report from SSMs Independent Expert Group on Electromagnetic Fields, 2007. Report Number: 2008:12, 2008.

IX. ALTERNATIVES CONSIDERED

After determining that a new substation will be required to meet current and projected electric demands in the Greater Shelton Area, UI identified and evaluated alternative substation sites that would meet distribution system needs and provide a cost-effective approach for interconnecting to the existing electric transmission network. The objectives of this alternatives evaluation process were to:

a) Identify and assess potential substation sites that would meet distribution system needs, including distribution substation requirements (size, design), as well as the new or upgraded distribution lines that would be required to interconnect any new substation site to the existing distribution infrastructure and the load centers in Shelton.

b) Evaluate potential substation sites based on engineering, constructability, environmental, social, and cost considerations, applying in particular the criteria contained in UI's *Transmission and Distribution Guideline for Substation Site Selection* (TDG 002; June 2007).

c) Select, from among the locations identified in (a) and (b), potential sites that could feasibly be developed for a distribution substation to meet the overall demands for electricity in the Greater Shelton Area, taking into consideration UI's site selection guidelines.

Using this analysis process, UI identified two potentially feasible sites for the new substation, each of which was subsequently evaluated in greater detail, taking into consideration engineering design, construction, environmental, and cost factors. As a result of these evaluations, UI selected the Old Stratford Road property as the preferred site and the Trap Falls Substation property as an alternative site that could be used to construct and operate the new substation, but at greater cost and with greater potential environmental and social effects.

This section summarizes the site selection process that is discussed in detail in Appendix H (*Site Selection Study*). In particular, the section:

- Reviews the step-by-step evaluations that UI performed that led to the identification of the Old Stratford Road property as the preferred site for the new substation.

- Describes the characteristics of the Trap Falls Substation alternative (but not preferred) site.

IX.A UI SITE SELECTION CRITERIA

IX.A.1 General Criteria

To identify and evaluate alternative sites for a new substation, UI followed the procedures contained in the *Transmission and Distribution Guideline for Substation Site Selection (Guideline)*, which describes the standard procedures and criteria to be used in the substation site selection process. The key factors considered in the site selection process included:

- Distance to load centers and to existing electric transmission lines.
- Site size requirements.
- Site terrain.
- Environmental and land use compatibility.
- Substation construction issues.
- Transmission and distribution line construction requirements.
- Accessibility.
- Cost.

To conduct the alternative siting analyses, UI assembled a multidisciplinary team comprised of personnel with expertise in electrical distribution and transmission system planning, design, and construction; environmental science; and real estate. This team followed a step-by-step process, whereby potential substation locations were first identified and screened in accordance with UI's standard objectives for substation siting. In addition to the factors listed above, the UI team took into consideration the following guiding principles, as detailed in the *Guideline*:

- Minimize the need to acquire residences and viable commercial/industrial uses to accommodate substation development.
- Maintain consistency/compatibility with existing land uses and land use plans to the extent possible.
- Minimize adverse effects on sensitive environmental resources and the social environment.
- Maintain public health and safety.
- Demonstrate cost-effectiveness, while adhering to good engineering and sound environmental planning practices.

- Present the public with a clear and well-documented methodology for the identification of the proposed and alternative sites.

IX.A.2 Distribution System Considerations in the Shelton Area

To meet the distribution capacity need in the Greater Shelton Area, UI determined that any new substation should be located to facilitate interconnections to the existing electric transmission and distribution systems, and particularly to allow cost-effective interconnections to the existing and projected electric load areas. The following primary factors were considered when identifying and assessing potential substation sites:

- *Location of potential sites in relation to load growth centers.* The *Shelton Area Capacity Analysis* determined that the primary areas of load growth in the Greater Shelton Area in the southern portion of the City of Shelton and the southeast portion of the Town of Trumbull were generally in the vicinity of State Route 8 and along the Bridgeport Avenue corridor.

- *Location of potential sites in relation to the existing electric distribution network.* For distribution interconnections, sites are typically preferred that are near existing distribution infrastructure or in areas where new distribution infrastructure could be economically developed to reach load centers. In certain areas, the development of new distribution infrastructure is constrained by land uses, physical encumbrances or the presence of other utilities (which can limit options for the routing of either overhead or underground distribution lines).

- *Availability of land for development of a distribution substation.* The minimum required area for a "distribution only" open-air 115/13.8 kV substation, meaning a substation supplied by two transmission lines with one transmission tie circuit breaker, no expansion capability on the transmission side, and appropriate buffers and setbacks, is two acres.

- *Location of sites in relation to existing transmission lines (possible interconnections).* Four CL&P 115 kV transmission lines extend north to south through Shelton (i.e., the lines from the Stevenson Substation in the Town of Monroe to the Devon Switching Station in the City of Milford) and are located adjacent to UI's Trap Falls Substation. In addition, two UI 115 kV transmission lines extend west from UI's Indian Well and Ansonia substations (referred to as the Derby Junction – Indian Well – Ansonia lines) to interconnect to the Stevenson – Devon lines at Derby Junction, which is located in central Shelton, north of North Constitution Boulevard.

Taking these factors into consideration, UI defined the preferred geographic location area for the new substation as within an approximately one-mile-wide corridor along the existing Devon – Stevenson transmission line corridor between Derby Junction and the Trap Falls Substation. This siting region was selected because the majority of future load growth is expected to be located within the southern portion of Shelton. Further, the loads in Shelton diminish rapidly north of Derby Junction, and the majority of the load relief is needed at Trap Falls Substation and Indian Well Substation.

IX.B IDENTIFICATION AND SCREENING OF POTENTIAL SITES

IX.B.1 Overview of the Site Screening Process

Within the defined geographic siting region, UI applied the siting criteria and conducted baseline research, performed field reconnaissance, and consulted with municipal officials. As a result of this process, UI identified 36 potential sites for initial consideration for the development of the new substation. These potential sites were identified based on the UI *Guideline* and the distribution capacity need and transmission considerations specific to the Greater Shelton Area.

The potential sites were then screened using the following primary criteria:

- Greater than or equal to two acres of developable land (the estimated minimum size for the development of an open-air distribution substation)
- Sites with at least one of the following characteristics:
    - ✓ Land adjacent to the Stevenson-Devon transmission line corridor between Derby Junction and the Trap Falls Substation
    - ✓ Land owned by UI
    - ✓ Land that is vacant, available for sale, underdeveloped (e.g., formerly developed properties that are available for reuse), or otherwise undeveloped

Properties that appeared, based on preliminary study, to meet at least some of the siting criteria were then qualitatively evaluated using the following factors:

- <u>Environmental</u> – Environmental issues, including site character, present and past land uses of the property, cultural resources, threatened and endangered species, tidal or inland wetlands, ponds, aquifers, watercourses, public watersheds and floodplains, potential need for environmental remediation (for previously developed sites), encumbrances
- <u>Surroundings</u> – Zoning and description of surrounding area, including proximity to statutory facilities (schools, playgrounds, daycares, nursery schools, day camps, and residential neighborhoods)

- Transmission and Distribution System – System transmission and distribution interconnection costs and other considerations including system impacts, accessibility, and right-of-way requirements

- Construction **–** Substation construction and vehicular access costs and other related considerations, including the effects of site size, shape, and subsurface/topographical conditions

- Acreage available **–** Property availability, additional land for buffer or expansion, expected cost, and availability of easements

- Permitability – Anticipated ability to obtain all the required siting, land use, environmental, and construction permits

Using this process, most of the initially identified potential sites were found to be impractical for the development of the new substation and were eliminated from further consideration. The reasons for eliminating a particular site varied, and ranged from environmental issues (e.g., presence of wetlands, rock, insufficient developable area, incompatible land uses) to the identification of new information regarding other future development plans for vacant property.

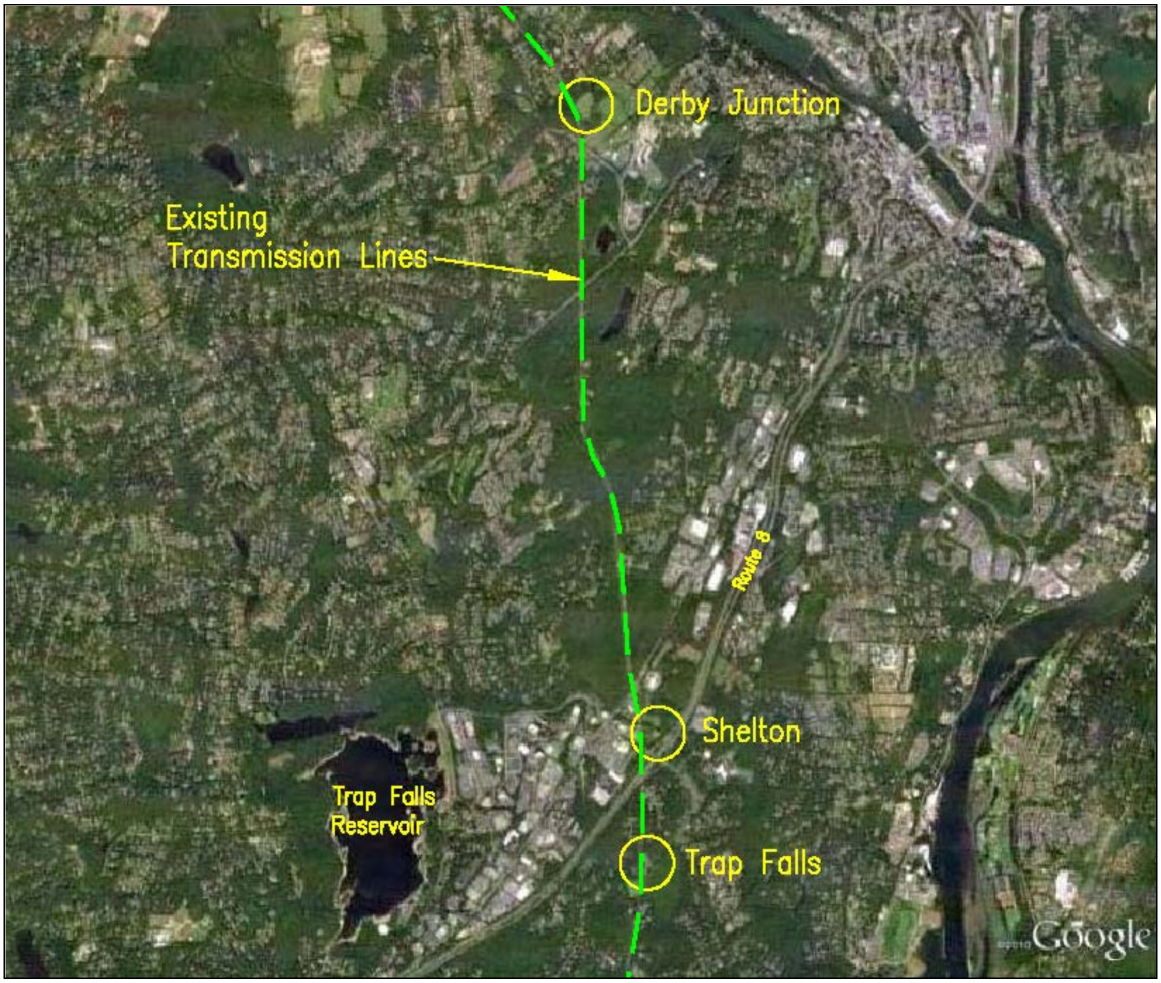
However, based on the screening analyses, UI identified three sites that initially appeared feasible for the development of the new substation:

- Derby Junction
- Trap Falls Substation (UI property)
- 14 Old Stratford Road (UI property)[21]

Figure IX-1 illustrates the locations of these three sites.

UI conducted more detailed evaluations of each of these three sites. As discussed in the following subsections, of these three alternative sites, UI determined that the development of the new substation at the Old Stratford Road site would best meet the Project objectives, based on environmental, technical, and cost considerations. The Trap Falls Substation site, although less preferable based on cost and environmental considerations, offers a second siting option. In contrast, the Derby Junction site was found to be impractical for the development of the new substation.

[21] At the initiation of the siting study, the 14 Old Stratford Road site was privately owned. UI purchased the property in 2009.



Source: Google Earth, April 2012

Figure IX-1: Alternate Sites Evaluated

IX.B.2 Derby Junction: Site Evaluated but Eliminated

This undeveloped 5.2-acre site is located at the north end of Constitution Boulevard North, at the intersection of CL&P's 115 kV overhead Stevenson – Devon transmission lines and UI's 115 kV Derby Junction – Indian Well – Ansonia overhead transmission lines. As a result of its location at the intersection of these major transmission lines, the development of a 115/13.8 kV distribution substation at this site would provide the opportunity to connect to and, in the future, sectionalize multiple transmission lines, and thereby substantially increase UI's customer reliability in the Shelton, Ansonia, Derby, and Orange areas.

However, the site is within a 40.3-acre property owned by the City of Shelton and identified as conserved open space. The site is presently characterized by old field vegetation, bordered by forest lands and wetlands. The site is zoned R-1. In addition, the site is located approximately 0.2 mile to the northwest of Shelton High School. The site is separated from the high school by the City's open space, with associated wooded buffer areas, as well as the school playing fields (e.g., softball, soccer). Since this site is in the northern part of the City of Shelton, the distribution circuit get-away would be along North Constitution Boulevard until Shelton Avenue is reached and separate distribution circuit paths can be created.

Although Derby Junction would offer transmission system benefits, the development of a 115/13.8 kV distribution substation on this municipal open space would not be consistent with the City of Shelton's current land use plans. In addition, because the site is not in proximity to the load centers in the southern portion of the City, new distribution infrastructure, originating along North Constitution Boulevard, would be required. Such distribution infrastructure would be costly to construct due to the limited north-to-south roads suitable for distribution lines between Derby Junction and the southern portion of the City of Shelton. These factors contributed to UI's determination that the use of Derby Junction as a new 115/13.8 kV distribution substation would not be cost-effective or consistent with Shelton's land use plans. If the Derby Junction site is required for a future UI 115 kV transmission facility or a 115/13.8 kV substation, the site may be reconsidered pending the specific future need and construction costs associated with this location.

IX.B.3 Trap Falls Substation: Alternative Site

This site is located in the southern portion of Shelton near the Town of Stratford boundary, and is immediately adjacent to UI's existing Trap Falls Substation at 102 Armstrong Road. The Devon – Derby Junction transmission lines abut the site on the west. Forested vegetation screens the site from residential areas located to the north and east, whereas Armstrong Road forms the southern boundary of the site. A cranberry bog is located across Armstrong Road in Stratford.

In the general vicinity of the site, single-family residences border Armstrong Road and also characterize areas to the north of the substation (i.e., residential subdivisions along Daybreak Lane and Partridge Lane). Areas farther to the west along Armstrong Road, near the intersection with Bridgeport Avenue, are developed as office parks and for various commercial/retail uses.

The development of the new substation at the Trap Falls site would have a number of positive attributes, including general proximity to the load centers in southern Shelton. Other benefits would include the site's current UI ownership, adjacency to the existing Trap Falls Substation, location next to the Devon – Derby Junction transmission lines, and the availability of land. In addition, the new substation would represent an extension of the existing utility use of the portions of the property that are presently used for the existing Trap Falls Substation.

However, the siting of a new substation adjacent to the existing Trap Falls Substation would be constrained by the presence of the existing CL&P 115 kV transmission line corridor, relatively steep topography (with rock outcrops), and nearby residential developments. As a result, the new substation could only be situated within an approximately 2.5-acre portion of UI's property, located to the east of the existing substation. This would place the new substation facilities relatively close (within approximately 600 feet) of residential developments located along Partridge Lane.

Moreover, due to local topographic conditions, extensive grading/earthwork would be required to develop the new substation at this site. New underground electric distribution lines would have to be installed to interconnect to the existing distribution network, located along Old Stratford Road (approximately 0.25 mile east of the site).

A new underground duct line could potentially be constructed beneath Armstrong Road toward Old Stratford Road to accommodate the capacity of a two-transformer substation. However, an existing water main in the road would have to be relocated and the existing duct line (which currently serves as a distribution get-away for the existing Trap Falls Substation) would have to be modified. These complexities would make the construction of the new substation on the Trap Falls site approximately 20% more expensive than the construction at the preferred Old Stratford Road site.

However, with the development of a three-transformer substation at Trap Falls, an additional (third) duct line could not be accommodated within Armstrong Road, beneath which underground utilities are already located. Instead, a new underground distribution duct line would have to be routed from the northern portion of the substation, either along Daybreak Lane or Partridge Lane, to interconnect to the existing distribution network in Old Stratford Road. UI would have to obtain underground easements from private property owners along these residential streets to install the duct line and associated splice chambers, and construction activities would necessarily affect these residential areas.

IX.B.4 Preferred Site: 14 Old Stratford Road

This UI-owned site, which encompasses approximately six acres, was formerly developed for industrial purposes. The site is presently vacant and is zoned for IA-2 use. UI currently uses portions of the site for parking equipment used in utility maintenance work.

CL&P's Devon – Derby Junction 115 kV transmission lines traverse north to south across the western portion of the site. Overall, the property is bordered to the north by the Far Mill River and agricultural areas; to the southeast by a wooded buffer, a small brook, and State Route 8; to the south by Old Stratford Road; and to the northwest by Pootatuck Place and commercial uses, including a gas station, convenience store, and hotel. Extensive commercial (office and retail) developments are located to the northwest of the site, along Bridgeport Avenue.

The property has a long industrial history, and is presently undergoing environmental (groundwater) remediation. The previous site owner coordinated the remediation work with the DEEP. This remediation activity is confined to the treatment of groundwater for chlorinated solvent pollution. Groundwater monitoring wells associated with the remediation effort are located on the northeastern portion of the property.

The development of a 115/13.8 kV distribution substation at this site would be consistent with the former use of the property for industrial purposes. The substation development would be consistent (and would not conflict with) the current remediation of groundwater contamination at the site. The site size and location adjacent to the Devon – Derby Junction transmission lines would allow the development of a cost-effective open-air substation design. Further, the site is relatively close to the load growth pockets in the southern portion of the city, and thus distribution infrastructure costs and impacts would be minimized. Underground distribution infrastructure congestion is not an issue at the Old Stratford Road site since there are currently no UI underground distribution facilities installed on Old Stratford Road.

UI selected the 14 Old Stratford Road property as the preferred site for the new substation due primarily to the following factors:

- The site provides the lowest evaluated cost option.

- The site offers favorable set-back and visual screening potential, and is located adjacent to the State Route 8 corridor. Although located near the major distribution load centers and near commercial areas, the site is relatively isolated.

- The site is located directly along CL&P's existing 115 kV transmission ROW.

- The site is a former industrial property that is presently vacant and therefore underutilized. The development of this site for a substation would effectively re-adapt this brownfield site for productive use and therefore enhance its property value.

IX.B.5 Summary of Site Selection Process

In sum, the Old Stratford Road site represents the least-cost option for the development of the new Shelton Substation, and location at this site is environmentally consistent. The UI-owned site is located near Shelton's major distribution load centers, and is optimally located directly along CL&P's existing 115 kV transmission line corridor. Further, the site is a brownfield property, which would be returned to productive economic use, providing property tax benefits to the City of Shelton, with the development of the new substation.

The Trap Falls Substation represents a feasible, but not preferred, alternative to the Old Stratford Road site. Although also owned by UI and adjacent to the 115 kV transmission line, the Trap Falls Substation site would be considerably more costly (by approximately 20%) due to the additional land development costs and additional distribution infrastructure to interconnect to UI's existing distribution line network. Also, the Trap Falls site expansion would be in close proximity to residential areas and farther from load centers than the Old Stratford Road site.

X. PROJECT SCHEDULE AND ESTIMATED PROJECT COSTS

The construction of the substation is expected to begin in July 2013, with the substation scheduled for in-service in December 2014.

The estimated cost for the siting, design, and construction of the Shelton Substation and supporting infrastructure is approximately $38.3 million (in 2012 dollars).

The following represents the estimated Project costs (in $ millions):

Materials and Equipment:	$16.3
Land:	$4.0
Engineering, Permitting, and Construction Management:	$7.8
Construction:	$10.2
Total	**$38.3**

XI. PROJECT PERMITS, APPROVALS, AND CONSULTATIONS

During the planning of the proposed Shelton Substation Project, UI has coordinated with representatives of the City of Shelton, as well as with the public and with representatives of the Town of Stratford, the Corps, and other regulatory agencies. UI expects to continue to consult with the involved federal, state, and local agencies as the planning for and development of the Project continues.

XI.A Federal and State Agency Approvals Required and Consultations

In addition to the Certificate of Environmental Compatibility and Public Need from the Siting Council, the Project will require a General Permit (Category 2 per Section 404 the Clean Water Act) from the Corps. Certain approvals also may be required from the DEEP. Table XI-1 summarizes the permits and approvals required for the Project and the consultations that UI has held to date with involved federal and state agencies.

Table XI-1: Permits and Approvals Applicable to the Shelton Substation Project

Agency	Permit/Approval Required	Application Submitted or Consultation (Date)	Status*
Connecticut Siting Council	Certificate of Environmental Compatibility and Public Need under Connecticut General Statutes §16-50*l*(a)(1)	October 1, 2012	Pending
U.S. Army Corps of Engineers, New England District	General Permit (Category 2 per Section 404 of the Clean Water Act)	Consultation initiated in February 2012; Permit application expected to be filed late Fall 2012	Pending
• DEEP	401 Water Quality Certification / Floodplain management	Consultations pending	Pending
• The Mashantucket Pequot Tribal Nation	Consultation as part of Category 2 General Permit	Consultation initiated in September 2012	Correspondence indicating no adverse effect received September 12, 2012
• The Mohegan Tribe	Consultation as part of Category 2 General Permit	Consultation initiated in September 2012	Response pending
DEEP NDDB	Threatened and endangered species review	Consultation initiated in December 2011	Correspondence indicating no adverse effect received February 12, 2012
DEEP	General Permit	Stormwater management	Prior to construction
SHPO	Cultural Resource Consultation under Connecticut General Statutes §16-50*l*(e)	Consultation initiated on November 23, 2011	Correspondence indicating no adverse effect received June 28, 2012

*Copies of correspondence received from agencies to date are included in Appendix B.

XI.B Municipal Consultation Filing and Outreach

As a primary mechanism both for informing the public about the Project and for soliciting comments on the Project from local leadership and the public, UI conducted municipal consultations in accordance with the Siting Council's Municipal Consultation Filing (MCF) requirements.

The MCF, which is a key component of the Council's application process, requires applicants intending to apply for a Council Certificate of Environmental Compatibility and Public Need to consult with potentially affected municipalities at least 60 days prior to the Application filing date. The pre-application consultation must include, but not be limited to, good faith efforts to meet with the chief elected official of each potentially affected municipality and to provide technical reports concerning the public need, site selection process, and environmental effects of the proposed facilities.

In July of 2012, UI submitted an MCF for the Project. This MCF was duly noticed and provided to the City of Shelton and the Town of Stratford, the municipalities in which the proposed Project may be constructed or, in the case of the Town of Stratford, is located within 2,500 feet of the alternative substation location.

During the municipal consultation period, UI offered to meet with the chief executive officers of both municipalities to review the MCF in more detail in order to present an overview of the Project and the siting process and to review the methods available for each town to provide input to the Project's siting process. UI met with Mayor Harkins of Stratford, and gained input regarding concerns or special considerations associated with the proposed site in Stratford. Although Mayor Lauretti of Shelton declined UI's offer to meet during the MCF period, UI had already met with the Mayor twice regarding the proposed Project prior to the issuance of the MCF.

On August 1, 2012, UI held a public "open house" meeting to discuss the Project with members of the public and to obtain comments regarding the proposed Project. Members of the UI Project team and subject matter experts were available at the open house to provide information and to answer specific questions.

The overall objective of the municipal consultation process was to obtain input regarding the proposed Project from representatives of the municipalities potentially affected by the proposed Project, as well as from the interested public. In accordance with the Siting Council's requirements and Conn. Gen. Stat. §16-50*l*(e), within 15 days of filing the Application, UI will provide to the Siting Council all materials provided to the municipalities and a summary of the consultations with the towns, including any comments or recommendations issued by the municipalities as well as copies of comments received from the public.

Table XI-2 summarizes UI's public outreach efforts to date.

XI.C Other Relevant Information

As required by Conn. Gen. Stat. §16-50l(e), UI provided the same information submitted to the municipalities in July 2012 to the Connecticut Energy Advisory Board ("CEAB") on July 20, 2012.

Table XI-2: Summary of Outreach Efforts

DATE	STAKEHOLDER GROUP	PURPOSE OF MEETING
12/3/2011	City of Shelton Wetlands and P&Z	Discuss Permit Requirements for Project
12/20/11	City of Shelton Mayor's Office	UI CEO and Project Team to discuss Project with Mayor Lauretti
12/21/2011	City of Shelton P&Z	Discuss Setback Requirements for Project
1/6/12	CT Siting Council	UI Counsel and Project Team to discuss Project with the Council
4/9/2012	City of Shelton Mayor's	Letter to Mayor Lauretti to recap discussion held on 12/20/2011
6/21/2012	City of Shelton Mayor's Office	Call to set up meeting to discuss municipal filing
6/21/2012	Town of Stratford Mayor's Office	Call to set up meeting to discuss municipal filing
7/2/2012	City of Shelton Town of Stratford	Municipal Consultation Filing delivered to the CEOs of Shelton and Stratford
7/3/2012	City of Shelton Mayor's Office	Call to reschedule meeting that was canceled for 7/3/2012
7/18/2012	Town of Stratford Mayor's Office	Met with Mayor Harkins to discuss Project
7/20/2012	CEAB	Provided a copy of the MCF to CEAB
7/20/2012	Property Abutters 14 Old Stratford Road	Sent written invitations to the property abutters and both mayors, with a copy of the ad that ran for the Open House
7/25/2012	City of Shelton Residents	Print Advertisement inviting Shelton residents to attend the Open House Event
7/26/2012	Town of Stratford	Print Advertisement inviting Stratford residents to attend the Open House Event
7/26/2012	City of Shelton P&Z	Mr. Schultz called to discuss the Project and inquire whether or not UI would be holding public meetings
7/30/2012	City of Shelton Residents	Posted a 6' x 10' sign at the site announcing the Open House
7/30/2012	Property Abutters	Placed a phone call to invite Nathaniel Wells to the Open House
7/31/2012	City of Shelton	Request for Shelton to identify community organizations for notice of application
8/1/2012	Property Abutters	Placed a phone call to invite Nathaniel Wells to the Open House
8/1/2012	City of Shelton Town of Stratford	Open House Event
8/6/2012	City of Shelton Residents	Sent a copy of the MCF to Ms. Parkins and Ms. Flannery per their request from the Open House
8/8/2012	Town of Stratford	Request for Stratford to identify community organizations for notice of application
8/15/2012	City of Shelton Residents	Letter to Mr. John Anglace addressing his customer service issue that was brought to UI's attention at the Open House
8/20/2012	City of Shelton Mayor Lauretti	Letter to advise of Siting Council filing date

XII. APPLICATION DIRECTORY

This Application conforms to the Siting Council's *Application Guide for an Electric Substation Facility* (April 2010) and includes all relevant information regarding the proposed Project. Table XII-1 identifies the information requested in the Application Guide and the location in this Application where such data can be found.

Table XII-1: Cross-Reference between the Siting Council's Application Guide, Regulations, and UI's Application for the Shelton Substation Project

Council's Application Guide	Council's Regulations	UI's Application
I.A. Pre-Application Process (General Statutes § 16-50*l*(e)) Municipal Consultations		Section XI.B
I.B. Application to Municipal Agencies (General Statutes § 16-50x(d))		Section II.A.
II. Form of Application (Regs. Conn. State Agencies § 16-50*l*-2)	Regs. Conn. State Agencies § 16-50*l*-2	Section I.A; Section I.B; Section I.C; Section I.D; see also generally Application and Appendices.
III. Filing Requirements (Regs. Conn. State Agencies § 16-50j-12)	Regs. Conn. State Agencies § 16-50j-12	Section XII; Section II.A; see also generally Application and Appendices.
IV. Application Filing Fees (Regs. Conn. State Agencies § 16-50v-la)	(Regs. Conn. State Agencies § 16-50v-la)	Section XIV.
V. Municipal Participation Account (General Statutes § 16-50bb)	(Regs. Conn. State Agencies § 16-50v-4)	Section XIV.
VI. Contents of Application (General Statutes § 16-50l(a)(1))		
A. Executive summary–A brief description and the location of the proposed facility, including an artist's rendering and/or narrative describing its appearance.		Section ES-1.
B. A description of the proposed facility including: (1) Itemized estimated costs; (2) Comparative costs of alternatives considered; (3) Facility service life; (4) Bus and specifications; (5) Overhead take-off design, appearance, and heights; (6) Length of interconnections to transmission and distribution; (7) Initial and design voltages and capacities; (8) Rights-of-way and accessway acquisition; (9) Transmission connections and distribution feeders; and (10) Service area.		Items (1) and (2): Section X; Section III.C.; Section IX. Item (3): Facility service life: Section IV.D. Items (4), (5), (6), (7), and (9): Section IV.C; Appendix A. Item (8): Section IV.A; Appendix A. Item (10): Section I.A

Council's Application Guide	**Council's Regulations**	**UI's Application**
C. A statement of the purpose for which the application is being made.		Section I.A.
D. A statement describing the statutory authority for such application.		Section I.B.
E. The exact legal name of each person seeking the authorization or relief and the address or principal place of business of each such person.		Section I.C.
F. The name, title, address, and telephone number of the attorney or other person to whom correspondence and communications in regard to the application are to be addressed.		Section I.D.
G. A statement and full explanation of why the proposed facility is needed and how the facility would conform to a long-range plan for the expansion of the electric power grid serving the state and interconnected utility systems that would serve the public need for adequate, reliable, and economic service, including: (1) A description and documentation of the existing system and its limitations; (2) Justification for proposed in-service date; (3) The estimated length of time the existing system is judged to be adequate with and without the proposed facility; (4) Identification of system alternatives with the advantages and disadvantages of each; and (5) If applicable, identification of the facility in the forecast of loads and resources pursuant to General Statutes § 16-50r.		Section III.A; Section III.B; Section III.C; Section IX; Appendix F; Appendix G.
H. A proposed site map at a scale no smaller than one inch = 40 feet and aerial photos of suitable scale showing the site, access, and abutting properties including proximity of the following: 1. Settled areas 2. Schools and daycare centers 3. Hospitals 4. Group homes 5. Forests and parks 6. Recreational areas 7. Seismic areas 8. Scenic areas 9. Historic areas 10. Areas of geologic or archaeological interest 11. Areas regulated under the inland Wetlands and Watercourses Act 12. Areas regulated under the Tidal Wetlands Act and Coastal Zone Management Act 13. Public water supplies 14. Hunting or wildlife management areas 15. Existing transmission lines within one mile of the site		Appendix A maps and site plan; refer also to discussion in Section VI (proposed substation site is not in proximity to most listed features)

Council's Application Guide	**Council's Regulations**	**UI's Application**
I. A justification for selection of the proposed site including a comparison with alternative sites which are environmentally, technically, and economically practicable. Include enough information for a complete comparison between the proposed site and any alternative site contemplated.		Section IX; Appendices F, G, H.
J. Safety and reliability information, including: (1) Provisions for emergency operations and shutdowns; and (2) Fire suppression technology.		Section VI; Section VIII.
K. A description of the effect that the proposed facility would have on the environment, ecology, and scenic, historic, and recreational values, including effects on: (1) Public health and safety; (2) Local, state and federal land use plans; (3) Existing wildlife and vegetation, including rare and endangered species and species of special concern, with documentation by the Department of Energy and Environmental Protection Natural Diversity Data Base; (4) Water supply areas; (5) Archaeological and historic resources, with documentation by the State Historic Preservation Officer; and (6) Other environmental concerns identified by the applicant, the Council or any public agency.		Section VII; Appendix B, Appendix C; Appendix D, Appendix E.
L. A statement explaining mitigation measures for the proposed facility including: (1) Construction techniques designed specifically to minimize adverse effects on natural areas and sensitive areas; (2) Special routing or design features made specifically to avoid or minimize adverse effects on natural areas and sensitive areas; (3) Establishment of vegetation proposed near residential, recreational, and scenic areas; and (4) Methods for preservation of vegetation for wildlife habitat and screening.		Section V; Section VII.
M. Justification that the location of the proposed facility would not pose an undue safety or health hazard to persons or property at the site of the proposed facility, including:		Section VIII; Appendix I.
1. Measurements of existing electric and magnetic fields (EMF) at site boundaries and at boundaries of adjacent schools, daycare facilities, playgrounds, and hospitals, with extrapolated calculations of exposure levels during normal and peak normal line loading.		Section VIII; Appendix I
2. Calculations of expected EMF levels at the above-listed locations that would occur during normal and peak normal		Section VIII; Appendix I

Council's Application Guide	**Council's Regulations**	**UI's Application**
operation of the facility.		
3. A statement describing consistency with the Council's "Best Management Practices for Electric and Magnetic Fields," as amended.		Section VIII; Appendix I
N. A schedule of the proposed program for right-of-way or property acquisition, construction, rehabilitation, testing, and operation.		Section V; Section X.
O. Identification of each federal, state, regional, district, and municipal agency from which approvals have been obtained or will be sought, copies of approvals received, and a schedule for obtaining approvals not yet received.		Section XI.A; Section XI.B; Appendix B.
P. Bulk filing of municipal zoning, planning, planning and zoning, conservation, and inland wetland regulations and bylaws.		Section XIII (summary); bulk filing separate.
Q. Such information any department or agency of the state exercising environmental controls may, by regulation, require.		Section XI.A; Appendix B, Appendix C.
R. Such information the applicant may consider relevant.		Application; Section XI.C.
VII. Proof of Service (General Statutes § 16-50*1*(b))		Section II.A.
VIII. Notice to Community Organizations		Section II.B.
IX. Public Notice (General Statute § 16-50*l*(b))		Section II.C.
X. Notice to Abutting Landowners (General Statutes § 16-50l(b))		Section II.D.

XIII. BULK FILING OF MUNICIPAL DOCUMENTS

As applicable, bulk filing of the municipal zoning, planning, planning and zoning, conservation (including any plans of conservation and development and open space plans), and inland wetland regulations and bylaws of the City of Shelton and the Town of Stratford will be provided to the Council by a separate filing.

XIV. APPLICATION FILING FEE

The filing fee for this Application is determined by the Council's filing fee schedule set forth in RCSA § 16-50v-1a and based on the estimated construction cost for the substation. Pursuant to RCSA § 16-50v-4 and Conn. Gen. Stat. § 16-50bb, the Company also encloses a separate check in the amount of $25,250 payable to the Council for the Municipal Participation Fee.

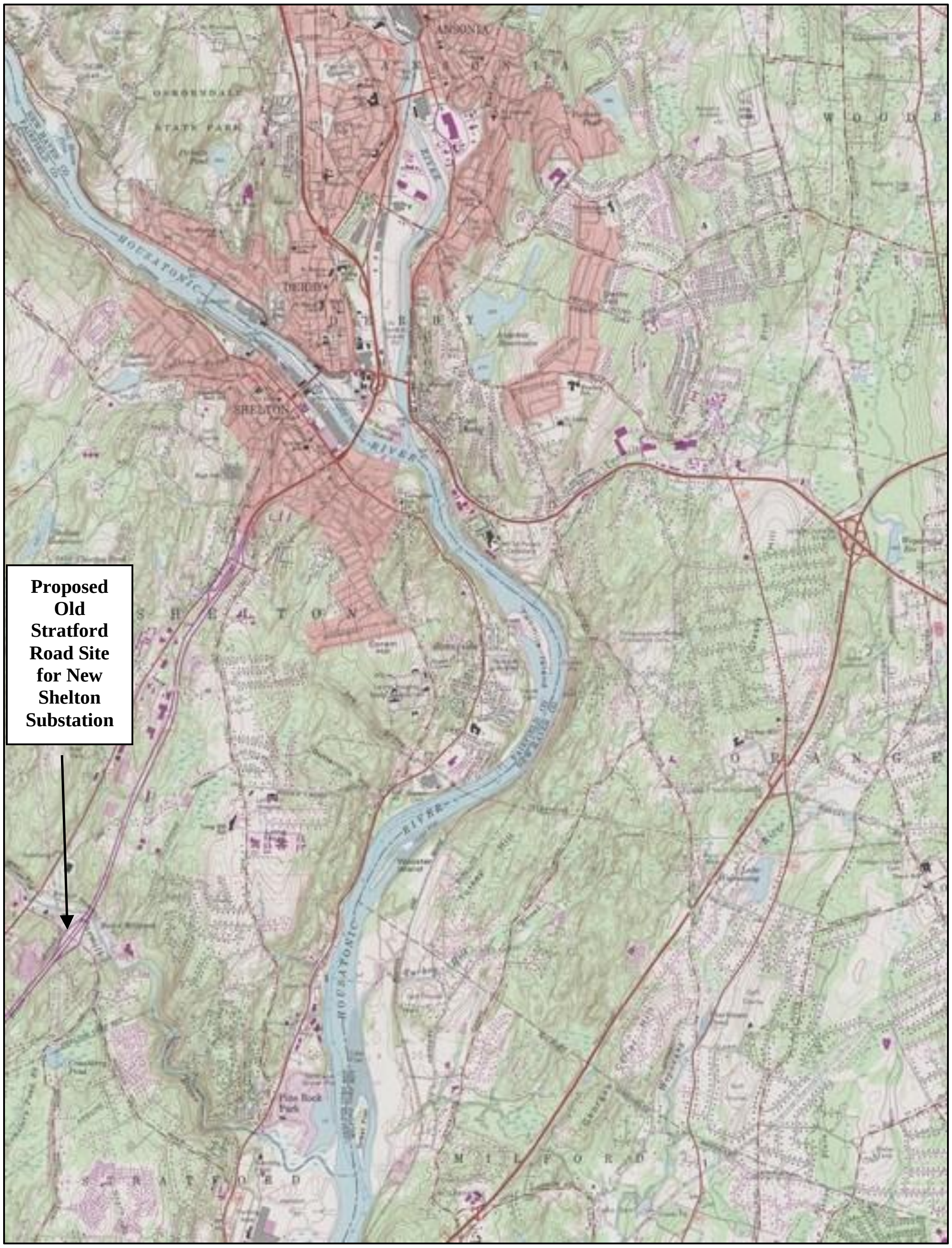
APPENDICES

APPENDIX A

MAPS AND DRAWINGS

Appendix A DR.1

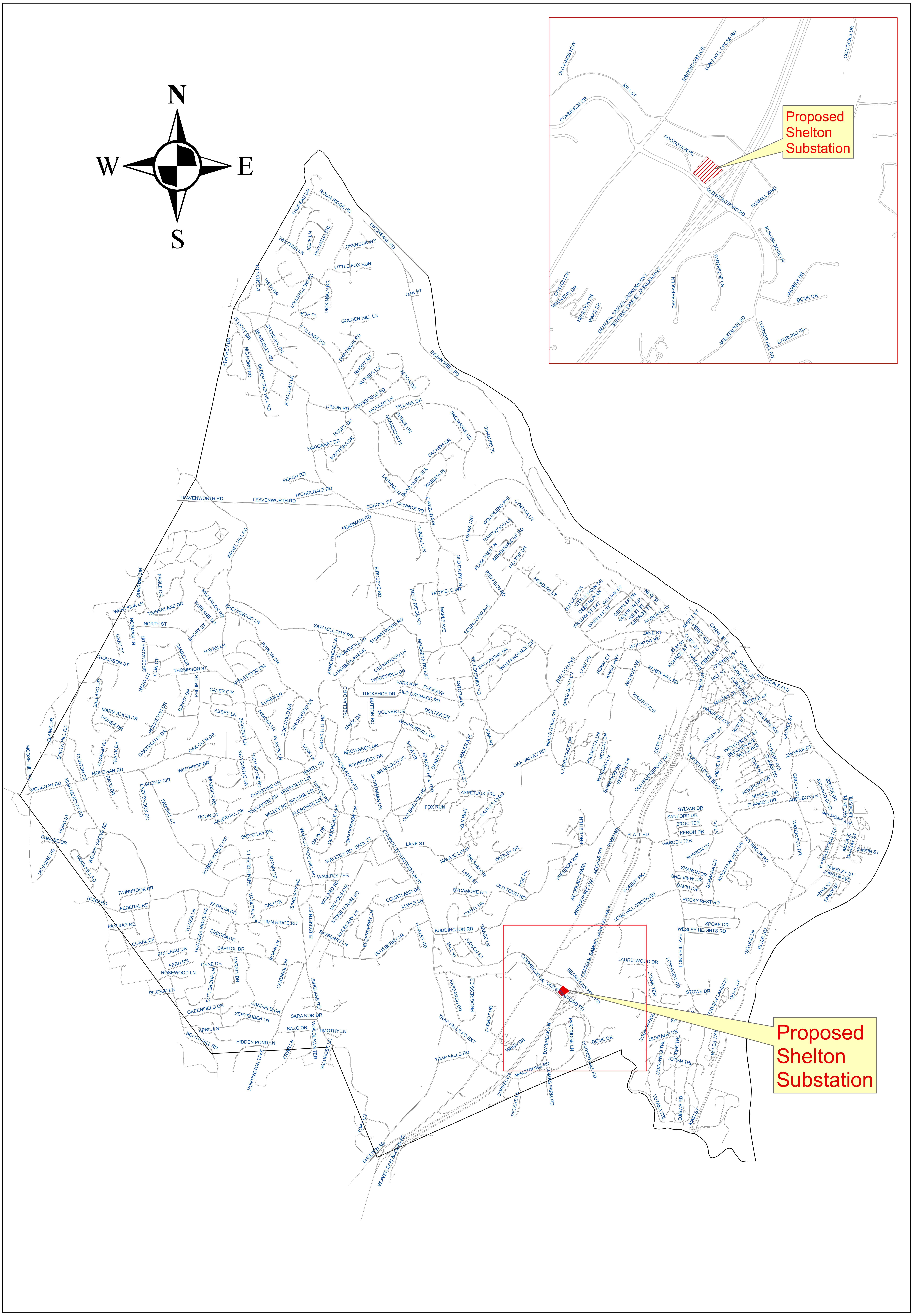
ATTACHMENT A: OVERVIEW MAP



Overview Map
Proposed Shelton Substation
Old Stratford Road Site

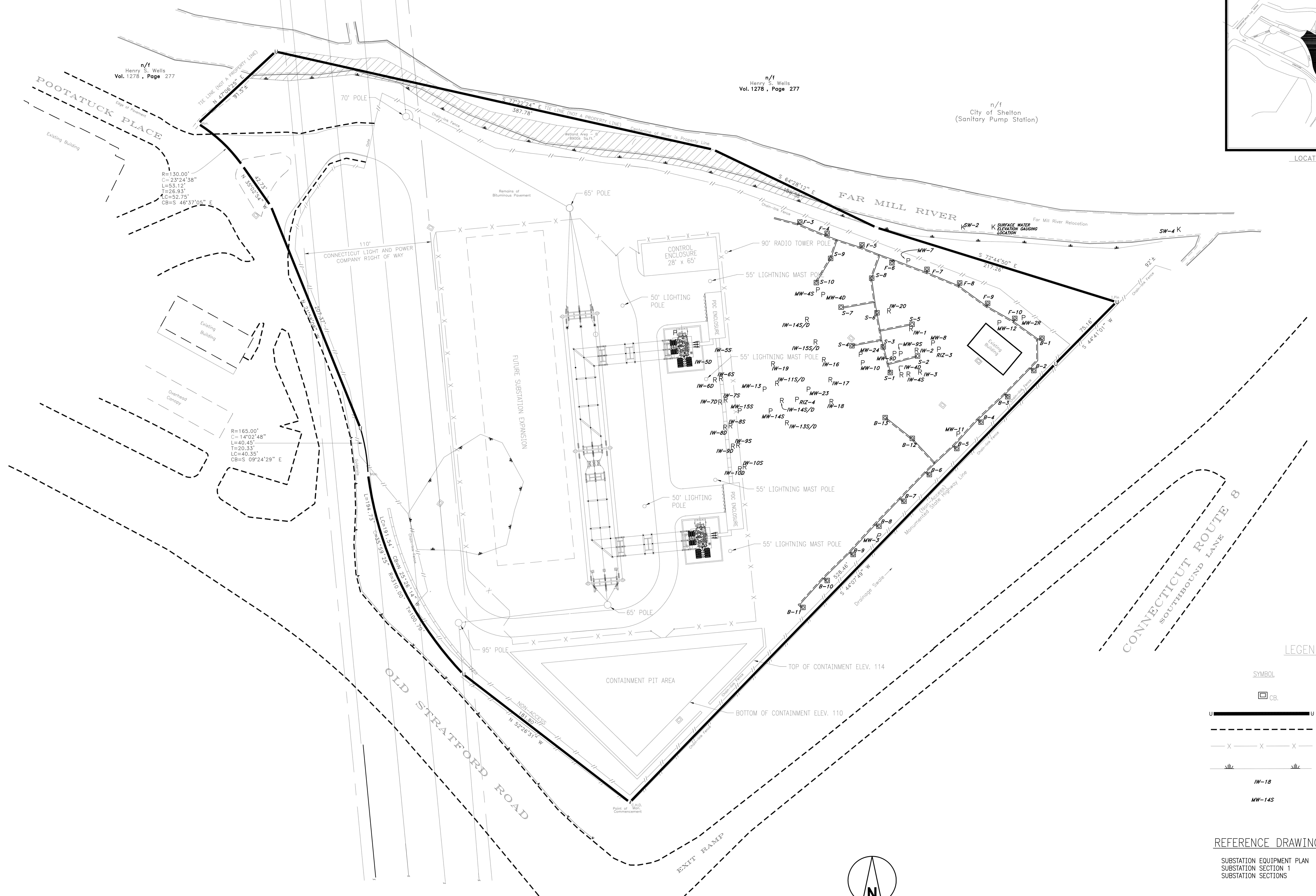
Source: Ansonia USGS Topographic Quadrangle, 1984, 1:24,000 Scale

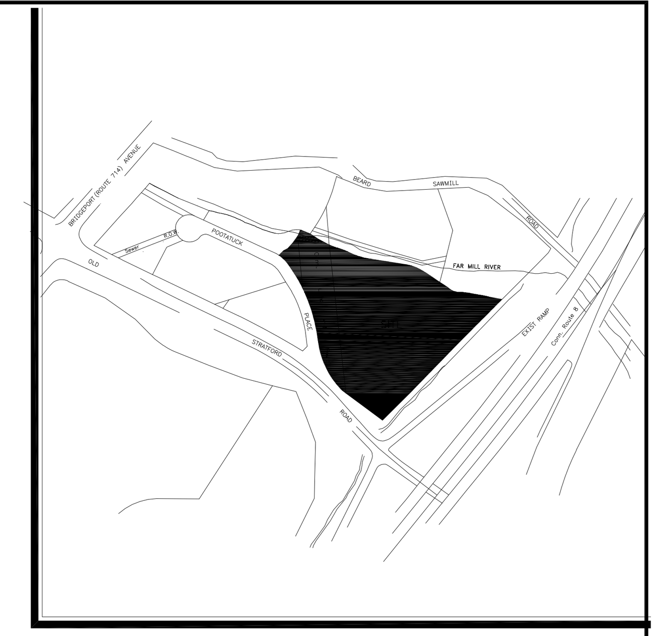
Appendix A DR.2



Proposed Shelton Substation
Shelton, CT

Appendix A DR.3





LOCATION MAP

LEGEND

SYMBOL	DESCRIPTION
CB.	CATCH BASIN
	PROPERTY LINE
	EDGE OF PAVEMENT
	NEW 8' FENCE
	WETLANDS LINE
IW-18	INJECTION WELLS
MW-14S	MONTORING WELLS

REFERENCE DRAWINGS

SUBSTATION EQUIPMENT PLAN	XXXXX-400
SUBSTATION SECTION 1	XXXXX-401
SUBSTATION SECTIONS	XXXXX-402

PRELIMINARY

NOT TO BE USED FOR CONSTRUCTION

40' 20' 0 40' 80'
1"=40'-0"

BLACK & VEATCH
Building a world of difference®

PROJECT NO. 174811

DRAWN JDB
DESIGNED JDB
APPROVED ALL
CHECKED –

No	Date	Revision	By	Chkd.	Engr.	Supv.
0	05/2012	MCF REVIEW ISSUE	JDB	–	ALL	–

The United Illuminating Company
157 Church St. New Haven, Ct. 06506

Drawn
Chkd.
Date 01/27/12
Design Engr. –
Scale: 1:40
Design Supv. –

SITE PLAN
SHELTON SUBSTATION

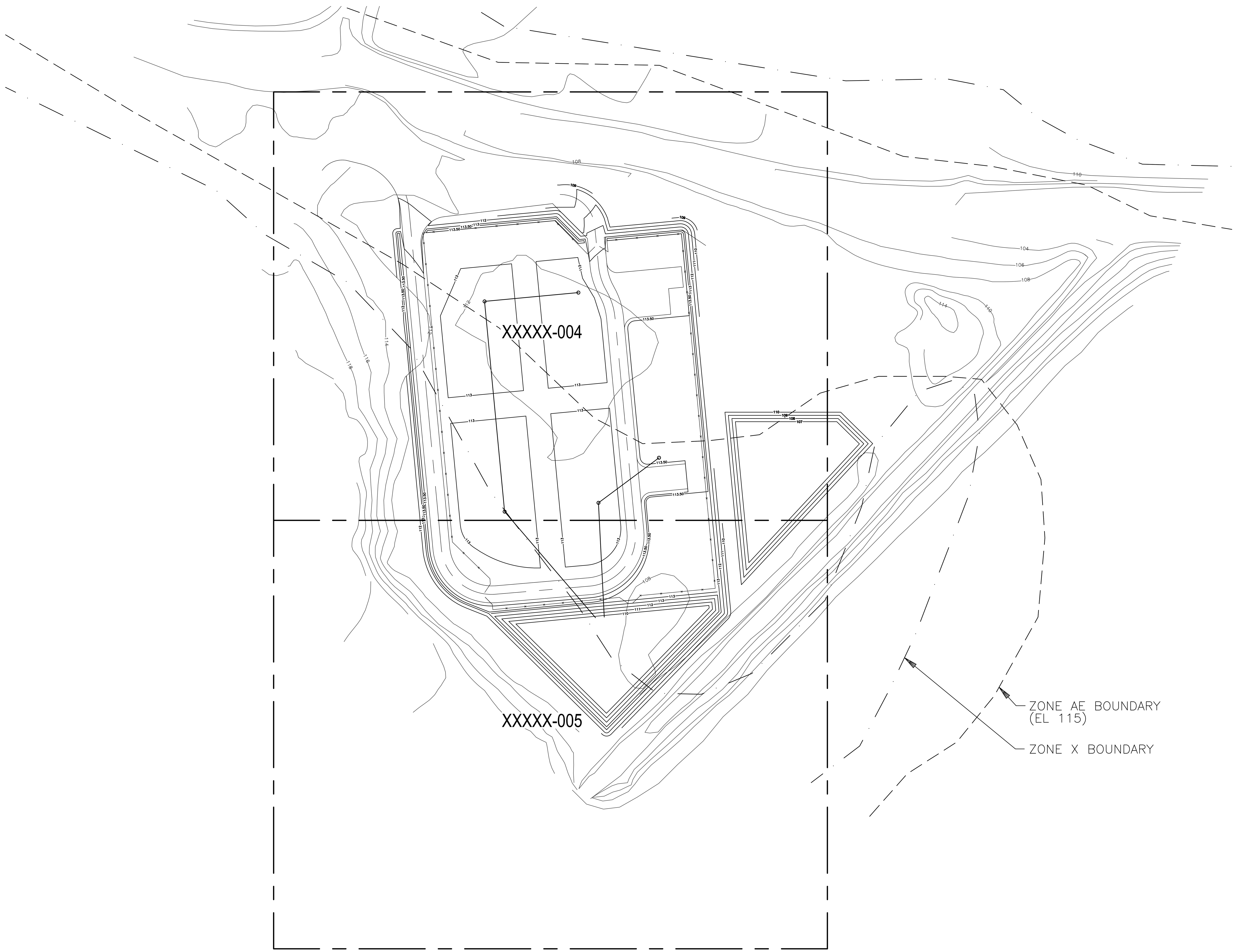
CAD FILE NAME	SEQUENCE No.	DRAWING NUMBER
–	–	XXXXX–001

PRELIMINARY

NOT TO BE USED FOR CONSTRUCTION

40' 20' 0 40' 80'
1"=40'-0"

BLACK & VEATCH Building a world of difference® PROJECT NO. 174811								The United Illuminating Company 157 Church St. New Haven, Ct. 06506	AERIAL SITE PLAN SHELTON SUBSTATION
DRAWN JDB									
DESIGNED JDB									
APPROVED ALL	0	05/2012	MCF REVIEW ISSUE	JDB	–	JDB	–	Drawn ____ Date 01/27/12 Scale: 1:40	CAD FILE NAME / SEQUENCE No. / DRAWING NUMBER XXXXX–002
CHECKED –	No	Date	Revision	By	Chkd.	Engr.	Supv.	Chkd. ____ Design Engr. ____ Design Supv. ____	



GENERAL NOTES

1. GENERAL NOTES APPLICABLE TO ALL GRADING AND DRAINAGE AND EROSION CONTROL DRAWINGS.
2. SEE DRAWING XXXXX-006 FOR EROSION CONTROL PLANS.
3. SEE DRAWING XXXXX-007 FOR CATCH BASIN SCHEDULE AND DETAILS AND XXXXX-009 FOR GRADING AND DRAINAGE DETAILS.
4. COORDINATES SHOWN ARE BASED ON CONNECTICUT STATE PLANE NAD27 FEET.
5. GRADE SHALL SLOPE UNIFORMLY BETWEEN FINISH SPOT ELEVATIONS AND CONTOURS SHOWN ON THE PLANS.
6. A SMOOTH VERTICAL TRANSITION SHALL BE PROVIDED AT ROAD INTERSECTIONS.
7. SLOPES SHALL BE 3(H):1(V) OR FLATTER, UNLESS NOTED OTHERWISE.
8. THE CONTRACTOR IS RESPONSIBLE FOR TYING FINISHED CONTOURS INTO EXISTING CONTOURS IN AREAS WHERE THERE IS INSUFFICIENT SURVEY DATA OF THE EXISTING GRADE.
9. EXISTING CONTOURS AND SPOT ELEVATIONS ARE BASED ON THE 10/29/2009 ALTA SURVEY PRODUCED BY NOWAKOWSKI, O'BYMACHOW, KANE AND ASSOCIATES.
10. SPOT ELEVATIONS AND CONTOURS ON THESE DRAWINGS ARE TOP OF FINISHED GRADE. SUBTRACT FINISH SURFACING MATERIAL THICKNESS TO OBTAIN TOP OF SUBGRADE.
11. ALL AREAS OUTSIDE OF THE SUBSTATION THAT ARE DISTURBED DURING CONSTRUCTION SHOULD BE RESTORED TO THEIR PRE-CONSTRUCTION CONDITIONS, AND STABILIZED UNLESS NOTED OTHERWISE.
12. SLOPE GRADE TO DRAIN IN DIRECTION OF FLOW ARROWS.
13. THE FINISHED GRADE SHALL BE SET 6 INCHES BELOW TOP OF CONCRETE UNLESS NOTED OTHERWISE. FINISHED GRADE SHOULD SLOPE AWAY FROM THE STRUCTURE AT A MINIMUM SLOPE OF 1%.

LEGEND APPLICABLE TO ALL GRADING AND DRAINAGE DRAWINGS

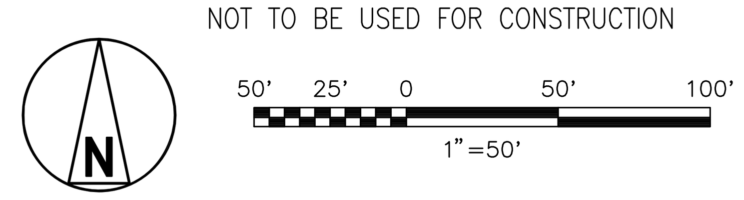
- ZONE X BOUNDARY
- ZONE AE BOUNDARY
- PROPERTY LINE
- R/W — LIMIT OF RIGHT-OF-WAY
- SUBSTATION FENCE
- 99 — NEW CONTOUR
- CATCH BASIN
- NEW STORM WATER SYSTEM
- NEW CULVERT
- DITCH/SWALE FLOW INDICATOR
- GRADE SURFACE FLOW INDICATOR
- 123.45 + — NEW SPOT ELEVATION
- SURVEY CONTROL MONUMENT
- EXISTING FENCE
- 99 — EXISTING CONTOUR
- 1 — SECTION OR DETAIL NUMBER
- S3000 — DRAWING DESIGNATION NUMBER
- ASPHALT SURFACING
- AGGREGATE SURFACING
- REINFORCED CONCRETE
- EARTH
- RIPRAP
- SAND/BEDDING MAT'L
- GRASS
- WETLANDS

ABBREVIATIONS APPLICABLE TO ALL GRADING AND DRAINAGE DRAWINGS

A	ARC LENGTH	LS	LIFT STATION
AGG	AGGREGATE	LTR	LATER
APPROX	APPROXIMATE	MATL	MATERIAL
ASPH	ASPHALT	MH	MANHOLE
AVG	AVERAGE	MSL	MEAN SEA LEVEL
BLDG	BUILDING	MW	MONITORING WELL
B/MH	BOTTOM OF MANHOLE ELEVATION	N	NORTH
BOD	BOTTOM OF ELECTRICAL DUCT BANK	NO.	NUMBER
BOP	BOTTOM OF PIPE	NTS	NOT TO SCALE
BU	BELL-UP	OD	OUTSIDE DIAMETER
CHDPE	CORRUGATED HIGH DENSITY POLYETHYLENE PIPE	OWS	OIL/WATER SEPARATOR
CJ	CONTRACTION JOINT	PC	POINT OF CURVATURE
CL	CENTERLINE	PE	PLAIN END
CMP	CORRUGATED METAL PIPE	PI	POINT OF INTERSECTION
CO	CLEANOUT	PL	PROPERTY LINE
D	DEGREE OF CURVE	PLCS	PLACES
Δ	DELTA ANGLE OF HORIZONTAL CURVE	PRC	POINT OF REVERSE CURVE
DI	DUCTILE IRON	PT	POINT OF TANGENT
DIA	DIAMETER	PVC	POINT OF VERTICAL CURVE
DIM	DIMENSION	PVI	POINT OF VERTICAL INTERSECTION
DWG	DRAWING	PVT	POINT OF VERTICAL TANGENT
E	EAST	R	RADIUS
EA	EACH	RCP	REINFORCED CONCRETE PIPE
EF	EACH FACE	RD	ROOF DRAIN
EGP	EDGE OF PAVEMENT	RED	REDUCER
EGS	EDGE OF SHOULDER	REQD	REQUIRED
EHH	ELECTRICAL HANDHOLE	REV	REVISION
EL	ELEVATION	R/W	RIGHT-OF-WAY
EJ	EXPANSION JOINT	S	SOUTH
EW	EACH WAY	SE	SUPERELEVATION
EXP	EXPANSION	SIM	SIMILAR
FD	FLOOR DRAIN	STA	STATION
FDN	FOUNDATION	T	TANGENT LENGTH
FF	FINISHED FLOOR	TMH	TOP OF MANHOLE
FG	FINISHED GRADE	TOC	TOP OF CONCRETE
FRP	FIBER REINFORCED PIPE	TOG	TOP OF GRATING
FT	FOOT	TOP	TOP OF PAVEMENT
HC	HANDICAPPED	TYP	TYPICAL
HDPE	HIGH DENSITY POLYETHYLENE	UNO	UNLESS NOTED OTHERWISE
HVCM	HORIZ & VERT CONTROL MONUMENT	DS	DESIGN SPEED
HP	HIGH POINT	VERT	VERTICAL
ID	INSIDE DIAMETER	W	WEST
IN	INCH	W/	WITH
INV	INVERT	W/O	WITHOUT
L	LENGTH	WP	WORK POINT
LC	LENGTH OF VERTICAL CURVE		

PRELIMINARY

NOT TO BE USED FOR CONSTRUCTION



BLACK & VEATCH
Building a world of difference®

PROJECT NO. 174811

DRAWN	RMG
DESIGNED	SMR
APPROVED	–
CHECKED	–

No	Date	Revision	By	Chkd.	Engr.	Supv.
0	04/30/12	MCF REVIEW ISSUE	RMG	–	SMR	–

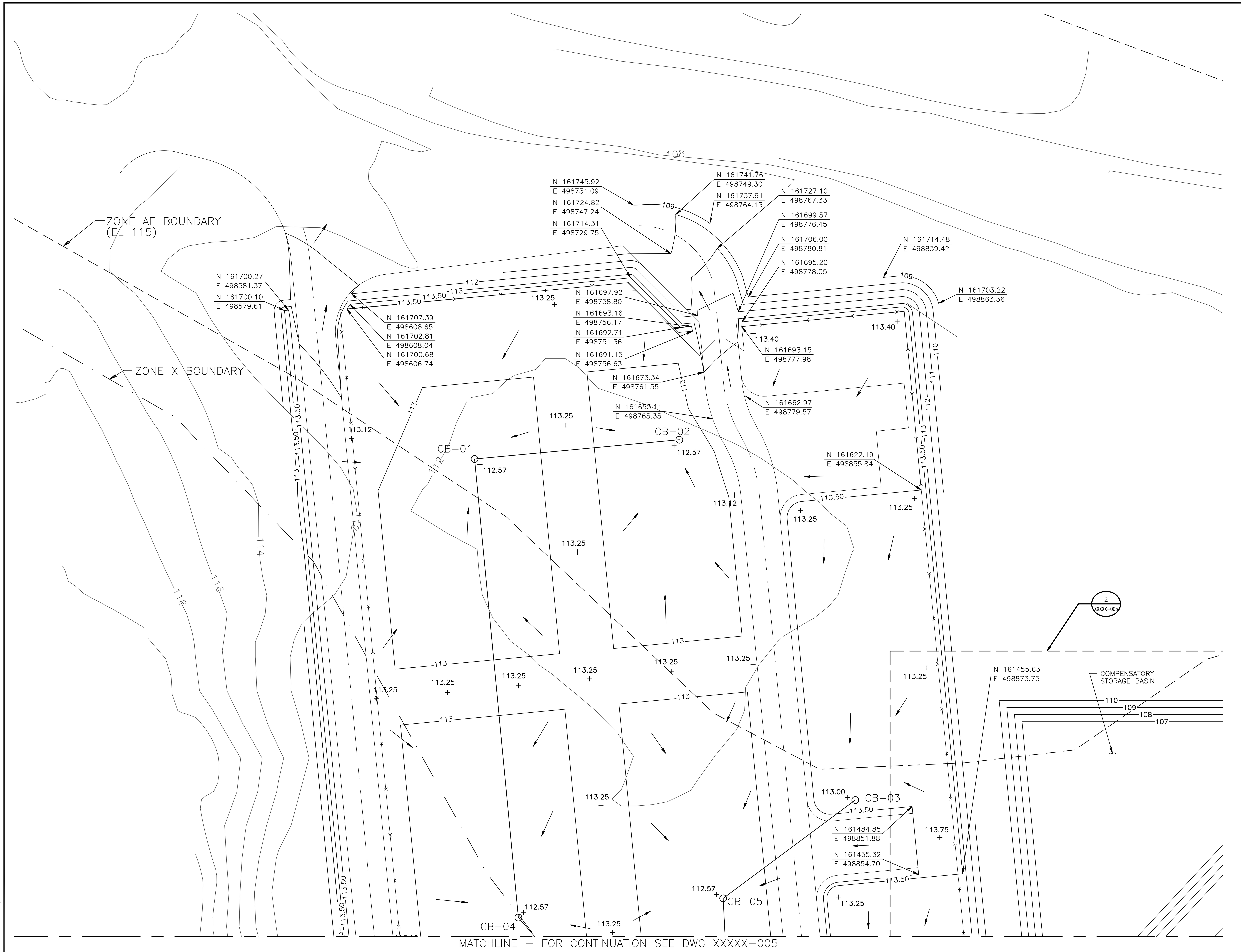
The United Illuminating Company
157 Church St. New Haven, Ct. 06506

Drawn RMG	Date 04/30/12	Scale: 1:50
Chkd. –	Design Engr. SMR	Design Supv. –

GRADING AND DRAINAGE – SITE
KEY PLAN
SHELTON SUBSTATION

CAD FILE NAME	SEQUENCE No.	DRAWING NUMBER
–	–	XXXXX-003

GUS64641 ACAD
04/30/12 15:59:26 1 18.0s (LMS Tech)



NOTES

1. SEE DWG XXXXX-003 FOR GENERAL NOTES, KEY PLAN AND ABBREVIATIONS.

PRELIMINARY

NOT TO BE USED FOR CONSTRUCTION

20' 10' 0 20' 40'

1"=20'

BLACK & VEATCH
Building a world of difference®

PROJECT NO. 174811

DRAWN	RMG
DESIGNED	SMR
APPROVED	–
CHECKED	–

No	Date	Revision	By	Chkd.	Engr.	Supv.
0	04/30/12	MCF REVIEW ISSUE	RMG		SMR	

The United Illuminating Company
157 Church St. New Haven, Ct. 06506

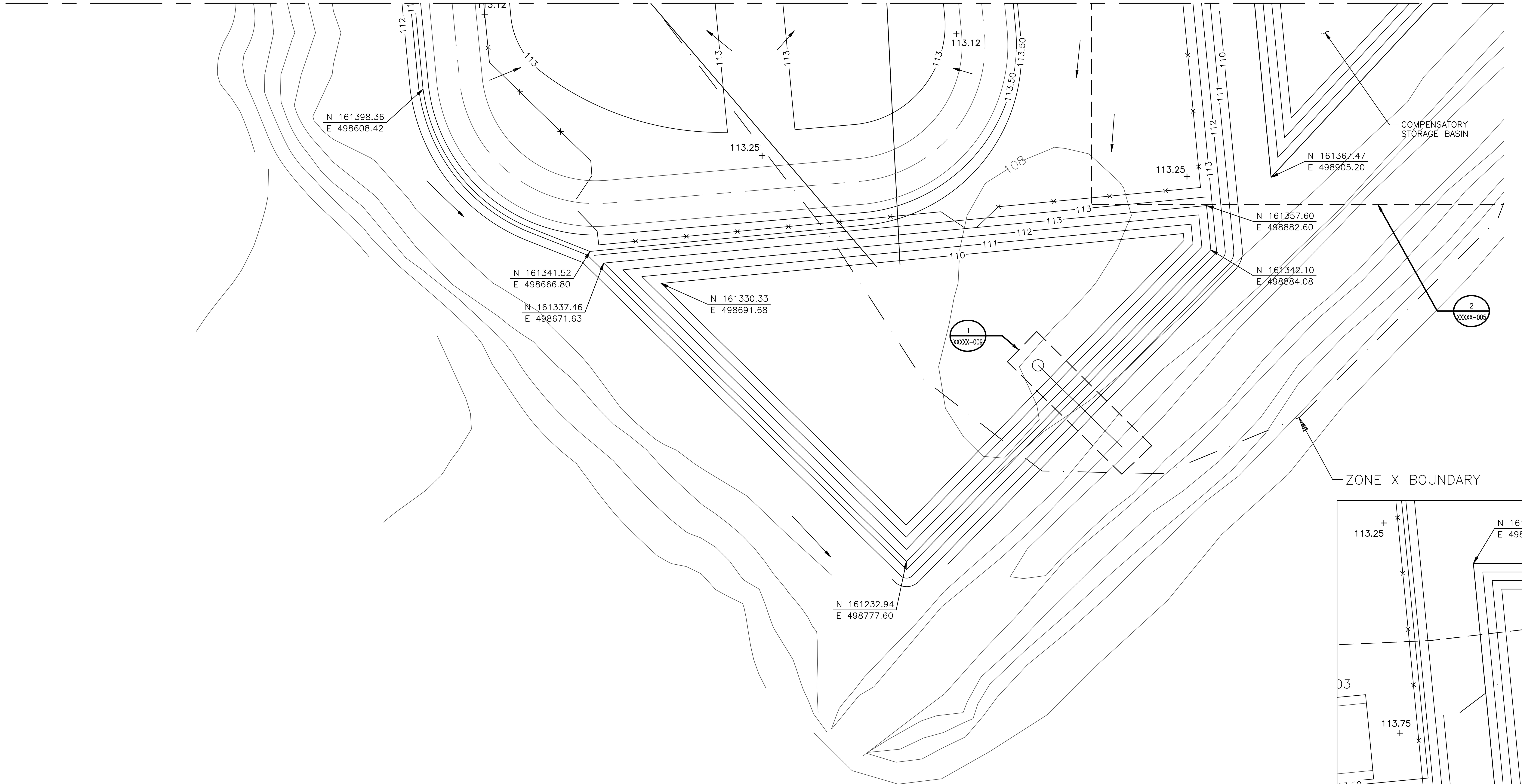
Drawn RMG | Date 04/30/12 | Scale: 1:20
Chkd. – | Design Engr. SMR | Design Supv. –

GRADING AND DRAINAGE – SITE PLAN – AREA 1
SHELTON SUBSTATION

CAD FILE NAME	SEQUENCE No.	DRAWING NUMBER
–	–	XXXXX-004

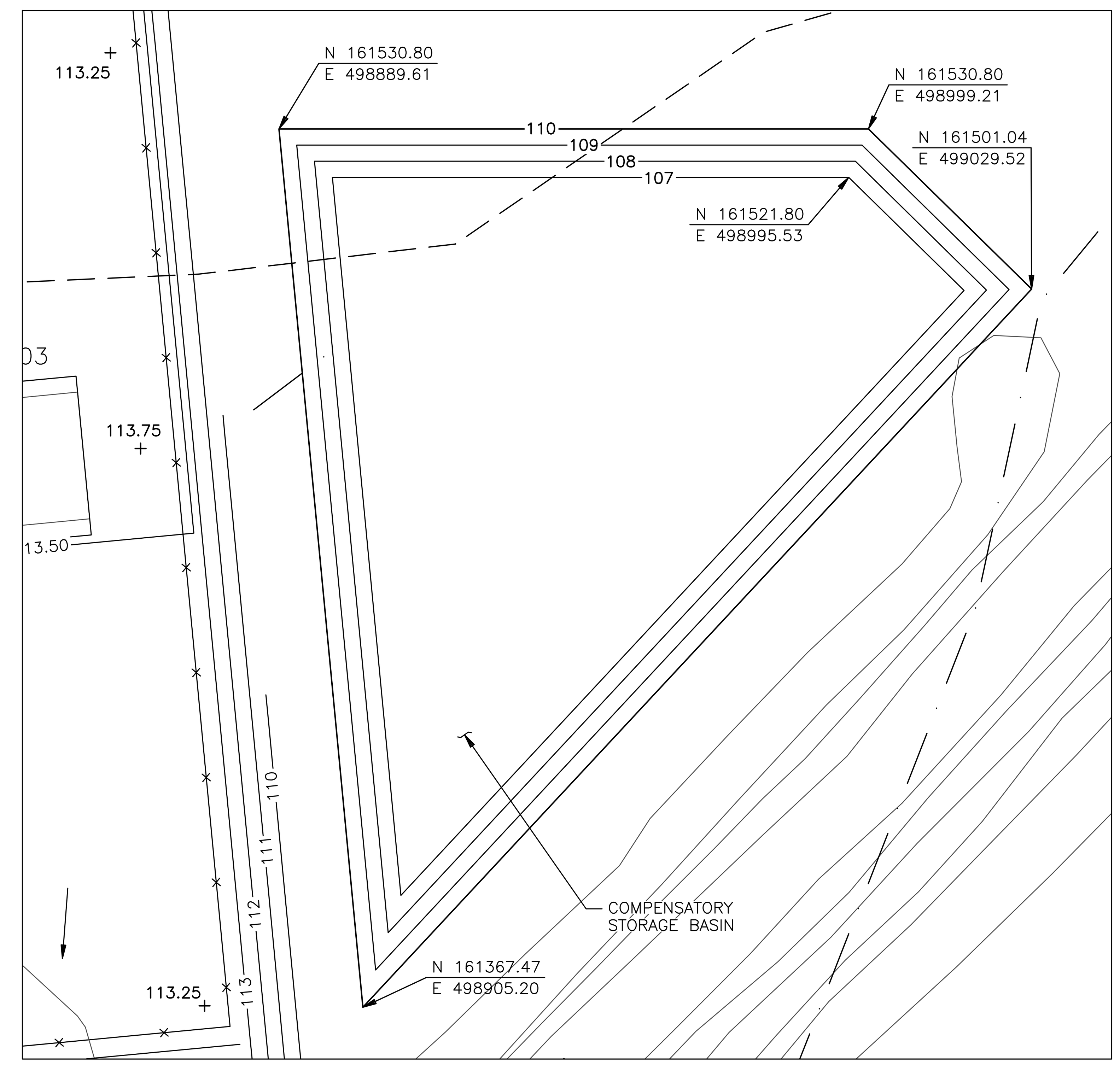
ACAD
GUS64641 04/30/12 16:02:31 18.0s (LMS Tech)

MATCHLINE – FOR CONTINUATION SEE DWG XXXXX-004



NOTES

1. SEE DWG XXXXX-003 FOR GENERAL NOTES, KEY PLAN AND ABBREVIATIONS.



DETAIL 2
SCALE: 1"=20'

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

20' 10' 0 20' 40'
1"=20'

BLACK & VEATCH
Building a world of difference®

PROJECT NO. 174811

DRAWN	RMG
DESIGNED	SMR
APPROVED	–
CHECKED	–

No	Date	Revision	By	Chkd.	Engr.	Supv.
0	04/30/12	MCF REVIEW ISSUE	RMG		SMR	

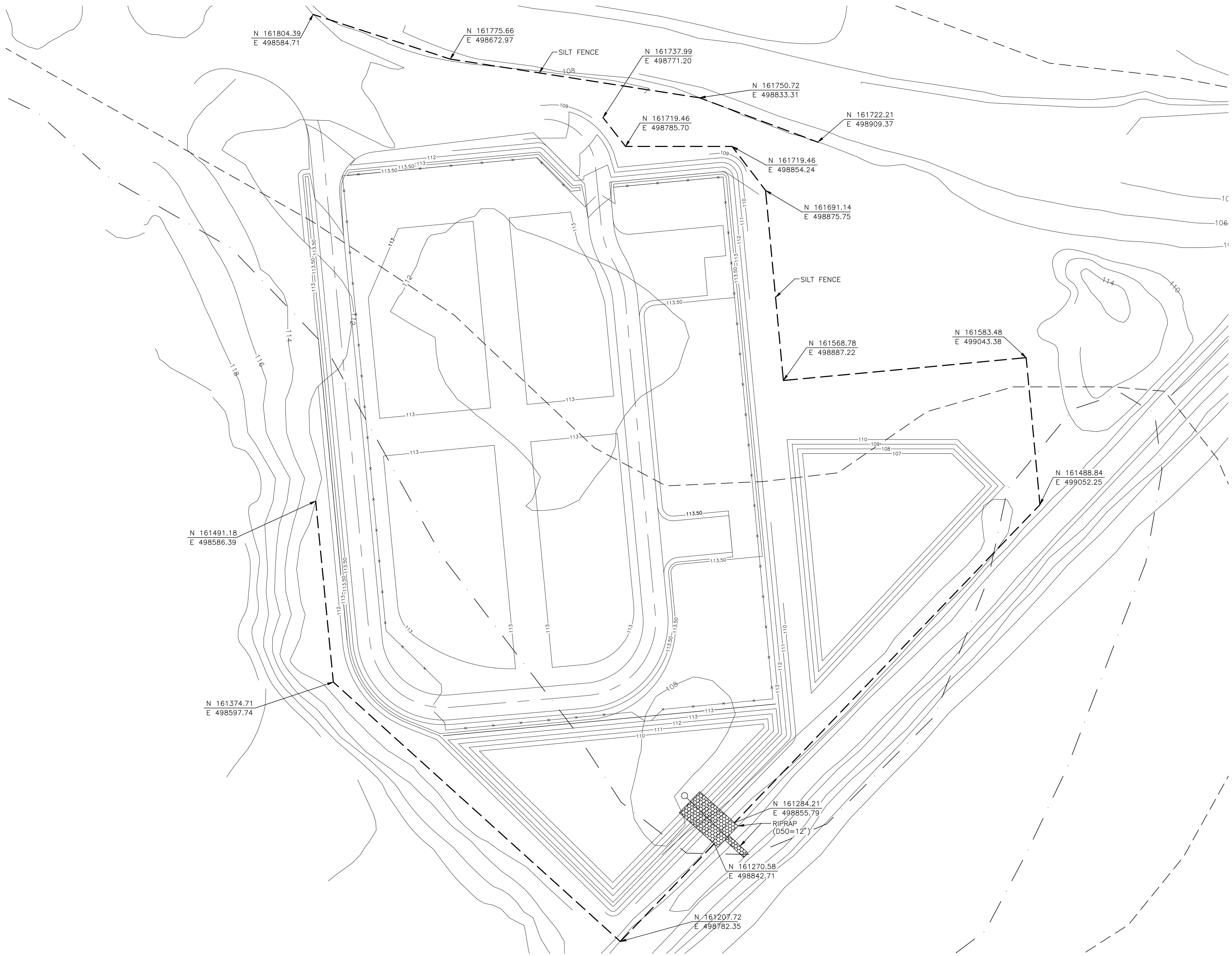
The United Illuminating Company
157 Church St. New Haven, Ct. 06506

Drawn RMG	Date 04/30/12	Scale: 1:20
Chkd. –	Design Engr. SMR	Design Supv. –

GRADING AND DRAINAGE – SITE PLAN – AREA 2
SHELTON SUBSTATION

CAD FILE NAME	SEQUENCE No.	DRAWING NUMBER
–	–	XXXXX-005

GUS64641 04/30/12 16:05:09 1 ACAD 18.0s (LMS Tech)



NOTES

1. SEE DWG XXXXX-003 FOR GENERAL NOTES, KEY PLAN AND ABBREVIATIONS.

PRELIMINARY

NOT TO BE USED FOR CONSTRUCTION

30' 20' 10' 0 30' 60'

1"=30'

BLACK & VEATCH
Building a world of difference®

PROJECT NO. 174811

DRAWN	RMG
DESIGNED	SMR
APPROVED	–
CHECKED	–

No	Date	Revision	By	Chkd.	Engr.	Supv.
0	04/30/12	MCF REVIEW ISSUE	RMG		SMR	

The United Illuminating Company
157 Church St. New Haven, Ct. 06506

Drawn RMG	Date 04/30/12	Scale: 1:30
Chkd. –	Design Engr. SMR	Design Supv. –

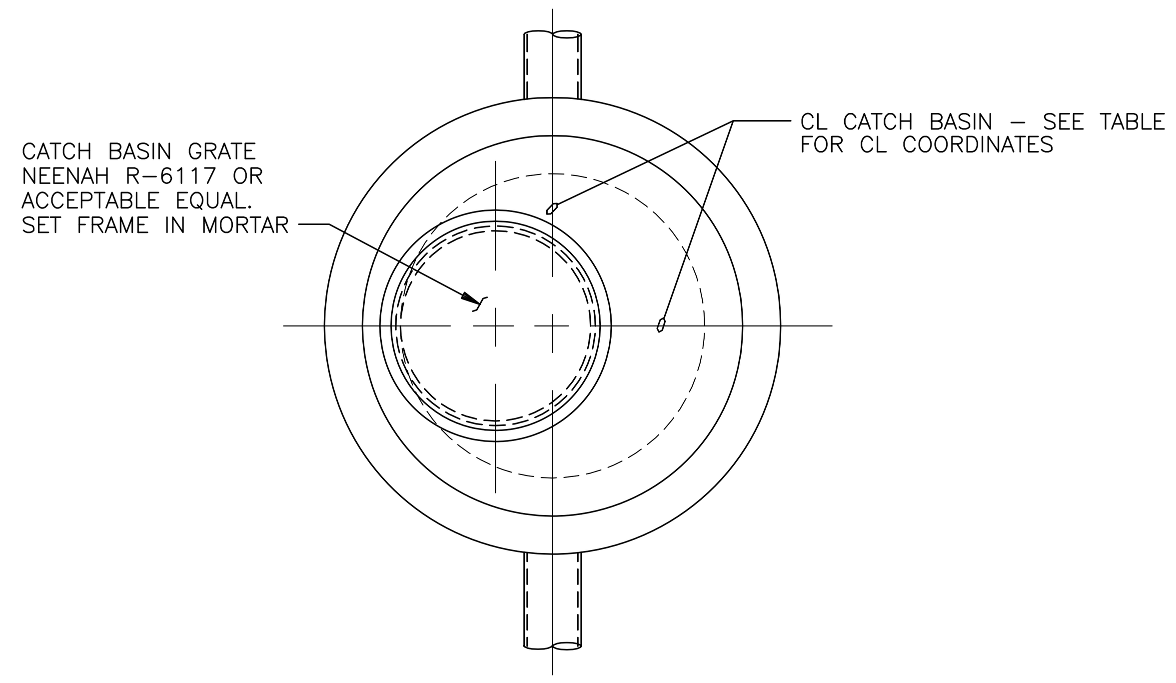
EROSION CONTROL – SITE PLAN
SHELTON SUBSTATION

CAD FILE NAME	SEQUENCE No.	DRAWING NUMBER
–	–	XXXXX–006

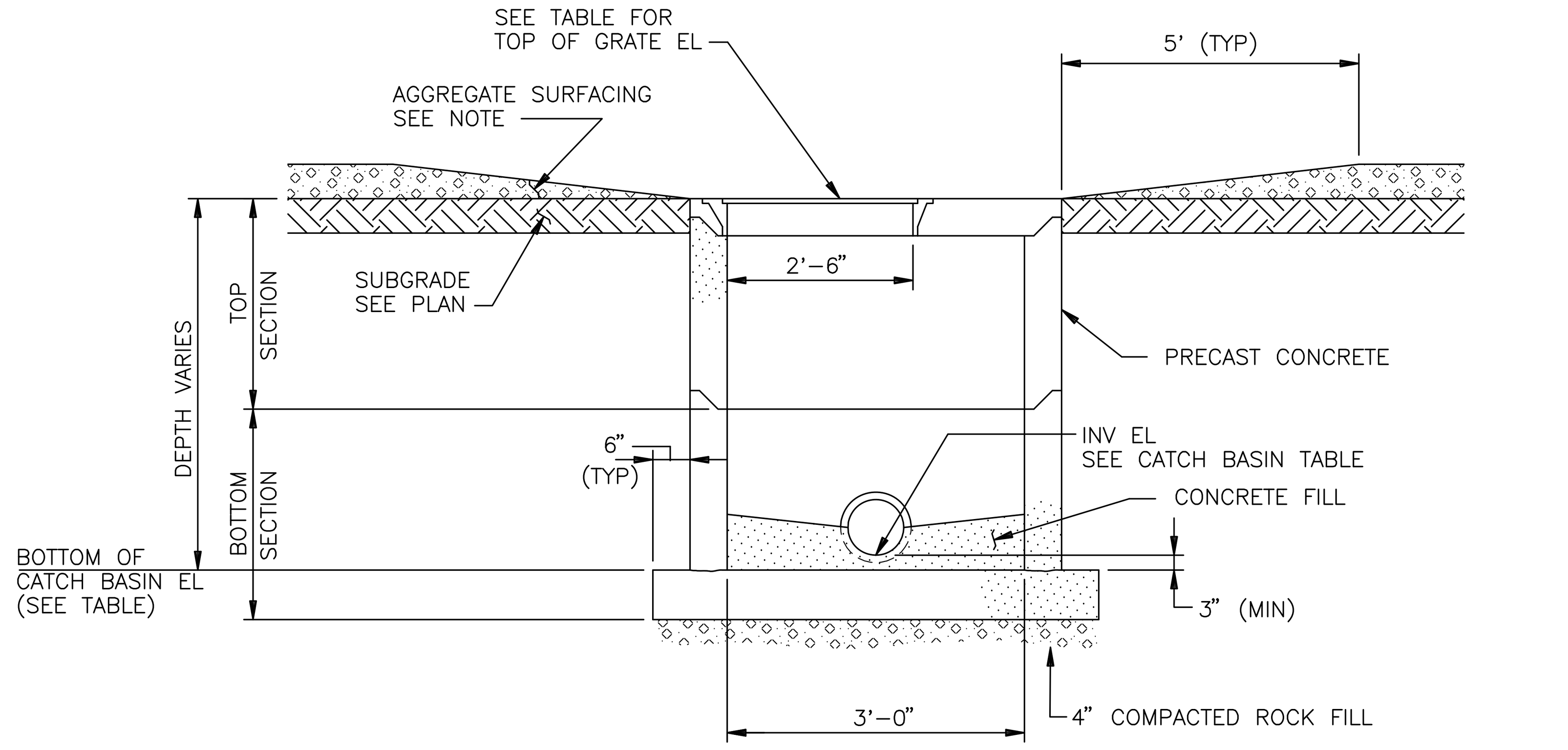
GUS64641 04/30/12 ACAD 18.0s (LMS Tech)

NOTES

1. SEE DWG XXXXX-003 FOR GENERAL NOTES, KEY PLAN AND ABBREVIATIONS.



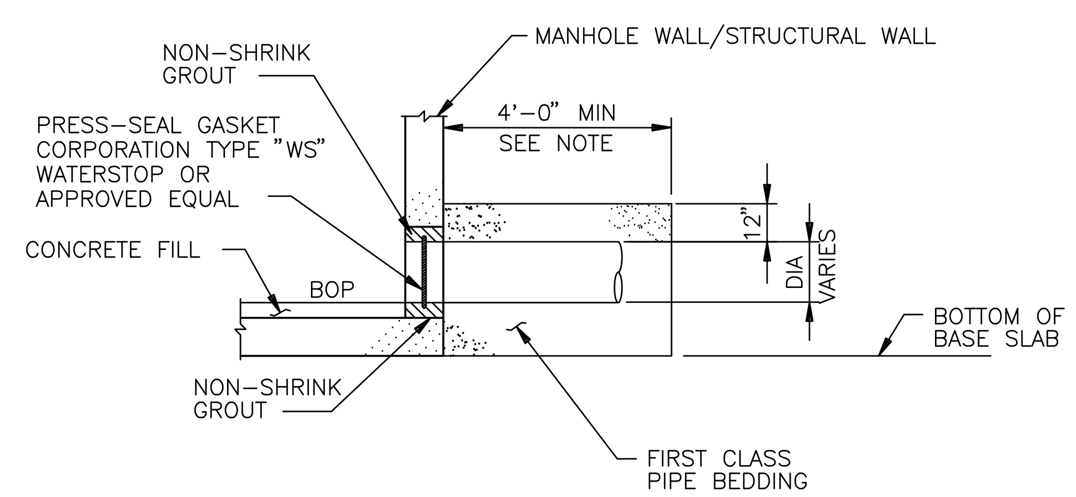
PLAN



SECTION

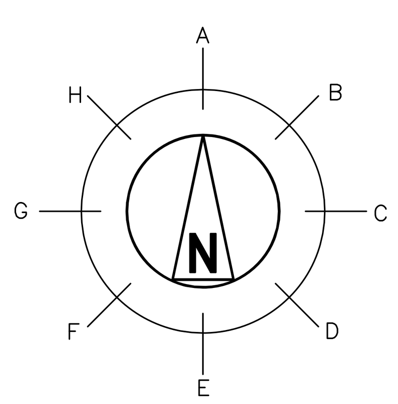
NOTE: AGGREGATE SURFACING SHALL TRANSITION FROM 0 AT THE EDGE OF THE MANHOLE TO FULL DEPTH WITHIN 5' OF THE MANHOLE EDGE.

TYPICAL PRECAST CATCH BASIN
NO SCALE



NOTE: FIRST CLASS PIPE BEDDING TO LIMITS SHOWN OR EDGE OF MANHOLE EXCAVATION WHICHEVER IS GREATER.

TYPICAL WALL PENETRATION DETAIL
NO SCALE



CATCH BASIN TABLE

STRUCTURE NO.	DRAWING NO.	CENTERLINE COORDINATES		TOP OF GRATE ELEVATION	BOTTOM OF CATCH BASIN ELEVATION	INLET & OUTLET PIPE INFORMATION																REMARKS
						A		B		C		D		E		F		G		H		
		NORTH	EAST			INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	INV EL	DIA	
CB-01	XXXXX-004	155397.00	545431.00	112.57	109.32	–	–	–	–	109.95	12"	–	–	109.68	15"	–	–	–	–	–	–	
CB-02	XXXXX-004	155497.50	546497.00	112.57	109.82	–	–	–	–	–	–	–	–	–	–	–	–	110.17	12"	–	–	
CB-03	XXXXX-004	153621.00	547412.75	113.00	110.25	–	–	–	–	–	–	–	–	–	–	110.60	12"	–	–	–	–	
CB-04	XXXXX-004	153009.00	545659.00	112.57	108.57	109.18	15"	–	–	–	–	108.93	18"	–	–	–	–	–	–	–	–	OUTLET TO RETENTION BASIN
CB-05	XXXXX-004	153109.00	546725.00	112.57	109.32	–	–	110.36	12"	–	–	–	–	–	–	109.67	12"	–	–	–	–	OUTLET TO RETENTION BASIN

ALL DIMENSIONS ARE IN FEET, EXCEPT DIAMETER, WHICH IS IN INCHES
FOR PIPELINE MATERIAL SEE PIPELINE LIST

GUS64641 04/30/12 16:11:06 ACAD 18.0s (LMS Tech)

PRELIMINARY

NOT TO BE USED FOR CONSTRUCTION

BLACK & VEATCH
Building a world of difference®

PROJECT NO. 174811

DRAWN	RMG
DESIGNED	SMR
APPROVED	–
CHECKED	–

No	Date	Revision	By	Chkd.	Engr.	Supv.
0	04/30/12	MCF REVIEW ISSUE	RMG		SMR	

The United Illuminating Company
157 Church St. New Haven, Ct. 06506

Drawn RMG	Date 04/30/12	Scale: –
Chkd. –	Design Engr. SMR	Design Supv. –

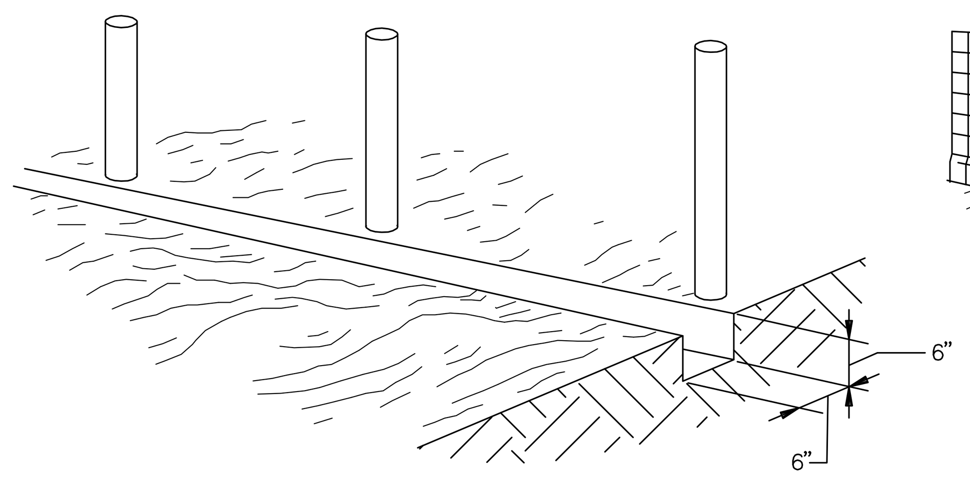
GRADING AND DRAINAGE – SITE
CATCH BASIN SCHEDULE AND DETAILS
SHELTON SUBSTATION

CAD FILE NAME	SEQUENCE No.	DRAWING NUMBER
–	–	XXXXX-007

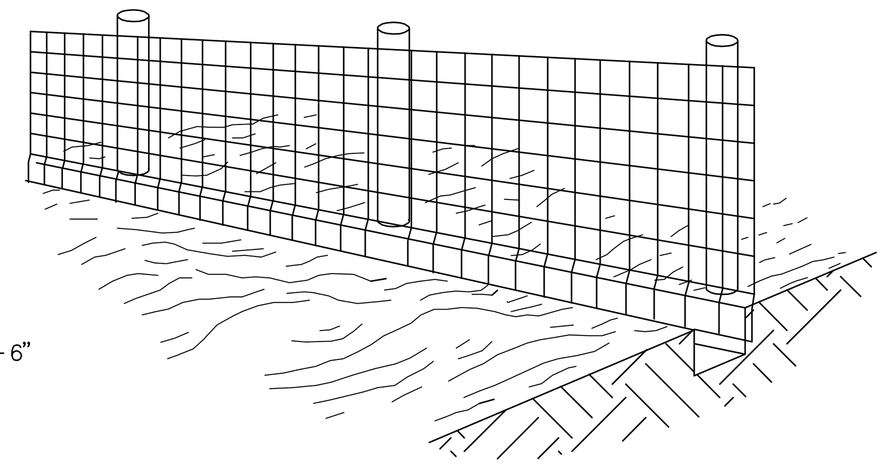
NOTES

1. SEE DWG XXXXX-003 FOR GENERAL NOTES, KEY PLAN AND ABBREVIATIONS.

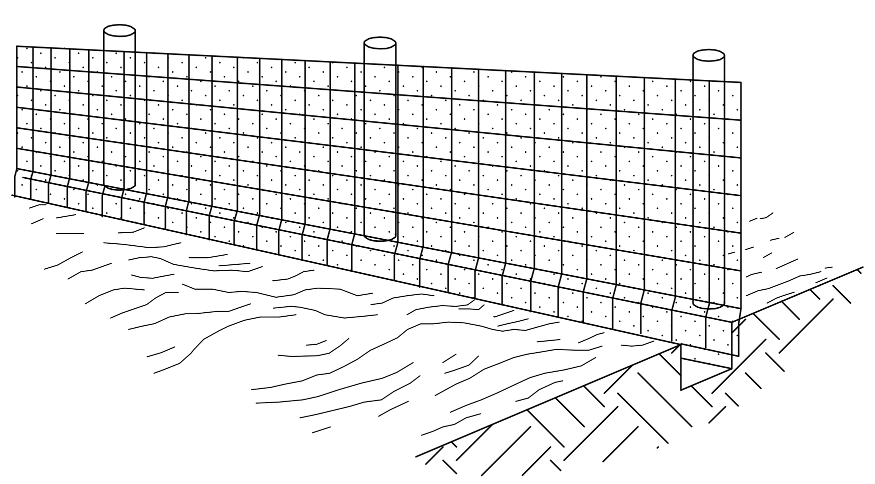
1. SET POSTS AND EXCAVATE A 6"X6" TRENCH UP SLOPE ALONG THE LINE OF POSTS.



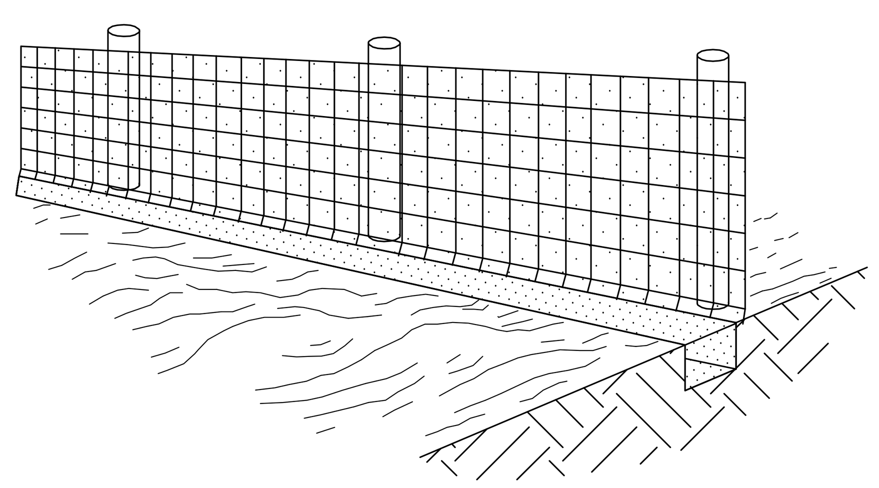
2. STAPLE WIRE FENCING TO THE POSTS.



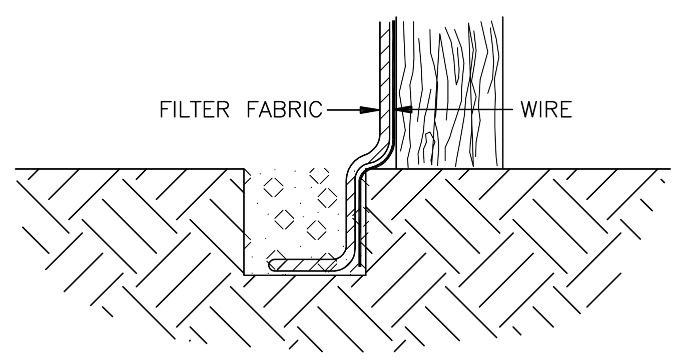
3. ATTACH THE FILTER FABRIC TO THE WIRE FENCE AND EXTEND IT INTO THE TRENCH.



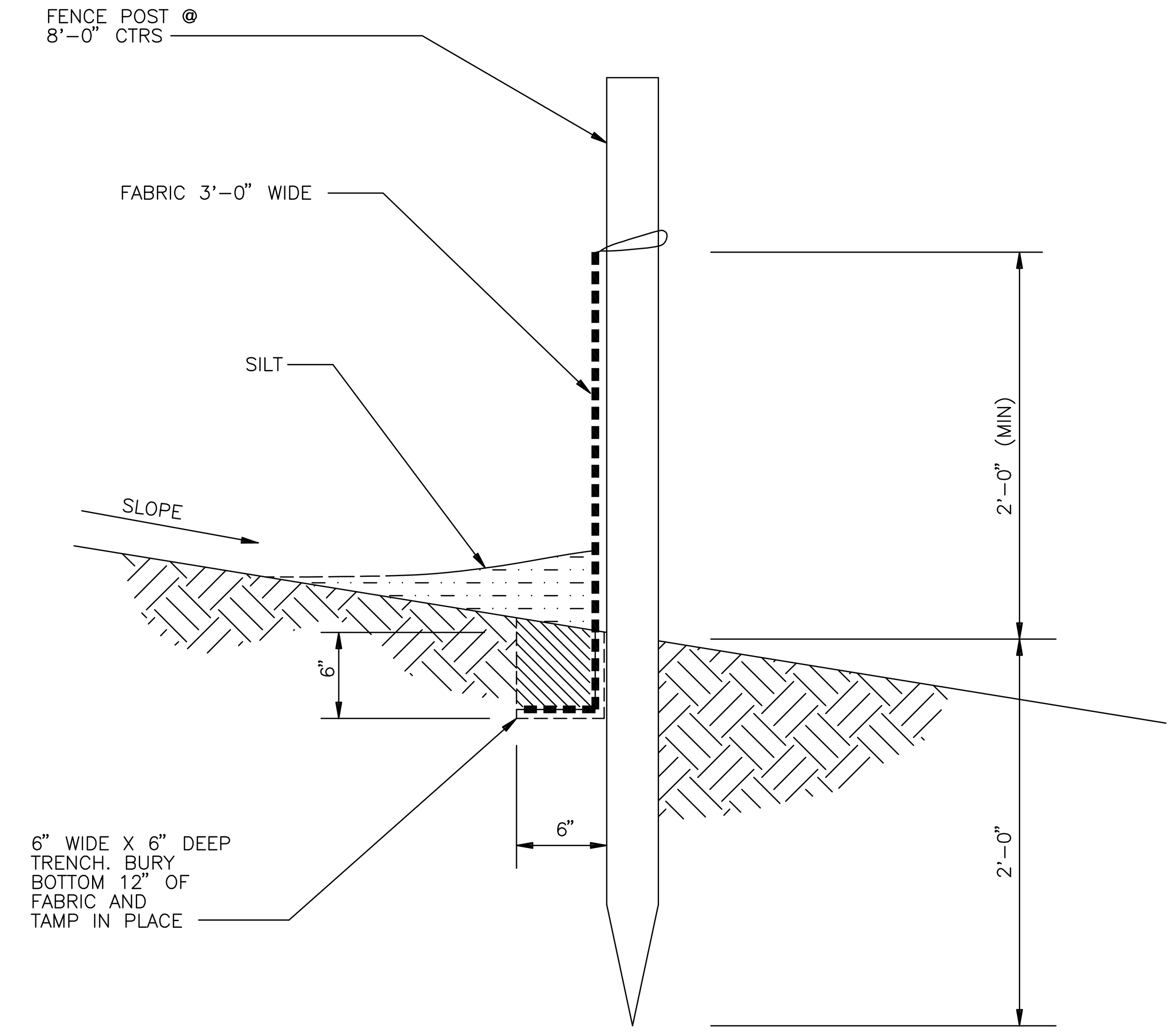
4. BACKFILL AND COMPACT THE EXCAVATED SOIL.



EXTENSION OF FABRIC AND WIRE INTO THE TRENCH



PLANS



ELEVATION

SILT FENCE DETAIL
NO SCALE

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

BLACK & VEATCH
Building a world of difference®
PROJECT NO. 174811

DRAWN	RMG
DESIGNED	SMR
APPROVED	–
CHECKED	–

No	Date	Revision	By	Chkd.	Engr.	Supv.
0	04/30/12	MCF REVIEW ISSUE	RMG		SMR	

The United Illuminating Company
157 Church St. New Haven, Ct. 06506

Drawn RMG | Date 04/30/12 | Scale: –
Chkd. – | Design Engr. SMR | Design Supv. –

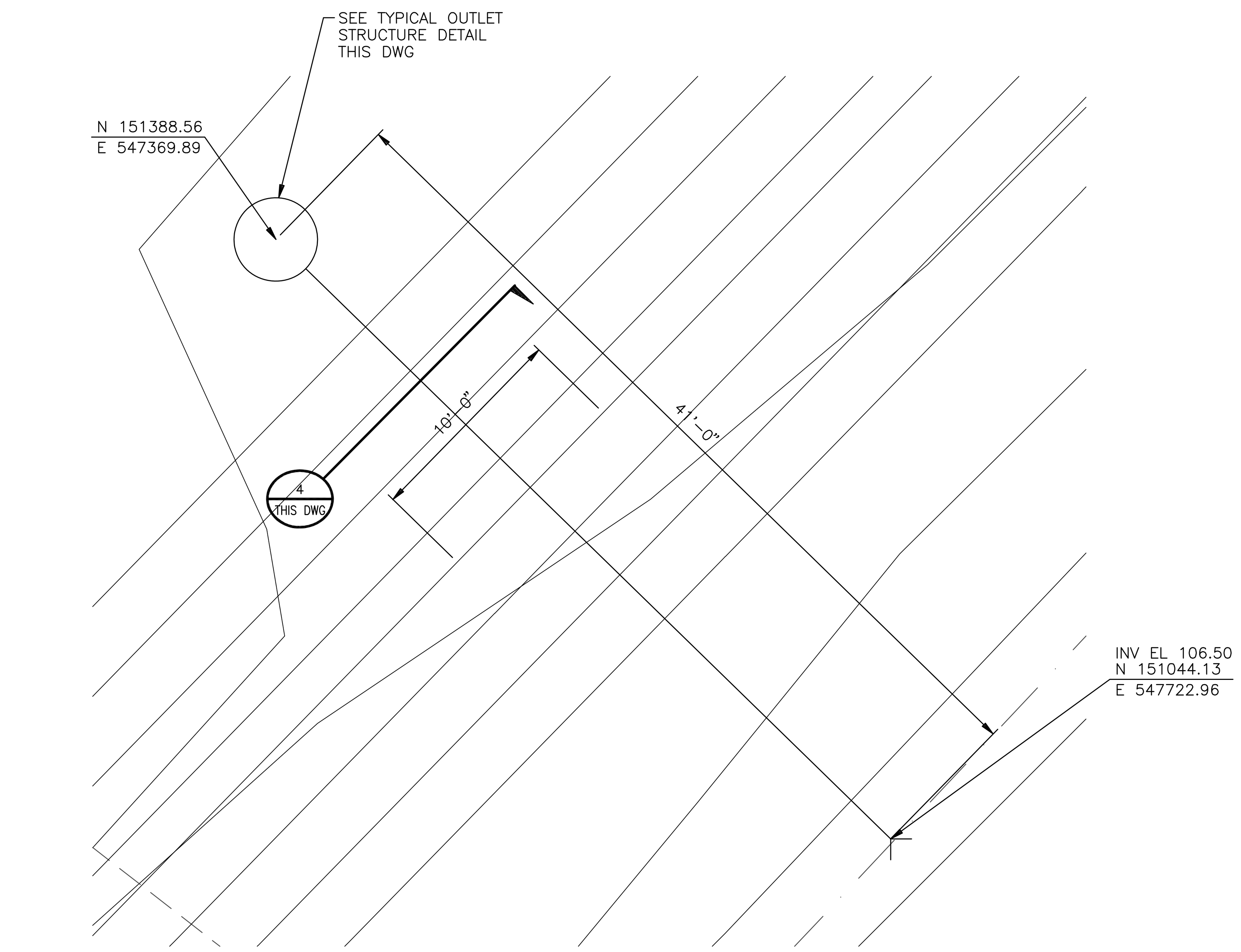
EROSION CONTROL – SITE
EROSION CONTROL DETAILS
SHELTON SUBSTATION

CAD FILE NAME	SEQUENCE No.	DRAWING NUMBER
–	–	XXXXX-008

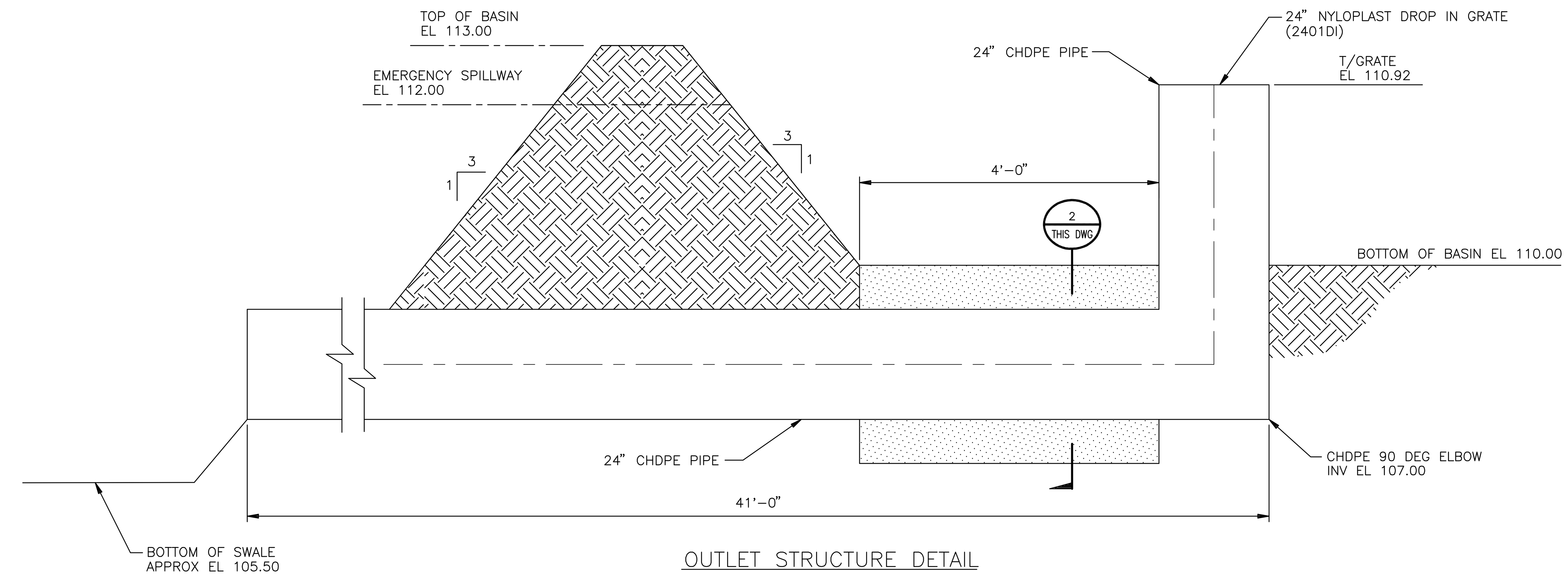
GUS64641 04/30/12 16:12:29=1 ACAD 18.0s (LMS Tech)

NOTES

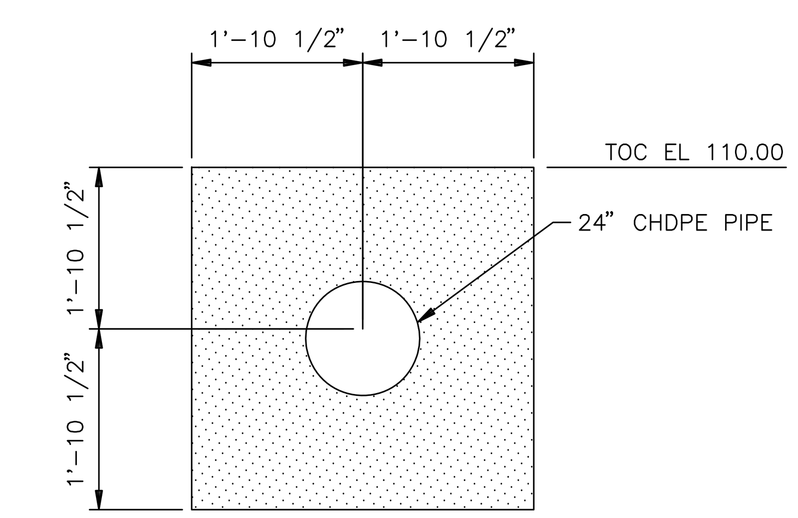
1. SEE DWG XXXXX-003 FOR GENERAL NOTES, KEY PLAN AND ABBREVIATIONS.



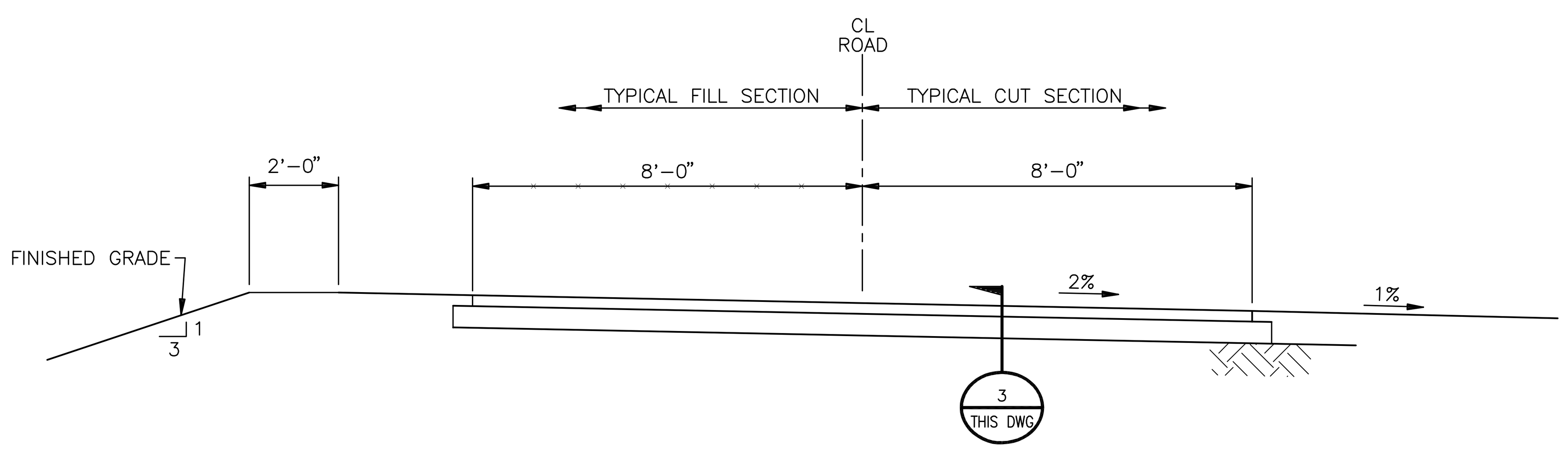
DETAIL 1
NO SCALE



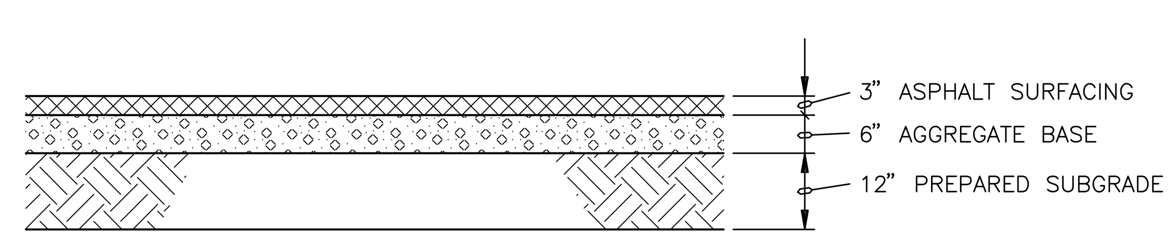
OUTLET STRUCTURE DETAIL
NO SCALE



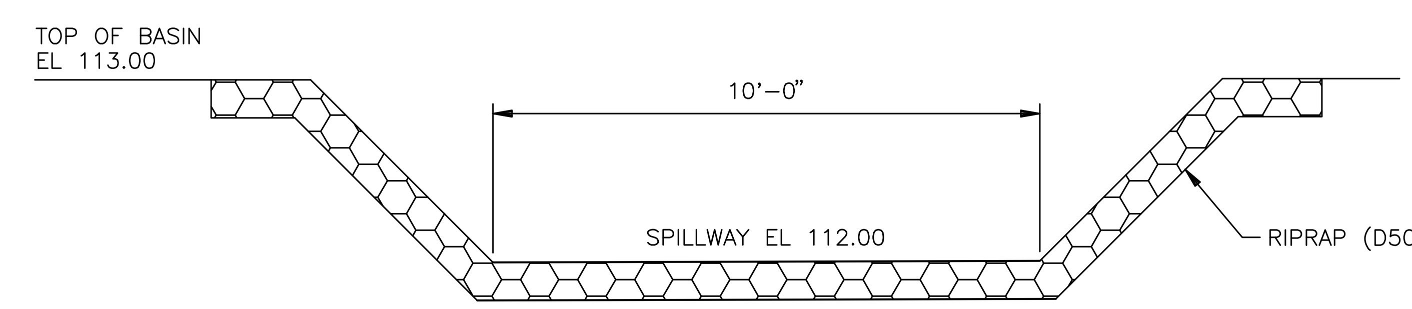
SECTION 2
NO SCALE



TYPICAL ASPHALT SURFACE ROAD SECTION
NO SCALE



SECTION 3
NO SCALE



SECTION 4
NO SCALE

GUS64641 ACAD
04/30/12 16:07:11 1 18.0s (LMS Tech)

PRELIMINARY

NOT TO BE USED FOR CONSTRUCTION

BLACK & VEATCH
Building a world of difference®

PROJECT NO. 174811

DRAWN	RMG
DESIGNED	SMR
APPROVED	–
CHECKED	–

No	Date	Revision	By	Chkd.	Engr.	Supv.
0	04/30/12	MCF REVIEW ISSUE	RMG		SMR	

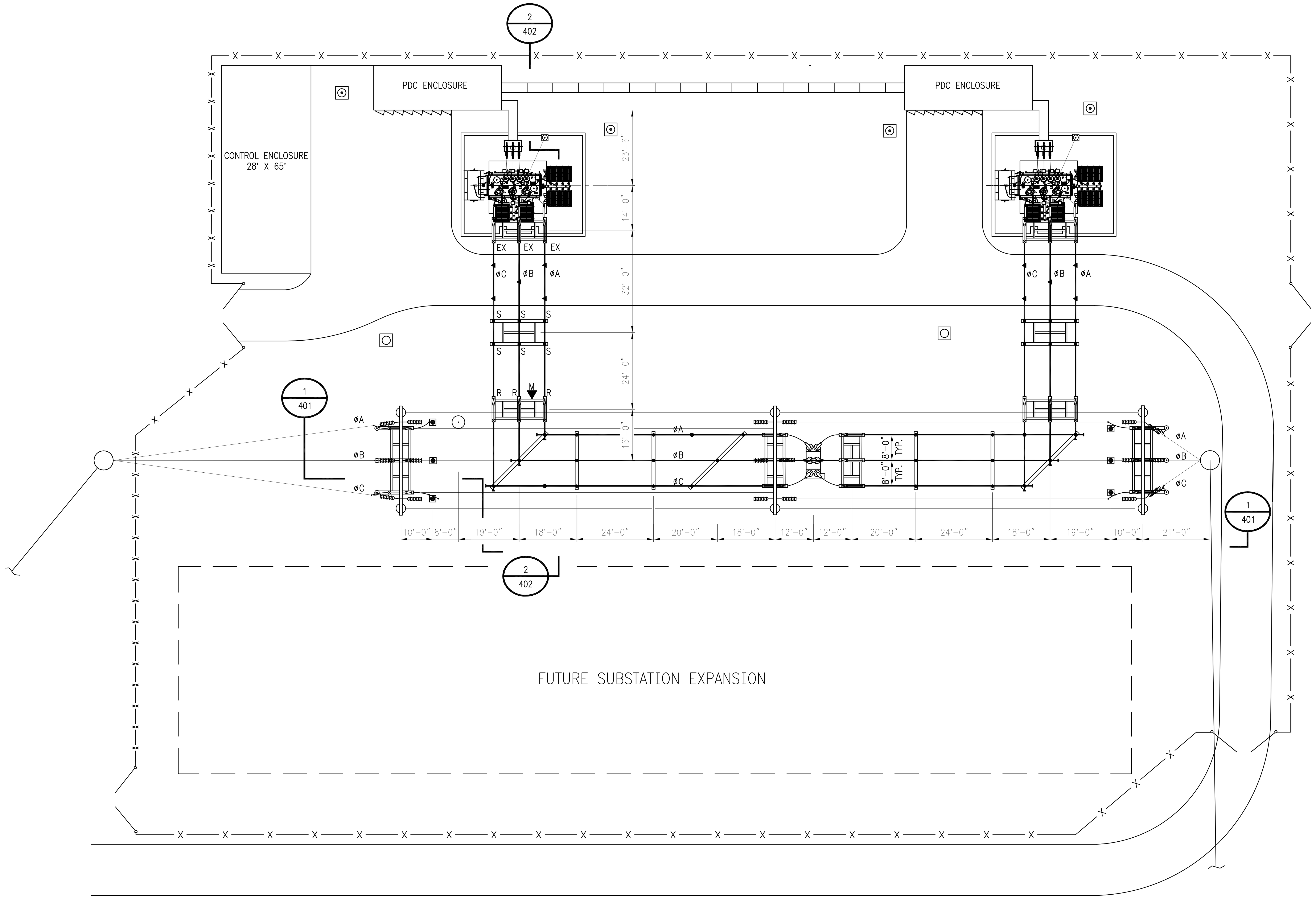
The United Illuminating Company
157 Church St. New Haven, Ct. 06506

Drawn RMG	Date 04/30/12	Scale: –
Chkd. –	Design Engr. SMR	Design Supv. –

GRADING AND DRAINAGE – SITE DETAILS
SHELTON SUBSTATION

CAD FILE NAME	SEQUENCE No.	DRAWING NUMBER
–	–	XXXXX-009

Appendix A DR.4



LEGEND

- BUS CONNECTION OR JOINT
- MOBILE TRANSFORMER TAP
- BUS SUPPORT
- R — RIGID (FIXED) BUS CONNECTION
- S — SLIP BUS CONNECTION
- EX — EXPANSION BUS CONNECTION
- COUPLING CAPACITOR VOLTAGE TRANSFORMER
- BUS GROUNDING STUD
- LIGHTING MAST
- LIGHTNING MAST
- SURGE ARRESTER
- M — DISCONNECT SWITCH MOTOR OPERATOR

REFERENCE DRAWINGS

SUBSTATION SECTION 1	XXXXX-401
SUBSTATION SECTION 2	XXXXX-402

PRELIMINARY

NOT TO BE USED FOR CONSTRUCTION

20' 10' 0 20' 40'
1"=20'-0"

BLACK & VEATCH
Building a world of difference®

PROJECT NO. 174811

DRAWN JDB
DESIGNED JDB
APPROVED ALL
CHECKED –

No	Date	Revision	By	Chkd.	Engr.	Supv.
0	5/2012	MCF REVIEW ISSUE	JDB	–	MRH	ALL

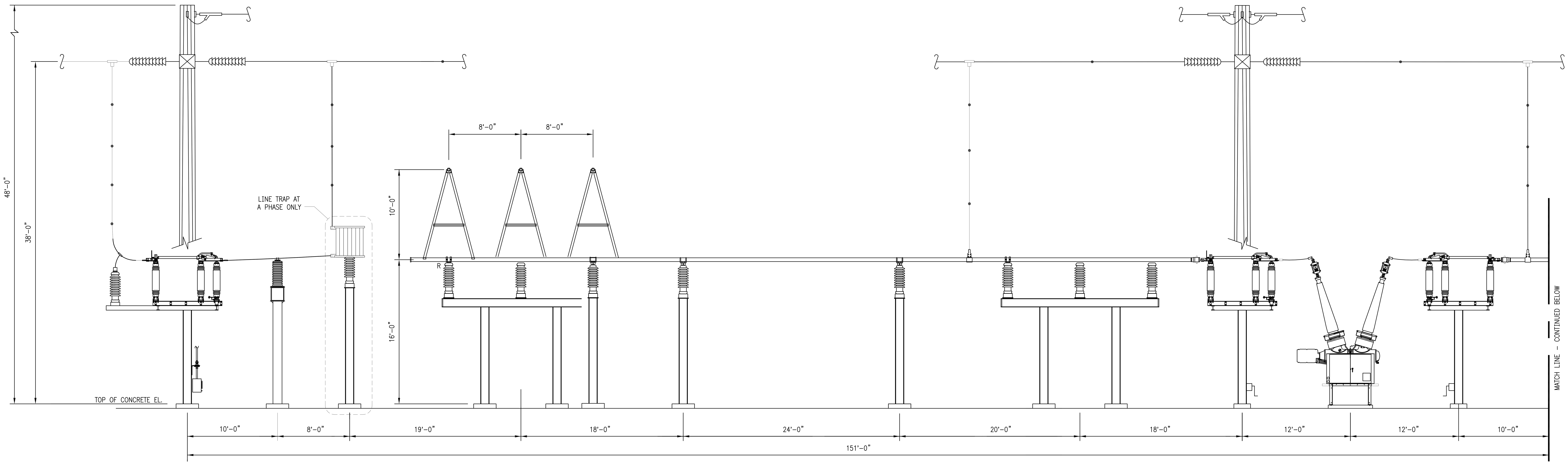
The United Illuminating Company
157 Church St. New Haven, Ct. 06506

Drawn ____ Date ____ Scale: 1" = 20'
Chkd. ____ Design Engr. ____ Design Supv. ____

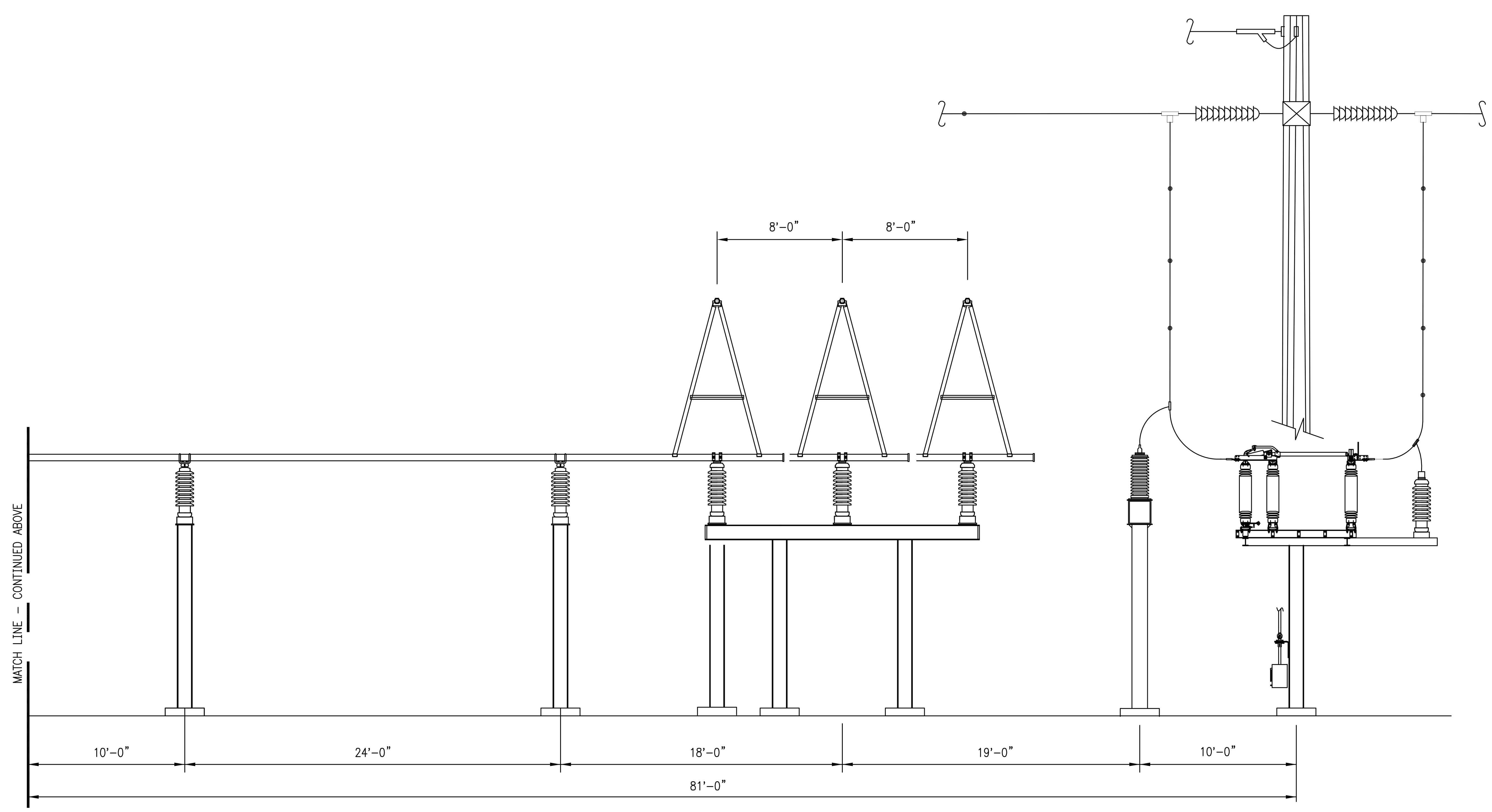
EQUIPMENT PLAN

SHELTON SUBSTATION

CAD FILE NAME	SEQUENCE No.	DRAWING NUMBER
		XXXXX-400



SECTION 1



SECTION 1 – CONTINUED

PRELIMINARY

NOT TO BE USED FOR CONSTRUCTION

6' 4' 2' 0 5' 10'
3/16"=1'-0"

BLACK & VEATCH
Building a world of difference®

PROJECT NO. 174811

DRAWN JDB
DESIGNED JDB
APPROVED –
CHECKED ALL

No	Date	Revision	By	Chkd.	Engr.	Supv.
0	5/2012	MCF REVIEW ISSUE	JDB		ALL	

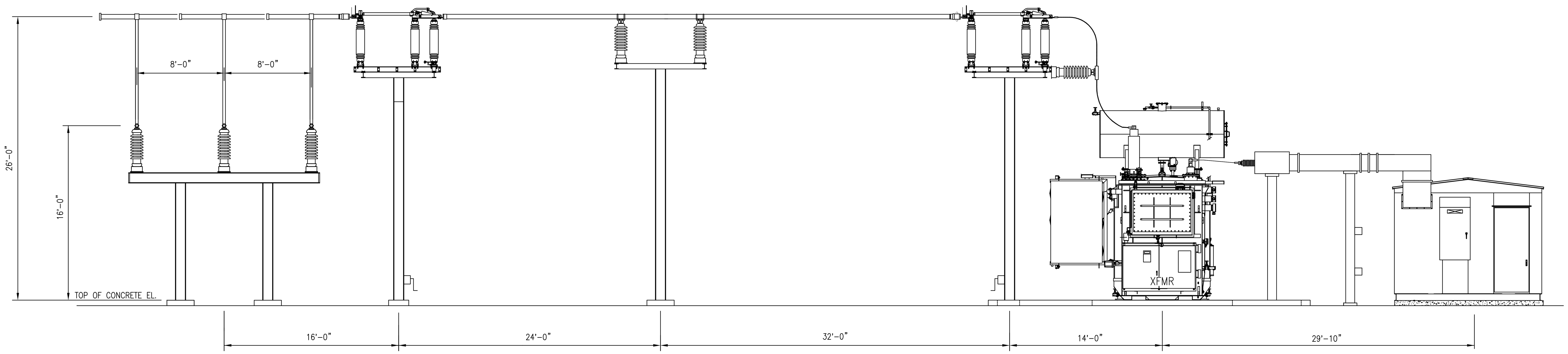
The United Illuminating Company
157 Church St. New Haven, Ct. 06506

Drawn ______ Date ______ Scale: 3/16" =1'-0"
Chkd. ______ Design Engr. ______ Design Supv. ______

SECTION

SHELTON SUBSTATION

CAD FILE NAME | SEQUENCE No. | DRAWING NUMBER XXXXX-401



SECTION 1

SCALE: 3/16"=1'-0"

6' 4' 2' 0 5' 10'

3/16"=1'-0"

PRELIMINARY

NOT TO BE USED FOR CONSTRUCTION

BLACK & VEATCH
Building a world of difference®

PROJECT NO. 174811

DRAWN JDB
DESIGNED JDB
APPROVED –
CHECKED ALL

No	Date	Revision	By	Chkd.	Engr.	Supv.
0	5/2012	MCF REVIEW ISSUE	JDB		ALL	

The United Illuminating Company
157 Church St. New Haven, Ct. 06506

Drawn ____ Date ____ Scale: 3/16" =1'-0"
Chkd. ____ Design Engr. ____ Design Supv. ____

SECTION

SHELTON SUBSTATION

CAD FILE NAME | SEQUENCE No. | DRAWING NUMBER XXXXX-402

Appendix A DR.5

Representative Photographs of the Proposed Shelton Substation Site: November 2011

View of existing paved access road into site from Pootatuck Place. Far Mill River borders site to the north (trees in photograph border the river).

Representative view of site, looking east-northeast from near corner of Pootatuck Place and Old Stratford Road (toward State Route 8).

View to north from corner of Pootatuck Place and Old Stratford Road, showing western boundary of site, 115-kV overhead transmission lines that traverse the site, and commercial developments to the west (hotel, gas station, Dunkin Donuts).

View to west from northern portion of site, showing on-site paved road and commercial uses to the west (Far Mill River borders site to the north, outside of tree line and fence.

Representative Photographs of the Proposed Shelton Substation Site: November 2011

View from northeastern portion of site, looking south-southwest across site, vicinity of groundwater monitoring wells. Transmission line structures shown are on southern side of Old Stratford Road.

View of remaining building and cones, generally placed at location of groundwater monitoring wells, on northeast corner of site. Mature forested vegetation surrounds the site to the east (adjacent to the Far Mill River and State Route 8).

View from western portion of site, looking north along existing 115-kV transmission line right-of-way.

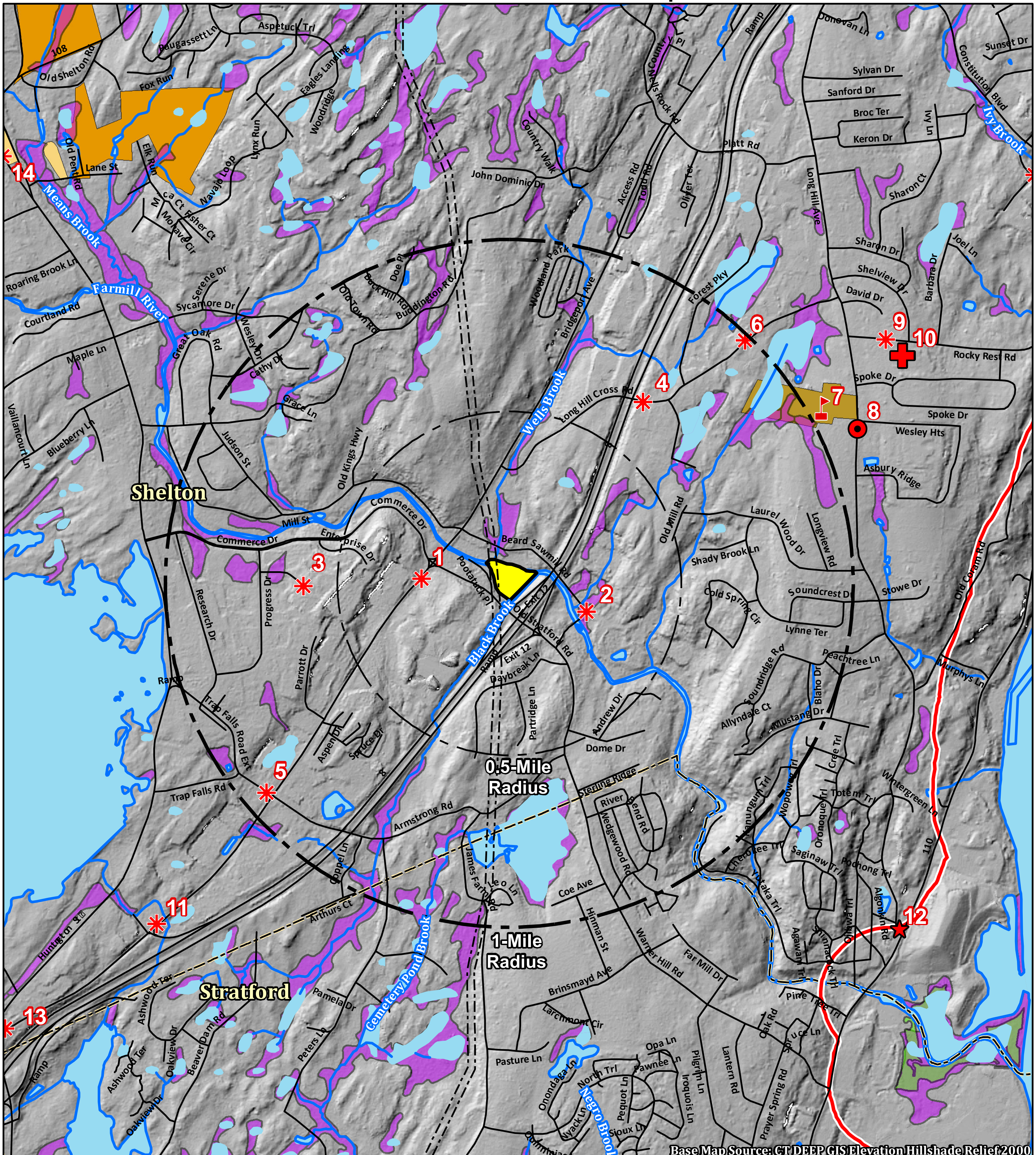
View to east of northern border of site along Far Mill River. A municipal sewer line crosses the river, aerially, to the west of the site. UI proposes to avoid any development within the immediate riparian river corridor.

Google

To see all the details that are visible on the screen, use the "Print" link next to the map.

Appendix A DR.6

-Public Facilities and Resources Map-



UI Property Boundary
Transmission Corridor
Licensed DayCare
Licensed Group Homes
Licensed Youth Camps*

GNIS
Hospital
Population Place (Settled Area)
School
Trail*
Scenic View from Trail*
Railroad
Road

Coastal Boundary
Town Boundary
Watercourse
Waterbody
Tidal Wetland 1990s
Inland Wetland Soils

DEP Property
State Forest*
State Park or Preserve*
Wildlife Area or Sanctuary*

*No Data depicted within map extents

Municipal and Private Open Space
Cemetery
General Recreation
Recreation*
School

Notes: Digital Parcel Data is not currently available for the City of Shelton
City of Shelton is in a 0.15 PGA Zone (Peak Ground Acceleration provided by USGS Seismic Zones Map)

N W E S

0 500 1,000 2,000
Feet

The United Illuminating Company
ALL-POINTS TECHNOLOGY CORPORATION

Public Facilities and Resources

ID Number	Name	Address (all locations in Shelton, except where noted)	Distance from Substation
Daycare			
1	Tutor Time Child Care Learning Center	708 Bridgeport Avenue	.21 mile west
2	Pumpkin Preschool of Shelton	100 Beard Sawmill Road	.20 mile east
3	Bright Horizons Childrens Center	3 Corporate Drive	.51 mile east
4	Apple Tree Daycare & Preschool Center	117 Long Hill Cross Road	.58 mile northeast
5	Kindercare Learning Centers Inc.	1 Trap Falls Road	.9 mile southwest
6	Kid's First Learning Center	216 Long Hill Cross Road	1 mile northeast
9	Wonder Years Learning Center LLC	188 Rocky Rest Road	1.2 miles northeast
11	Bridge to Preschool LLC	917 Bridgeport Avenue	1.4 miles southwest
13	Huntington Point Child Development Center	1079 Bridgeport Avenue	1.9 miles southwest
14	Happy Day Preschool	41 Church Street	1.85 miles northwest
Group Home			
8	Bishop Wicke Health and Rehabilitation Center Inc.	584 Long Hill Avenue	1 mile northeast
Hospital			
10	Long Hill Hospital	172 Rocky Rest Road	1.2 miles northeast
Populated Place			
12	Pine Rock Park	Southeast portion of Shelton	1.5 miles southeast
School			
7	Long Hill School	544 Booth Hill Road	.9 mile northeast
Youth Camp			
*	Tom Rosati Golf Academy Junior Gold Programs	130 Coram Lane, Milford, CT	1.9 miles southeast

* Designates sites not shown on map view

APPENDIX B

AGENCY CORRESPONDENCE

Connecticut Department of

ENERGY &
ENVIRONMENTAL
PROTECTION

February 15, 2012

Bohdan Katreczko
The United Illuminating Company
801 Bridgeport Ave
Shelton, CT 06484
bohdan.katreczko@uinet.com

Project: Proposed Shelton Substation, 14 Old Stratford Rd., Shelton
Request No.: 201200394

Dear Bohdan Katreczko,

I have reviewed Natural Diversity Data Base maps and files regarding the area delineated on the map you provided for the proposed Proposed Shelton Substation, 14 Old Stratford Rd., Shelton, Connecticut. I have determined that the proposed activities will not impact any extant populations of Federal or State Endangered, Threatened or Special Concern Species that occur in the vicinity of this property.

Natural Diversity Data Base information includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Energy and Environmental Protection's Natural History Survey and cooperating units of DEEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substitutes for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

Please contact me if you have further questions at (860) 424-3592, or dawn.mckay@ct.gov . Thank you for consulting the Natural Diversity Data Base. Also be advised that this 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 DEEP for the proposed site.

Sincerely,

Dawn M. McKay

Dawn M. McKay
Environmental Analyst 3

March 20, 2012

Mr. Bohdan Katreczko
The United Illuminating Company
801 Bridgeport Avenue
Shelton, CT 06484

Regarding: Trap Falls Potential Alternative Site for New Substation, Shelton, CT
Natural Diversity Data Base 201200391

Dear Mr. Katreczko:

In response to your request for a Natural Diversity Data Base Review of State Listed Species for the Trap Falls Potential Alternative Site for a New Substation in Shelton, our records indicate extant populations of species documented on or within the vicinity of the site:

Eastern box turtle (*Terrapene carolina Carolina*) Status: Species of Special Concern

Habitat and Ecology: Eastern Box Turtles require old field and deciduous forest habitats, which can include power lines and logged woodlands. They are often found near small streams and ponds. The adults are completely terrestrial but the young may be semiaquatic, and hibernate on land by digging down in the soil from October to April. They have an extremely small home range and can usually be found in the same area year after year. Eastern Box Turtles have been negatively impacted by the loss of suitable habitat. Some turtles may be killed directly by construction activities, but many more are lost when important habitat areas for shelter, feeding, hibernation, or nesting are destroyed. As remaining habitat is fragmented into smaller pieces, turtle populations can become small and isolated.

Recommendation: If work is to be conducted on site during summer or fall, then Eastern box turtles could be impacted. In this circumstance, work should be done outside of these seasons. If work must be done in the summer or fall then the following guidelines shall be met:

- Silt fencing shall be installed around the work area prior to construction;
- After silt fencing is installed and prior to construction, conduct a sweep of the work area to look for turtles;
- Apprise workers of the possible presence of turtles, and provide a description of the species;
- Any turtles that are discovered shall be moved, unharmed, to an area immediately outside of the fenced area, and position in the same direction that it was walking;

- No vehicles or heavy machinery shall be parked in any turtle habitat;
- Work conducted during early morning and evening hours shall occur with special care not to harm basking or foraging individuals; and
- All silt fencing shall be removed after work is completed and soils are stable so that reptile and amphibian movement between uplands and wetlands is not restricted.

The Natural Diversity Data Base includes all information regarding critical biological resources available to us at the time of the request. This information is a compilation of data collected over the years by the Department of Energy and Environmental Protection's Natural History Survey and cooperating units of DEEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultations with the Data Base should not be substituted for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as, enhance existing data. Such new information is incorporated into the Data Base as it becomes available. If the project is not implemented within 12 months, then another Natural Diversity Data Base review should be requested for up-to-date information.

Please be advised that this 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 the Department of Energy and Environmental Protection for the proposed site.

Thank you for consulting the Natural Diversity Data Base. If you have any additional questions, I can be contacted by email at Elaine.Hinsch@po.state.ct.us.

Sincerely,

/s/
Elaine Hinsch
Program Specialist II
Wildlife Division

State Historic Preservation Office

DECD
State of Connecticut
Department of Economic and Community Development

June 28, 2012

Mr. Bruce McDermott
Managing Counsel – Operations
United Illuminating Company
157 Church Street
P.O. Box 1654
New Haven, CT 06506-0901

Subject: Comments on Proposed Shelton Substation, 14 Old Stratford Road, Shelton, Connecticut

Dear Mr. McDermott:

The Connecticut State Historic Preservation Office (SHPO) has reviewed the plans for the proposed construction of a new electrical substation at 14 Old Stratford Road in the Town of Shelton. The project site was formerly the location of a adhesives manufacturing facility operated by Lord Corporation. The industrial facilities were subsequently demolished and the property has been subject to remediation actions. We specifically note here the intent of UI to construct the new substation within previously disturbed sections of the property. No impacts to the wooded riparian buffer along the Far Mill River are proposed. Undisturbed level terrain in proximity to watercourses, such as may exist on the northern fringes of the subject parcel are sensitive for Prehistoric period Native American archaeological sites. However, it appears that these limited areas of concern to our Office will not be subject to ground disturbance from this project. Based on the information provided to our office, it is our opinion that no historic properties, including archaeological or historic architectural resources will be affected by the proposed construction of the substation. This opinion is based on the extensive previous ground disturbance within the limits of construction and the lack of significant historic buildings or structures within or adjacent to the property that would be subject to direct or indirect effects from the proposed development.

SHPO appreciates the opportunity to comment on this project. For further information please contact me at (860) 256-2761 or daniel.forrest@ct.gov.

Sincerely,

Daniel T Forrest

Daniel T. Forrest
Deputy State Historic Preservation Officer

US Army Corps of Engineers®
New England District

PRELIMINARY JURISDICTIONAL DETERMINATION FORM

BACKGROUND INFORMATION

1. **Report completion date for Preliminary Jurisdictional Determination (JD):** 3/7/12

2. **Name and Address of Person Requesting Preliminary JD:** Bruce McDermott/Bohdan Katreczko, The United Illuminating Company, 801 Bridgeport Avenue, Shelton, CT 06484

3. **District office, file name and number:** New England District, United Illuminating Company Old Stratford Road, NAE-2012-443

4. **Project location(s) and background information:**

See attached table of waters and wetlands

State: CT County: Fairfield City: Shelton
Coordinates of site (lat/long in degree decimal format):
Beginning Lat. 41.276028° N, Long. 73.118340° W
End Lat. 41.276028° N, Long. 73.118340° W
Universal Transverse Mercator: 18

Name of nearest waterbody: Farmill River

Identify (estimate) amount of waters in the review area:
Non-wetland waters: linear feet: width (ft) and/or acres.
Cowardin Class:
Stream Flow:
Wetlands: 0.20 acres
Cowardin Class: PEM/PSS

Name of any water bodies on the site that have been identified as Section 10 waters:
Tidal:
Non-Tidal:

5. **Review performed for site evaluation (check all that apply):**
[X] Office (Desk) Determination. Date: 2/16/12
[ ] Field Determination. Date(s):

a. The Corps of Engineers believes that there may be jurisdictional waters of the United States on the subject site, and the permit applicant or other affected party who requested this preliminary JD is hereby advised of his or her option to request and obtain an approved jurisdictional determination (JD) for that site. Nevertheless, the permit applicant or other person who requested this preliminary JD has declined to exercise the option to obtain an approved JD in this instance and at this time.

b. In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an approved JD for the activity, the permit applicant is hereby made aware of the following: (1) the permit applicant has elected to seek a permit authorization based on a preliminary JD, which does not make an official determination of jurisdictional waters; (2) that the applicant has the option to request an approved JD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an approved JD could possibly result in less compensatory mitigation being required or different special conditions; (3) that the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) that the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) that undertaking any activity in reliance upon the subject permit authorization without requesting an approved JD constitutes the applicant's acceptance of the use of the preliminary JD, but that either form of JD will be processed as soon as is practicable; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a preliminary JD constitutes agreement that all wetlands and other water bodies on the site affected in any way by that activity are jurisdictional waters of the United States, and precludes any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an approved JD or a preliminary JD, that JD will be processed as soon as is practicable. Further, an approved JD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331, and that in any administrative appeal, jurisdictional issues can be raised (see 33 C.F.R. 331.5(a)(2)). If, during that administrative appeal, it becomes necessary to make an official determination whether CWA jurisdiction exists over a site, or to provide an official delineation of jurisdictional waters on the site, the Corps will provide an approved JD to accomplish that result, as soon as is practicable.

This preliminary JD finds that there *"may be"* waters of the United States on the subject project site, and identifies all aquatic features on the site that could be affected by the proposed activity, based on the following information:

c. **Supporting Data. Data reviewed for Preliminary JD -** checked items should be included in case file and, where checked and requested, appropriately reference sources below):

- [x] Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: February 2012 Summary Information
- [x] Data sheets prepared/submitted by or on behalf of the applicant/consultant. 8/14/2009
  - [x] Office concurs with data sheets/delineation report.
  - [ ] Office does not concur with data sheets/delineation report.
- [ ] Data sheets prepared by the Corps:
- [ ] Corps navigable waters' study:
- [ ] U.S. Geological Survey Hydrologic Atlas:
  - [ ] USGS NHD data.
  - [x] USGS 8 and 12 digit HUC maps. 01100005
- [x] U.S. Geological Survey map(s). Cite scale & quad name: ANSONIA, CONN., 1:24000
- [ ] USDA Natural Resources Conservation Service Soil Survey. Citation:

- [x] National wetlands inventory map(s). Cite name: ANSONIA, CONN. 4/80 aerial
- [ ] State/Local wetland inventory map(s):
- [ ] FEMA/FIRM maps:
- [ ] 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
- [ ] Photographs: ☐ Aerial (Name & Date):
  or ☐ Other (Name & Date):
- [ ] Previous determination(s). File no. and date of response letter:
- [ ] Other information (please specify):

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

8/7/12

Susan Lee Date
Regulatory Project Manager

Bruce McDermott Date
The United Illuminating Company
801 Bridgeport Avenue, Shelton, CT 06484

WETLAND AND WATERS TABLE

Lat. 41.276028° N, Long. 73.118340° W

Water #	Water Name	Cowardin	Type (optional)	Lat.	Long.	Estimate aquatic resource in review area		Class of aquatic resource
						SF	LF	
1	Wetland 1	PEM/PSS	depression	41.28	-73.12	7200		Non-Sec 10 - Wetland
						0	0	

Notes:

1. Water ID can be either the applicant's or the Corps number.
2. Cowardin info can be found at:
   R:\REGDOCS\Jurisdiction
   R:\REGDOCS\Guidance & Useful Information
   R:\General\Resource-Reference Materials\Cowardin
3. Only use LF if applicable (e.g., pipeline project)

From: Bruce McDermott
To: Antonino Buccheri; Loni Gardner; Adam O"Laughlin; Louise Mango
Subject: Fw: PROPOSED SHELTON SUBSTATION STATION PROJECT ON FORMER INDUSTRIAL SITE - 14 OLD STRATFORD RD., CITY OF SHELTON, FAIRFIELD COUNTY - U.S. ARMY CORPS OF ENGINEERS N.E. DISTRICT - PROJECT NO. NAE-2012-443
Date: Wednesday, September 12, 2012 4:35:15 PM

From: Knowles, Kathleen
Sent: Wednesday, September 12, 2012 4:23:59 PM
To: Bruce McDermott
Cc: Forrest, Daniel; Stevens, Sue
Subject: PROPOSED SHELTON SUBSTATION STATION PROJECT ON FORMER INDUSTRIAL SITE - 14 OLD STRATFORD RD., CITY OF SHELTON, FAIRFIELD COUNTY - U.S. ARMY CORPS OF ENGINEERS N.E. DISTRICT - PROJECT NO. NAE-2012-443

Mr. Bruce McDermott,
Managing Counsel – Operations
United Illuminating Company
UIL Holdings Corporation
157 Church St.   P.O. Box 1564
New Haven, CT 06506-0901

Re: PROPOSED SHELTON SUBSTATION STATION PROJECT ON FORMER INDUSTRIAL SITE
14 OLD STRATFORD RD., CITY OF SHELTON, FAIRFIELD COUNTY
U.S. ARMY CORPS OF ENGINEERS, N.E. DISTRICT PROJECT NO. NAE-2012-443

Based on a review of the information provided, there does not appear to be any impact to potentially significant religious and cultural resources for the Mashantucket Pequot Tribe. The Mashantucket Pequot Tribe appreciates the opportunity to review and comment on this proposed project.

Kathleen Knowles,
Tribal Historic Preservation Officer

Mashantucket Pequot Tribal Nation
Natural Resources Protection &
Regulatory Affairs
550 Trolley Line Blvd.
P.O. Box 3202
Mashantucket, CT 06338-3202
Tel 860 396 6887 Fax 860 396 6914

kknowles@mptn-nsn.gov

APPENDIX C

WETLANDS AND WATERCOURSES REPORT

FIELD INVENTORY OF WETLANDS AND WATERCOURSES
14 OLD STRATFORD ROAD
CITY OF SHELGON, FAIRFIELD COUNTY, CONNECTICUT

September 2009

Prepared for:

The United Illuminating Company
801 Bridgeport Avenue
Shelton, Connecticut 06484

Prepared by:

Phenix Environmental, Inc.
3 Orange Pippin Road
Sandy Hook, Ct 06482

TABLE OF CONTENTS

Section **Page No.**

LIST OF FIGURES AND TABLES

ATTACHMENTS

1. INTRODUCTION

1.1 PROJECT BACKGROUND

In order to improve the reliability of electric service to existing and future customers in the City of Shelton, Fairfield County, Connecticut, the United Illuminating Company ("UI") proposes to develop a new electric distribution substation on a site located in the southeastern portion of the city, in the general vicinity of load centers along the State Route 8 corridor and Bridgeport Avenue. After the evaluation of various alternative sites, UI identified an approximately 6-acre site, located at 14 Old Stratford Road, as the preferred location for the new substation (refer to Figure 1-1).

The proposed substation site is bordered to the north by the Far Mill River and adjacent agricultural lands; to the east by State Route 8 and Black Brook (a small, channelized tributary to the river); to the south by Old Stratford Road; and to the west by Pootatuck Place and adjacent commercial development. A Connecticut Light and Power Company (CL&P) 115-kilovolt (kV) overhead transmission line, which occupies a 110-foot-wide right-of-way (ROW), traverses northwest-to-southeast across the western portion of the site; the proposed substation would interconnect to this transmission line. Portions of the site are within the Far Mill River's 100- and 500-year floodplain boundaries, as defined by the Federal Emergency Management Agency (FEMA).

The proposed substation site was previously developed and used for industrial (manufacturing) purposes. However, the manufacturing facilities have been removed (with the exception of a small building located on the northeast corner of the site) and the site is now vacant. As a consequence of the prior industrial activities, a groundwater remediation is ongoing; as part of this program, various monitoring wells are located on the site.

1.2 PURPOSE OF THE REPORT

As part of the evaluation of the proposed substation site, UI commissioned Phenix Environmental, Inc. (Phenix) to conduct an inventory of wetlands and watercourses. Working with Roy Shook Associates (certified soil scientists), Phenix performed this inventory on August 14, 2009. This report presents the results of the field investigations, describing the methods used to conduct the water resources inventory and the characteristics of the water resources identified.

Figure 1-1
Proposed Location of Shelton Substation

2. METHODS

The field investigations of the proposed substation site were performed to identify both Connecticut and federal jurisdictional water resources.

Connecticut Wetland Criteria

Connecticut jurisdictional wetlands were defined pursuant to the Connecticut Inland Wetlands and Watercourses Act, Connecticut General Statutes §§ 22a-36 through 22a-45. These statutes are administered by the individual municipalities in the state. In general, Connecticut wetlands are defined based solely on soil type, and are characterized as "…land, including submerged land…which consists of poorly drained, very poorly drained, alluvial and floodplain soils as defined by the National Cooperative Soils Survey. Such areas may include filled, graded or excavated sites which possess an aquatic (saturated) soil moisture regime as defined by the United States Department of Agriculture (USDA) Cooperative Soil Survey".

To characterize the soils on the proposed substation site, the U.S. Department of Agriculture, Soil Conservation Service *Fairfield County Soil Survey* was reviewed, followed by field investigations performed by a certified soil scientist (i.e., Roy Shook Associates).

Federal Wetland Criteria

Federal jurisdictional wetlands are defined based on the presence of three parameters, in accordance with the methods specified in the U.S. Army Corps of Engineers (ACOE's) *1987 Wetland Delineation Manual*. Pursuant to the ACOE criteria, to qualify as a federal jurisdictional wetlands, areas must exhibit distinct soil, hydrologic, and vegetation characteristics, which are generally defined as follows:

- **Soils**. Soils must be classified as hydric or must possess characteristics that are associated with anaerobic (reducing) soil conditions;
- **Vegetation**. Predominant vegetation must consist of plants adapted to life in hydric soil (e.g., anaerobic) conditions; and
- **Hydrology**. Soils must be permanently or periodically inundated at mean water depths less than 6.6 feet (2 meters) or the soil must be saturated at the surface for some time during the growing season.

Federal jurisdictional wetlands are subject to regulation in accordance with Section 404 of the Clean Water Act.

Field Investigations and Water Resource Evaluations

The 6-acre site was field surveyed by a team comprised of a biologist and soil scientist. Soils were tested using a soil auger. Vegetation and hydrologic characteristics were assessed based on the federal jurisdictional parameters. Wetland and watercourse boundaries were flagged and subsequently defined by surveyors, who were on site directly after the wetland and watercourse delineations.

Wetland vegetation was characterized in accordance with the system identified in the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin, et. al. 1979). Wetland functions and values were assessed as detailed in the ACOE's *The Highway Methodology Workbook Supplement: Wetland Functions and Values*.

3. RESULTS

The proposed 6-acre substation site is characterized principally by upland soils that have been altered as a result of previous industrial development. Similarly, vegetation on the site consists predominantly of herbaceous and shrub species that have opportunistically recolonized the site subsequent to the removal of the industrial buildings and related facilities. The only remnants of the prior industrial use of the site include an access road off Pootatuck Place, a small building on the northeast corner of the site, and locations where asphalt (apparently former parking areas) was identified below a thin layer of soil. Monitoring wells, located within a grassed area, are concentrated on the northeastern portion of the site.

The upland soil on the site is presently characterized as an Udorthent. This soil unit consists primarily of man-made or disturbed cut and/or fill areas that are not wet, with slopes ranging from 0 to 8%. The fill on the site is primarily earthen materials, with inclusions of concrete, bricks, wood, metals, plastic, and glass. Portions of the site also include small areas of well drained loamy soils and non-soil impervious areas (e.g., paved road, parking lot).

In addition, on the southwestern portion of the site, near the intersection of Pootatuck Place and Old Stratford Road, a small wetland has formed over old asphalt pavement. This wetland encompasses approximately 7,200 square feet[1]. The wetland is located partially within CL&P's transmission line ROW. The wetland, which is characterized by approximately 4 to 12 inches of earthy soil and geologic materials, is perched over the asphalt. The wetland is believed to have been created as a result of water and sediment runoff from adjacent upland areas, including drainage from Old Stratford Road. The soil in the small wetland meet the criteria as an Aquent, which consists primarily of man-made or disturbed cut and/or fill areas that are wet. Attachment A includes additional information regarding the soil characteristics on the proposed substation site.

The small on-site wetland is located in a shallow depression in an area that was formerly a paved parking lot. The shallow soil layer that has formed over the pavement is presently supporting a variety of wetland plants. Vegetation in the wetland is classified as emergent and scrub-shrub. Predominant species include wool grass (*Scirpus cyperinus*), soft-stemmed bulrush (*Scirpus validus*), soft rush (*Juncus effusus*), *Carex*

[1] Acreage defined based on surveys of wetland delineation boundary flagging.

spp., nut sedge (*Cyperus esculentus*), cattail (*Typha latifolia*), purple loosestrife (*Lythrum salicaria*), jewelweed (*Impatiens capensis*), pussy willow (*Salix discolor*), and dark green bulrush (*Scirpus atrovirens*). Attachment B includes the completed wetland delineation form and representative photographs of the wetland.

Although the wetland technically meets the definition of a federal wetland (based on the ACOE's three parameter method), it may not be jurisdictional due to its limited size and isolated nature[2]. In particular, the wetland is isolated from any adjacent water courses, and was created within the last 20 years (based on a review of historical aerial photography, which shows that the area was used as a paved parking lot in 1989). In addition, it is likely that the asphalt will crack and deteriorate over time, causing water to seep into the subsurface area and reducing the ability of the perched wetland to retain water and to support the current types of wetland vegetation.

The small wetland may potentially support some type of amphibian breeding, due to its isolated location. Because the field investigations were conducted in August, outside of amphibian breeding periods (which are typically in the spring), the specific potential for this small wetlands to support amphibian breeding could not be assessed. However, no amphibians were observed or heard during the field survey.

The functions and values of the small wetland on the site were assessed, taking into consideration the adjacent land uses and interrelationships between the wetland and adjacent upland areas. The wetland was evaluated using the 13 functions and values identified by the ACOE in *The Highway Methodology Workbook Supplement: Wetland Functions and Values*. These criteria, and the relationship of each to the wetland on the proposed substation site, are summarized in Table 3-1. Attachment B includes the completed ACOE Wetland Function - Value Evaluation Forms for the small wetland.

As the forms and Table 3-1 illustrate, the small, isolated wetland principally functions to trap sediment from stormwater runoff / overland sheet flow, and may aid in removing nutrients from nearby commercial / road areas that are carried by stormwater and sediment runoff. The small size of the wetland limits its value for wildlife habitat; however, the wetland vegetation is relatively dense and may provide habitat for smaller species (e.g., insects, small mammals, amphibians, birds).

[2] A determination as to whether the wetland is jurisdictional and, if so, whether the proposed substation project will result in any effects to the wetland has not been made. Whether or not the project will result in impacts to the wetland (whether jurisdictional or not) will depend on UI's proposed design and footprint for the substation.

In addition to this one federal wetland, the northern portion of the site is bordered by the Far Mill River, which comprises a Connecticut jurisdictional watercourse. The Far Mill River, a fresh water stream, flows southeast into the Housatonic River.

On the site, the areas immediately adjacent to the river are characterized by mature forested vegetation. The vegetation within this forested riparian corridor is dominated by the following species of mature trees: red maple (*Acer rubrum*), black locust (*Robinia pseudoacacia*), blue beech or American Hornbeam (Carpinus caroliniana), red oak (*Quercus rubra*), tamarack (*Larix laricina*), ash (*Fraxinus Americana*), eastern hemlock (*Tsuga canadensis*), American beech (*Fagus grandifolia*), witch hazel (*Hamamelis virginiana*), black birch (*Betula lenta*), and shagbark hickory (*Carya ovata*). (Refer to Attachment B for representative photographs of the Far Mill River corridor.)

Black Brook, the small channelized tributary to the Far Mill River, is located east of and outside of the proposed substation site boundary, beyond the property fence. This stream is located on Connecticut Department of Transportation property, which borders State Route 8. The stream is bordered by mature forested vegetation, which also screens the proposed substation site from the State Route 8 corridor.

Table 3-1
Wetland Functions and Values Summary
Proposed UI Substation Site
City of Shelton, Fairfield County, Connecticut

FUNCTION / VALUE CRITERIA	SUITABILITY		COMMENTS
	YES	NO	
Groundwater Recharge / Discharge		X	Wetland is isolated and perched above an asphalt parking lot.
Floodflow Alteration	X		Wetland may collect stormwater runoff and store water temporarily, but would not affect flows in the Far Mill River. The isolated wetland is located outside of the FEMA-designated 100- and 500-year floodplain boundaries along the Far Mill River.
Fish and Shellfish Habitat		X	Isolated. No fish or shellfish habitat present
Sediment / Toxicant Retention	X		Wetlands can serve to assist in trapping sediment. Since the site formerly was an industrial site with a remediation program, the wetland could provide these functions. Wetland also appears to be trapping sediment eroded from nearby areas, including as a result of stormwater flows from nearby roads and commercial areas.
Nutrient Removal	X		Sediment trapping potential, as described above.
Production Export		X	
Sediment / Shoreline Stabilization		X	
Wildlife Habitat	X		Small size limits the value of the wetland for wildlife, but it could provide habitat for insects, birds, small mammals, and amphibians.
Recreation		X	
Educational ./ Scientific Value		X	
Uniqueness/ Heritage		X	
Visual Quality / Aesthetics		X	
Endangered Species Habitat		X	

4. REFERENCES

Connecticut Inland Wetlands and Watercourses Act, Sections 22a-36 through 45, Connecticut General Statutes.

Cowardin, L. M., V. Carter, F.C. Golet, and E.T. LaRoe, 1979, *Classification of Wetlands and Deepwater Habitats of the United States*, U.S. Fish and Wildlife Service Biological Report 79/31, Washington, D.C.

United States Department of Agriculture, Natural Resources Conservation Service, February 1981, *Soil Survey Fairfield County*, Connecticut.

U.S. Department of the Army, Corps of Engineers, 1987, *Corps of Engineers Wetland Delineation Manual*, Environmental Laboratory, Technical Report Y-87-1, Vicksburg, Mississippi.

U.S. Department of the Interior, Fish and Wildlife Service, May 1988, *National List of Plant Species that Occur in Wetlands Northeast (Region 1)*, Biological Report 88 (26.1).

United States Department of the Army, Corps of Engineers, New England Division, September 1999, *The Highway Methodology Workbook Supplement: Wetland Functions and Values, A Descriptive Approach*.

ATTACHMENT A

SOIL REPORT

Roy Shook Associates

Soil & Environmental Consultants

Roy A. Shook Jr.
441 Geraldine Drive
Coventry, CT 06238
(860) 742-7283

Ms. Louise Mango
Phenix Environmental, Inc.
3 Orange Pippin Road
Sandy Hook, CT 06482

August 27, 2009

Job No. 09H141

Dear Ms. Mango:

RE: WETLAND / WATERCOURSE DELINEATION
PROPOSED UIC SUBSTATION SITE, LORD CORPORATION TRACT
POOTATUCK PLACE, SHELTON, CONNECTICUT

At your request, I made an on-site investigation of the above referenced tract. The purpose of my visit was to identify and delineate the Connecticut Inland Wetlands and Watercourses. Dr. Craig Ferris of your office accompanied me on the site visit. The fieldwork was done on August 14, 2009.

The wetland and/or watercourse boundaries are marked with blue flagging numbered RSA-1 through RSA-31. Flags numbered RSA-1 join RSA-11 delineate a small isolated man created wetland. Flags numbered RSA-12 through RSA-31 delineate the south bank of the Far Mill River along the north property boundary. Please refer to the enclosed sketch soil map for the approximate location of the inland wetland and watercourse boundaries and key wetland flag numbers.

The site is on a man-altered landscape. The tract was the location of a former industrial complex. The complex has been removed and site was for the most part cut/filled and graded. Both the existing wetland and upland soils are a reflection of past earth moving and grading activity.

The wetland is in a low slightly concave area of a former paved parking area. There is a thin layer, from 4 to 12 inches thick, of earthy soil and geologic materials placed over old asphalt pavement. It appears that at least a portion of the earthy soil material is eroded material that has been washed into the wetland. The dominant wetland vegetation is emergent herbaceous wetland species but includes some scrub shrub wetland species near the margin of the wetland. The water that supports the wetland is believed to be surface and storm water runoff from the adjoining upland area. This water is perched on the impervious asphalt layer and results in a shallow perched water table. Flotsam in the wetland area suggests that there are short periods when the wetland is temporarily ponded. It is likely that when the underlying asphalt pavement deteriorates and fractures, the water that supports the wetland would drain into the underlying unsaturated sandy and gravelly sub-base and soil beneath the pavement. The water necessary to drive the wetland would no longer be available and the wetland would dry out.

The soil within the wetland classifies as an Aquent soil, the AQ map unit. The AQ map unit consists primarily of man-made or disturbed cut and/or fill areas that are wet. Slopes range from 0 to 3 percent. These poorly drained soils have a long-term seasonally high watertable at less than 1.5 feet; have an aquic moisture regime and support hydrophytic vegetation. On this site this recently developed poorly drained soil has a thin 1 to 2 inch thick loamy A horizon that is darkened by organic matter. Soil color is dark grayish brown to dark brown, hue 10YR or 2.5Y, values of 3 or 4 and chromas of 2 or 3. The 3 to 10 inch thick underlying loamy C or Cg horizon has developed in transported earthy soil and geologic materials and exhibits pedogenic redoximorphic features of a wet hydric soil. Such features include thin gleyed subhorizons, low and high chroma mottles in subhorizons with low and high chroma matrix colors. Matrix soil colors have hue 10YR to 5Y, values 3 to 6 and chromas of 2 to 6. The soil colors are a result of pedogenic processes and in places are the inherent colors of the transported earthy material. Underlying the C horizon is the buried layer of essentially impervious asphalt pavement.

The presence of and the reasons for this recently developed wetland are unique to this site. However, based on soil, vegetative and hydrologic features, the AQ map unit meets the technical parameters of a wetland.

The flag line along the south bank of the Far Mill River delineates the flowage way of high level flows under non-flood flow conditions. It does not show a flood flow elevation. The delineation is along a stone and concrete armored stream bank. In spots there are narrow discontinuous 1 to 3 feet wide areas of vegetated alluvial soil at the base of the steeply sloping armored stream bank.

The upland soil on the site classify as a Udorthent, the UD map unit. The UD map unit consists primarily of man-made or disturbed cut and/or fill areas that are not wet. Slopes range from 0 to 8 percent. The fill is mostly earthy materials with minor amounts of non-earthy materials such as pieces of concrete, bricks, wood, metals, plastic and glass. Included in this map unit are small spots of natural well drained loamy soils and non soil areas of impervious surfaces such as paved road and parking lot.

Please contact me if you have any questions or if I can be of further assistance.

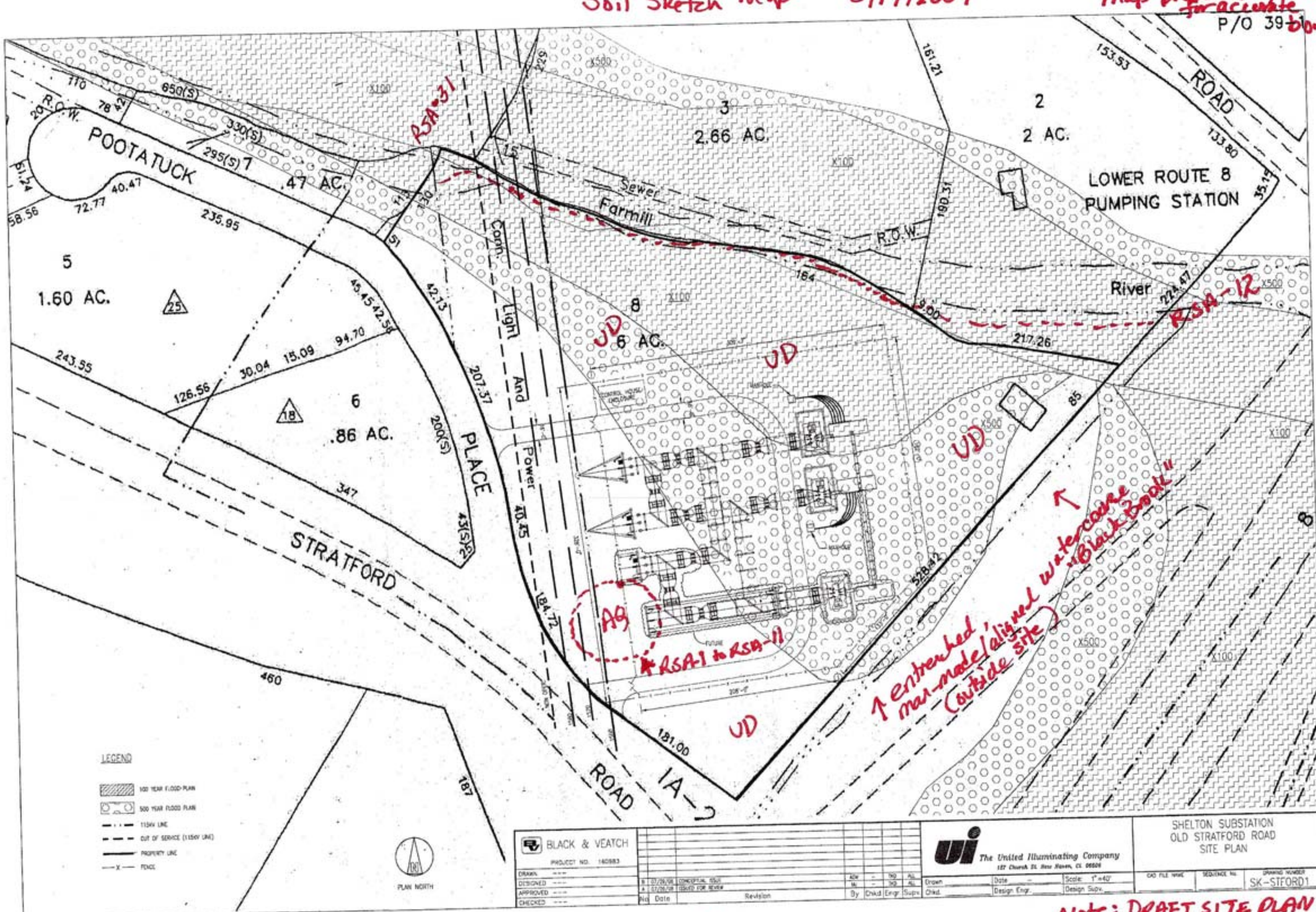
Respectfully yours,

Roy A. Shook, Jr.

Roy A. Shook, Jr.
Soil Scientist

Soil Sketch Map 8/14/2009*

*Refer to survey map prepared by UI for accurate bounday.



UD= Udorthent. Upland, altered soils
AG= Aquent soils
RSA= Wetland flagging /watercourse flagging #s

Note: DRAFT SITE PLAN. USED FOR SKETCH PURPOSES ONLY

ATTACHMENT B

WETLAND DELINEATION DATA FORMS, PHOTOGRAPHS, AND WETLAND FUNCTION-VALUE EVALUATION FORM

PROJECT TITLE: Shelton Substation Site (UI) TRANSECT: N/A PLOT: N/A

DELINEATOR(S): C. Ferris / R. Shook DATE: 08/14/2009

VEGETATION Stratum and Species	Observed Dominance	Relative Dominance	DOM	NWI Status
HERBACEOUS/EMERGENT				
Scirpus cyperinus (woolgrass)	Abundant			FACW+
S. validus (soft-stemmed bulrush)	Present			OBL
Juncus effusus (soft rush)				FACW+
Carex spp.				FACW
Cyperus esculentus (nutsedge)				FACW
Typha latifolia (cattail)				OBL
Lythrum salicaria (purple loosestrife)				FACW+
Impatiens capensis (jewelweed)				FACW
Salix discolor (pussy willow)				FACW
Scirpus atrovirens (dk. green bulrush)				OBL

HYDROPHYTES

OBL	FACW	FAC	*OTHER
3	7	-	-

NON-HYDROPHYTES

FAC-	FACU	UPL
-	-	-

Hydrophytes Subtotal (A): ___

Non-hydrophytes Subtotal (B): ___

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

HYDROLOGY

☐ RECORDED DATA
- Stream, lake, or tidal gage Identification: ______
- Aerial photography Identification: ______
- Other Identification: ______

☒ NO RECORDED DATA

☐ OBSERVATIONS:
- Depth to Free Water: ______
- Depth to Saturation (including capillary fringe): ______
- Altered Hydrology (explain): Asphalt pavement (due to prior development of site) at 4"-12" beneath surface

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

☒ OTHER (explain): Semi-impervious/impervious asphalt apparently has trapped water, resulting in ponding due to runoff from nearby areas. Sediment transport + ponding has resulted in the formation of this small wetland. Photographs @ 1989 show the area used for parking. Therefore, wetland has developed over past 20 years.

SOIL Sketch landscape position of this plot. Indicate relative position of other plot(s) and the wetland flag if not on plan.
[See Soil Report by. Roy Shook Associates]

Submission of photo of plot is encouraged. 0 - 3% slope. See photographs /map

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.)
1"-2"	A	10 YR / 2.5 Y, values of 3-4, chromas 2 or 3	Loam darkened by organic matter	Soils darkgray is brown to dark brown
3"-10"	Loamy C / Cg	10 YR-5Y values 3-6 Chromas 2-6	Pedogenic redoximorphic features of wet hydric soil: gleyed subhorizons, low + high chroma mottles in subhorizons w/ low + high matrix colors	Developed in transported earthy soil + geologic materials
↓	ashpalt [paved]			

HYDRIC SOIL INDICATOR(S): REFERENCE(S):

Note: this wetland has developed over an impervious asphalt base.

OPTIONAL SOIL DATA Aquent soil (AQ map unit) 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?	☒	☐	Adjacent soil are UD, Udorthents. Entire site has been altered by man-made cut/fill.

PROJECT TITLE: Shelton Substation Site TRANSECT: – PLOT: –

SUMMARY OF WETLAND FUNCTIONS AND VALUES ASSESSMENT

The proposed Shelton Substation site encompasses one small wetland, a portion of which is located within the CL&P transmission line ROW.

An assessment of the functions and values of this wetland was performed pursuant to methods described in the U.S. Army Corps of Engineers (ACOE), New England District's *The Highway Methodology Workbook Supplement, Wetland Functions and Values: A Descriptive Approach*. Wetland functions are defined by the ACOE as self-sustaining properties of a wetland ecosystem that exist in the absence of society. Values are benefits that derive from one or more functions and the physical characteristics associated with the wetland. The ACOE has identified 13 wetland functions and values for consideration in the review of projects. These 13 functions and values are:

- Groundwater recharge / discharge
- Floodflow alteration
- Fish and shellfish habitat
- Sediment / toxicant / pathogen retention
- Nutrient removal / retention / transformation
- Production export
- Sediment / shoreline stabilization
- Wildlife habitat
- Recreation
- Educational / scientific value
- Uniqueness / heritage
- Visual quality / aesthetics
- Threatened or endangered species habitat.

The function and value assessment form for the wetland on the proposed substation site is attached. This form was completed based on field delineations/observations and the results of the review of published documents concerning the environmental characteristics of the general project area (e.g., review of data regarding endangered / threatened species as maintained by the Connecticut Department of Environmental Protection [DEP], Natural Diversity Database, DEP water quality data).

Wetland Function-Value Evaluation Form

Wetland I.D. Shelton Substation W-1
Latitude ________ Longitude ________
Prepared by: C. Ferris Date 8·14·2009
Wetland Impact:
Type ________ Area ________

Evaluation based on:
Office ________ Field X
Corps manual wetland delineation completed? Y X N ____

Total area of wetland ________ Human made? Yes Is wetland part of a wildlife corridor? No or a "habitat island"? Yes

Adjacent land use Vacant former manufacturing site; CL&P transmission line right-of-way Distance to nearest roadway or other development ________

Dominant wetland systems present Emergent/scrub-shrub [PEM/PSS] Contiguous undeveloped buffer zone present ________

Is the wetland a separate hydraulic system? Yes If not, where does the wetland lie in the drainage basin? N/A

How many tributaries contribute to the wetland? None Wildlife & vegetation diversity/abundance (see attached list)

Function/Value	Suitability Y	Suitability N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
Groundwater Recharge/Discharge		X	6		wetland underlain by asphalt (former parking lot)
Floodflow Alteration	X		4,5,6,7,8,9	9	wetland created by stormwater/sheet flow runoff from adjacent upland areas, including roads
Fish and Shellfish Habitat		X			isolated wetland; no connection to watercourses
Sediment/Toxicant Retention	X		2,3,4,5	3	shallow wetland depression/asphalt layer traps water
Nutrient Removal	X		3,4,8	3	sediment trapping
Production Export		X			
Sediment/Shoreline Stabilization		X			
Wildlife Habitat	X		7,8,13,14	8	Small size of wetland limits wildlife value; however could provide habitat for insects, small mammals, birds, amphibians.*
Recreation		X			Site is former manufacturing area; brownfields groundwater monitoring ongoing
Educational/Scientific Value		X			site is not accessible
Uniqueness/Heritage		X			recently (last 20 years) created due to land alteration
Visual Quality/Aesthetics		X			Former manufacturing site, beneath transmission lines, adjacent to roads and commercial development
ES Endangered Species Habitat		X			No species are listed in the vicinity of this site per the CTDEP NDDB
Other					

* Refer to backup list of numbered considerations.

Notes:

*Near Far Mill River, and along CL&P transmission line ROW, which is maintained as scrub-shrub vegetation.

Representative Photographs: Water Resources on the Proposed Shelton Substation Site
August 2009

	
Representative view of vegetation within small wetland within and adjacent to CL&P transmission line ROW, southwest corner of the proposed substation site.	Representative view of small wetland within and adjacent to CL&P transmission line ROW, southwest corner of proposed substation site. .
	
View to north showing vegetation within small wetland and overhead CL&P transmission lines in background.	Soil testing in small wetland identified asphalt at a depth of 4-12 inches, resulting in the creation of a perched wetland.

Representative Photographs: Water Resources on the Proposed Shelton Substation Site
August 2009

Representative mix of herbaceous and scrub-shrub vegetation on eastern portion of proposed substation site; view to east-northeast, vicinity of monitoring wells.

View of remaining building, monitoring wells, and associated equipment, northeast corner of site. Mature forested vegetation surrounds the site to the east (adjacent to the Far Mill River and State Route 8).

View to east along existing access road, just south of Far Mill River. Representative view of forested riparian area along the river, adjacent to the road. (Chain link fence is installed between the access road and the river bank.)

Far Mill River, view to west (upstream), showing southern bank of river, adjacent to proposed substation property. Existing chain link fence that separates the property from the river is shown on the left hand side of the photograph. A municipal sewer line crosses the river, aerially, to the west of the site.

APPENDIX D

NOISE ASSESSMENT

PROJECT NOISE EVALUATION

Shelton Substation Project

B&V PROJECT NO. 174811

PREPARED FOR

The United Illuminating Company

7 MAY 2012

BLACK & VEATCH
Building a world of difference.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

Executive Summary

Black & Veatch Corporation has been contracted by The United Illuminating Company (UI) to conduct an assessment of the potential noise emissions associated with the proposed Shelton Substation (Substation). The Substation will include two (2) 30/40/50 MVA transformers with a single control building, two (2) PDC units, and associated HVAC equipment. A substation noise evaluation has been conducted to identify the existing conditions, predict the potential environmental noise emissions associated with the proposed Substation, and minimize noise impacts to the community.

The Substation will be located in the City of Shelton, Fairfield County, Connecticut on a site previously occupied by the Lord Corp industrial facility. The surrounding area is characteristic of a mixed use area with agricultural, commercial, and residential land uses. Major transportation arteries (Route 8 and Old Stratford Road) border the site to the southeast and southwest. There are residential receptors surrounding the site with the nearest property located at 26 Beard Sawmill Road, approximately 470 feet from the Substation property boundary.

The Substation will be subject to state and local regulations regarding noise emissions. However, due to an earlier nighttime designation and later daytime designation the City of Shelton regulations are more restrictive than those specified by the State of Connecticut. As such, the regulations set forth in the Shelton Code of Ordinances have been used to determine regulatory compliance. Based on information provided, the Substation property is currently zoned Office Park District (OPD) and upon completion will remain an Office Park zoning classification. Furthermore, based upon the Standard Land Use Classification Manual of Connecticut the Substation site would be classified as a Class C noise zone and therefore must not exceed the limits set forth in the Shelton Code of Ordinances for a Class C noise zone emitter.

In order to characterize the existing acoustical environment surrounding the substation site, an ambient sound level survey was conducted. The sound level survey was conducted at three (3) locations around the proposed substation site. These locations were selected to capture the acoustical environment representative of the nearby noise-sensitive receptors. The acoustical environments were predominantly influenced by traffic on State Highway 8 and local roads, air traffic (both fixed wing and helicopter), and local fauna such as birds and insects. The hourly background sound pressure levels at the survey locations ranged from 42 to 62 dBA during the daytime and nighttime hours. The ambient conditions are typical for suburban, mixed-use areas with significant traffic noise.

It is important to note that the predicted Substation noise emissions only include noise resulting from the proposed Substation and are exclusive of any background noise. Also, the predicted Substation noise emissions do not include noise associated with either site development or construction. The predicted sound levels associated with the Substation are expected to range from 40 to 50 dBA at the adjacent noise zone class boundaries and from 30 to 37 dBA at the nearest noise-sensitive receptors. Therefore, the predicted Substation sound levels are anticipated to comply with the regulatory limits specified by the City of Shelton and State of Connecticut and the potential increase to the ambient sound level at the nearest noise sensitive receptors are expected to be less than perceptible.

1.0 Introduction

The United Illuminating Company (UI) is proposing to install a new substation in the City of Shelton, Fairfield County, Connecticut. The proposed Shelton Substation (Substation) is located on a site previously occupied by the Lord Corp industrial facility and is surrounded by a mix of commercial, residential, and agricultural use properties. Based on available substation design information and drawings, the substation will include two (2) 30/40/50 MVA transformers with a single control building, two (2) PDC units, and associated HVAC equipment.

As a result Black & Veatch has conducted an ambient sound level survey and subsequent substation noise evaluation to address the following:

- What regulatory noise limits will apply to the Substation?
- Once operational, will the Substation noise emissions comply with the applicable noise regulations?
- What potential impacts will the nearest noise sensitive locations be subject to as a result of the Substation operation?

2.0 Substation Vicinity and Layout

An aerial view of the Substation site and surrounding vicinity is shown in Figure 2-1. The Substation site is surrounded by agricultural and commercial use areas to the north, State Route 8 to the east, Old Stratford Road and commercial land uses to the south, and Pootatuck Place with commercial and residential land uses to the west. As shown in Figure 2-1 and Table 2-1, the nearest residential receptors include 26 Beard Sawmill Road, 656 Bridgeport Avenue, and 10 Mill Street. The closest residential receptor, 26 Beard Sawmill Road, is approximately 470 feet from the Substation property boundary.

Table 2-1 Approximate Distance from Shelton Substation to Nearest Residential Receptors.

NEAREST RESIDENTIAL RECEPTOR	APPROXIMATE DISTANCE TO SHELTON SUBSTATION PROPERTY BOUNDARY, feet
26 Beard Sawmill Road	470
656 Bridgeport Avenue	500
10 Mill Street	670

Figure 2-1. Aerial view of substation site and nearest residential receptors.

3.0 Noise Regulations

Prior to conducting the ambient sound level survey, local regulations, standards, and guidelines related to environmental noise emissions were investigated and reviewed to determine the applicability to the Substation. The Substation noise emissions have been evaluated based on complying with the applicable regulations.

3.1 CITY OF SHELTON

The proposed site is located within the City of Shelton in the State of Connecticut. Based on the available information, there are local noise ordinances that apply to the Substation. The regulations are specified in Chapter 7, Article III of the City Code of Ordinances. Section 7-44 states that

> *"no person shall emit or cause to be emitted sound exceeding the sound levels stated herein when measured at any point on a tract or parcel of land not under their ownership or control. The determination of allowable sound shall be in accordance with the following objective numerical standards for the respective Noise Zone Classes:"*

Table 3-1 Shelton Code of Ordinances – Noise Zone Standards

	CLASS C, dBA	CLASS B, dBA	CLASS A DAYTIME HOURS, dBA	CLASS A NIGHTTIME HOURS, dBA
Class C emitter to	70	66	61	51
Class B emitter to	62	62	55	45
Class A emitter to	62	55	55	45

Notes:

1. Daytime hours = 7:30 AM to 9:00 PM and nighttime hours = 9:00 PM to 7:30 AM
2. Additionally, no person shall emit noise exceeding 70 dBC overall.

The noise zones are classified in accordance with the Standard Land Use Classification Manual of Connecticut (SLUCONN).

- Class A noise zone generally includes residential areas where human beings sleep or areas where serenity and tranquility are essential to the intended use of the land such as residential areas (single and multi-family), hotels, hospitals, and religious facilities.
- Class B noise zone generally includes commercial areas where human beings converse and such conversation is essential to the intended use of the land such as retail business, professional services, and recreational activities.
- Class C zone generally includes industrial areas where protection against damage to hearing is essential and the necessity for conversation is limited such as manufacturing facilities, utility uses, and agricultural activities.

Based upon these designations the noise zones surrounding the Substation site have been identified and are shown in Figure 3-1.

Figure 3-1. Shelton Substation neighboring noise zones per Shelton Code of Ordinances

3.2 SHELTON PLANNING AND ZONING COMMISSION

In addition to the Shelton Code of Ordinances, the Shelton Planning and Zoning Commission have established noise performance standards in Section 43 of the City of Shelton Zoning Regulations. Specifically, the performance standards establish maximum daytime octave band sound levels to protect residential districts from noise emitted from Industrial (IA-1) Districts and Light Industrial Park (LIP) Districts. However, as shown in Figure 3-2 and Appendix E the Substation property is currently zoned Office Park District (OPD). Additional comments received from UI confirm that the OPD zoning designation will remain unchanged after the Substation becomes operational. Therefore, the noise performance standards specified by the Shelton Planning and Zoning Commission is not applicable.

3.3 STATE OF CONNECTICUT

The state regulation governing noise is contained in the Regulations of Connecticut State Agencies (RCSA). The statutes provide limits that are based on land use and time of day. Additionally, noise zones are established based on the Standard Land Use Classification Manual of Connecticut. Specifically, Section 22a-69-3.5 states that the limits for a noise source within a Class C noise zone (which covers utilities) when adjacent to a Class A noise zone (residential) are 61 dBA during daytime hours and 51 dBA during nighttime hours. Daytime hours are defined as the hours between 7:00 AM and 10:00 PM and nighttime hours are defined as the hours between 10:00 PM and 7:00 AM. Compliance for the specified limits is determined by measuring the A-weighted sound pressure level at one (1) foot beyond the emitter's boundary inside the receptor's noise zone.

The emitter's zone includes contiguous rights of way for streets, highways, railroads, and waters of the state.

In addition to these limits, there is an additional 5 dB penalty when a prominent discrete tone is present. Per the statute, a prominent discrete tone is "the presence of acoustic energy concentrated in a narrow frequency range". The determination of the tone is relative to the sound pressure levels in the adjacent frequency bands as specified in Section 22a-69-1.2 (r). If a discrete tone exists, the daytime and nighttime limits would be reduced to 56 dBA and 46 dBA, respectively, for noise from a Class C noise zone to a Class A noise zone. While some transformers emit tonal noise in the form of a hum, the transformers included with this Project will be specified and designed to minimize tonal noise emissions.

Although these limits are objective and straightforward, the statute also contains language that can be used to file a complaint. For example, Section 22a-69-1.5 states that "compliance of a source with these Regulations is not a bar to a claim of nuisance by any person. A violation of any portion of these regulations shall not be deemed to create a nuisance per se." This would seem to permit some leeway in determining whether a source is a nuisance or not regardless of whether it meets the objective requirements.

3.4 APPLICABLE CRITERIA

The City of Shelton and State of Connecticut regulations are similar. In both cases, the nighttime sound level limit for a Class C noise source emitting to a Class A receiver is 51 dBA and is lower than the daytime sound level limit. However, as shown in Table 3-2 the City regulations are more restrictive as they have an earlier nighttime designation, i.e. 9:00 PM instead of 10:00 PM and a later daytime designation, i.e. 7:30 AM instead of 7:00 AM. Since the Substation will operate during both daytime and nighttime hours, the Substation design criteria (maximum allowable sound pressure level) related to noise emissions should be 51 dBA at the nearest Class A noise zone property boundary.

Table 3-2 City of Shelton and State of Connecticut Regulatory Comparison

REGULATORY JURISDICTION	APPLICABLE TIME PERIOD		MAXIMUM ALLOWABLE SOUND LEVEL, dBA CLASS C EMITTER TO CLASS A RECEIVER
City of Shelton	Daytime	7:30 AM to 9:00 PM	61
	Nighttime	9:00 PM to 7:30 AM	51
State of Connecticut	Daytime	7:00 AM to 10:00 PM	61
	Nighttime	10:00 PM to 7:00 AM	51

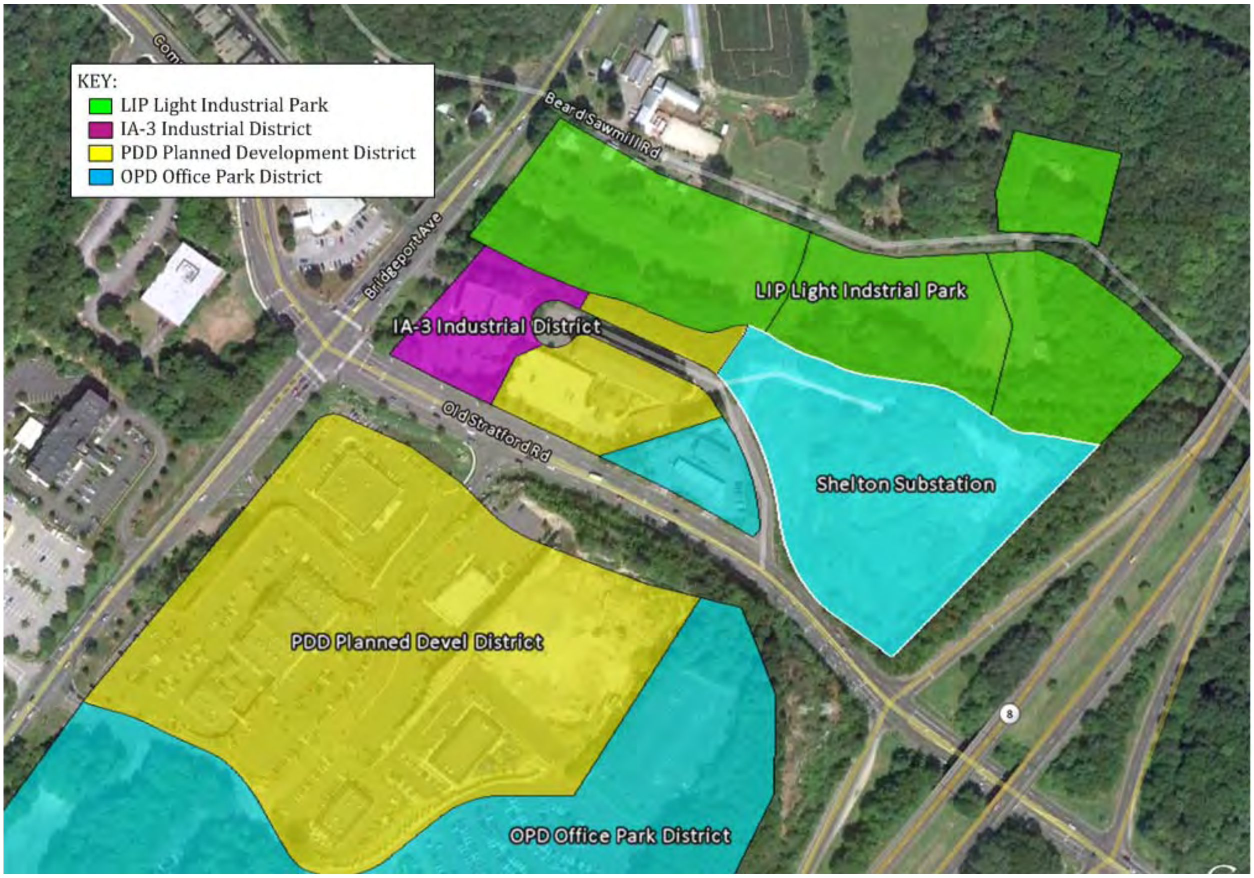


Figure 3-2. Shelton Substation and surrounding Zoning Districts

4.0 Existing Acoustical Environment

In order to characterize the existing acoustical environment surrounding the Substation site, an ambient sound level survey was conducted. This section describes the results of the survey and the nature of the existing acoustical environment surrounding the substation site.

4.1 SURVEY PROCEDURE AND CONDITIONS

The ambient sound level survey was conducted on October 3 through 5, 2011. The survey procedure was based on relevant portions of general industry standards including, but not limited to, ANSI S1.13, ANSI S12.9, ANSI S12.18, ASTM E1014, and ISO 1996. Sound level measurements were conducted using Type 1 and Type 2 sound level meters that meet the requirements of ANSI S1.4. The sound level meters were field calibrated immediately before and after each measurement period. All equipment had been laboratory calibrated within the last 12 months. Appendix B includes a list of the measurement equipment utilized during the survey and copies of corresponding calibration certificates.

The meteorological conditions during the ambient sound level survey were reasonable for environmental noise monitoring. Temperatures ranged from approximately 48 to 59 °F and skies were overcast. Wind speeds ranged from 0 to 3 mph. The temperature, wind speed, and humidity trends during the hours of the ambient sound level survey are detailed in Appendix C.

The ambient sound level survey was conducted at three locations surrounding the proposed substation site. Each measurement location is described in Table 4-1 and identified in Figure 4-4. R1, R2, and R3 were selected to characterize the acoustical environment of the noise sensitive receptors nearest the Substation and have been utilized to evaluate potential impacts.

In order to effectively quantify and qualify the existing daily sound levels within the surrounding community, the ambient survey included both continuous monitoring and short-term (attended) sound level measurements. The continuous monitors collected sound level data throughout the survey period, ranging from 38 to 39 hours. Short-term measurements were conducted periodically in order to qualify the existing overall conditions and quantify the existing spectral conditions during various daytime and nighttime hours. Each short-term measurement lasted a minimum of 10 minutes.

Several sound level metrics were used to quantify the fluctuating environmental noise. These metrics included the hourly L_{eq}, L_{10}, L_{50}, and L_{90} sound levels. The equivalent-continuous sound level, L_{eq}, is the equivalent-continuous sound level measured over a given time duration and provides an indication of the average sound energy for that period of time. The L_{90} sound level is generally considered representative of the residual or background sound level (i.e., without discrete noise events such as occasional traffic, aircraft, etc.), the L_{50} sound level is considered the median sound level, and the L_{10} sound level is generally considered the intrusive sound level (i.e., with the occasional discrete events such as traffic, aircraft, etc.).

Table 4-1. Noise Measurement Locations

LOCATION	UTM COORDINATES ZONE 18		DESCRIPTION	CONTINUOUS MONITORING	SHORT-TERM MEASUREMENTS
	M E	M N			
R1	657710.00	4571271.00	Entrance to the Lower Route 8 Pump Station	Yes	Yes
R2	657403.50	4571393.73	NW corner of Bridgeport Road and Beard Sawmill Road.	Yes	Yes
R3	657544.00	4571204.00	Pootatuck Place near Substation gate.	Yes	No

4.2 SOUND LEVEL MEASUREMENTS REPRESENTATIVE OF NEAREST NOISE SENSITIVE LOCATIONS

The survey results at each location have been evaluated and are detailed in subsequent sections. It is important to note that these results include the contribution of all ambient noise sources within the community.

4.2.1 R1 – 26 Beard Sawmill Road

At R1 the hourly background (L_{90}) sound levels ranged from 51 to 54 dBA during daytime hours (7:30 AM to 9:00 PM) and 45 to 54 dBA during nighttime hours (9:00 PM to 7:30 AM). The quietest periods occurred during the late night to early morning hours when the traffic volume on State Highway 8 had subsided. In addition to traffic on State Highway 8, other noise sources observed included traffic on Beard Sawmill Road, air traffic (both fixed wing and helicopter), hum from a utility pole transformer, and local fauna such as birds and insects. The L_{10}, L_{50}, and L_{90} hourly sound levels for R1 are shown in Figure 4-1.

4.2.2 R2 – 10 Mill Street and 656 Bridgeport Avenue

At R2 the hourly background (L_{90}) sound levels ranged from 48 to 59 dBA during daytime hours (7:30 AM to 9:00 PM) and 42 to 54 dBA during nighttime hours (9:00 PM to 7:30 AM). The quietest periods occurred during the late night to early morning hours when traffic on Bridgeport Avenue had subsided. In addition to traffic other noise sources observed included air traffic (both fixed wing and helicopter), water noise from Far Mill River, and local fauna such as birds and insects. The L_{10}, L_{50}, and L_{90} hourly sound levels for R2 are shown in Figure 4-2.

4.2.3 R3 – 25 Old Stratford Road

While 25 Old Stratford Road is a hotel and not a residence, it falls under the same noise zone class as a residence pursuant to the local noise ordinance. Therefore, in addition to residences, the hotel has also been considered as a noise sensitive receptor. At R3 the hourly background (L_{90}) sound levels ranged from 53 to 62 dBA during daytime hours (7:30 AM to 9:00 PM) and 45 to 59 dBA during nighttime hours (9:00 PM to 7:30 AM). The quietest periods occurred during the late night to early morning hours when traffic volume on State Highway 8 and Old Stratford Road had subsided. In addition to traffic, other noise sources observed included air traffic (both fixed wing and helicopter), wind blowing in the trees, gas station radio, water noise from Far Mill River, and local fauna such as birds and insects. The L_{10}, L_{50}, and L_{90} hourly sound levels for R3 are shown in Figure 4-3.

4.2.4 Summary of Sound Level Measurements

The hourly background sound pressure levels (L_{90}) at the survey locations ranged from 42 to 62 dBA during the daytime and nighttime hours and have been summarized in Table 4-2. These results are typical for suburban, mixed-use areas with significant traffic noise. The lower end of the sound level ranges summarized in Table 4-2 are generally indicative of periods when traffic on local roads and Highway 8 had subsided.

Table 4-2. A-weighted Sound Pressure Levels Measured at Nearest Noise Sensitive Locations

MEASUREMENT LOCATION	MEASURED HOURLY SOUND PRESSURE LEVEL (L_{90}), dBA	
	DAYTIME (7:30 AM TO 9:00 PM)	NIGHTTIME (9:00 PM TO 7:30 AM)
R1	51 - 54	45 - 54
R2	48 - 59	42 - 54
R3	53 – 62	45 - 59

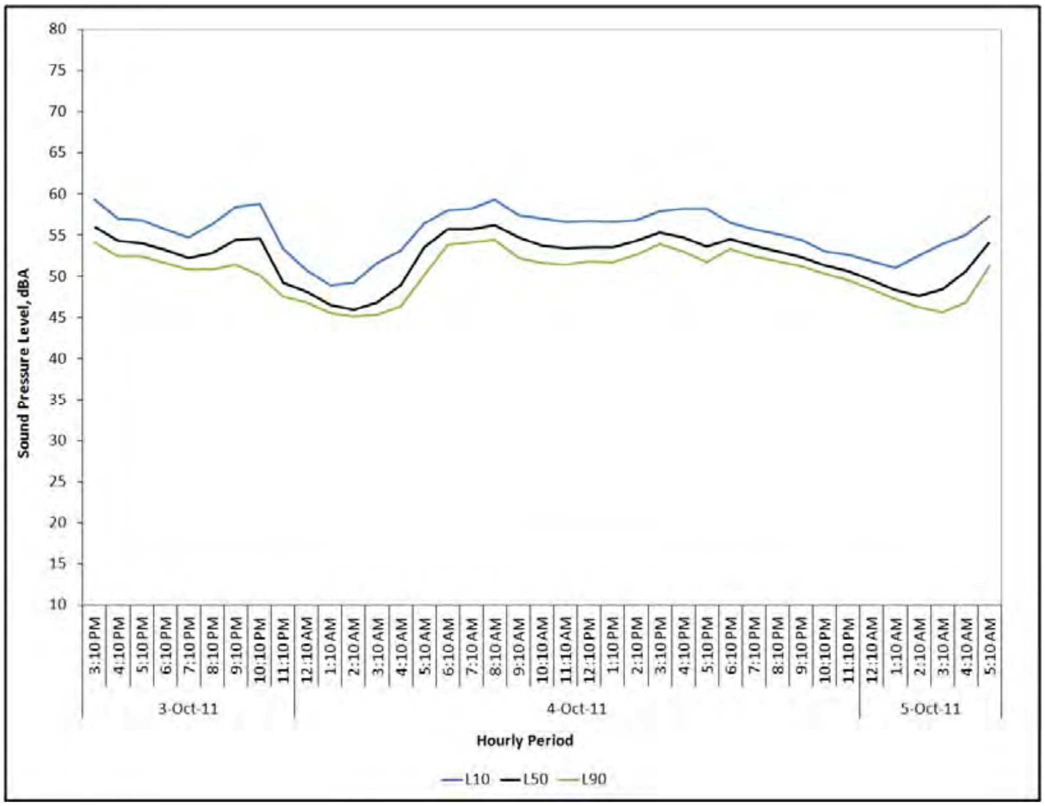


Figure 4-1. Measured hourly sound levels at R1

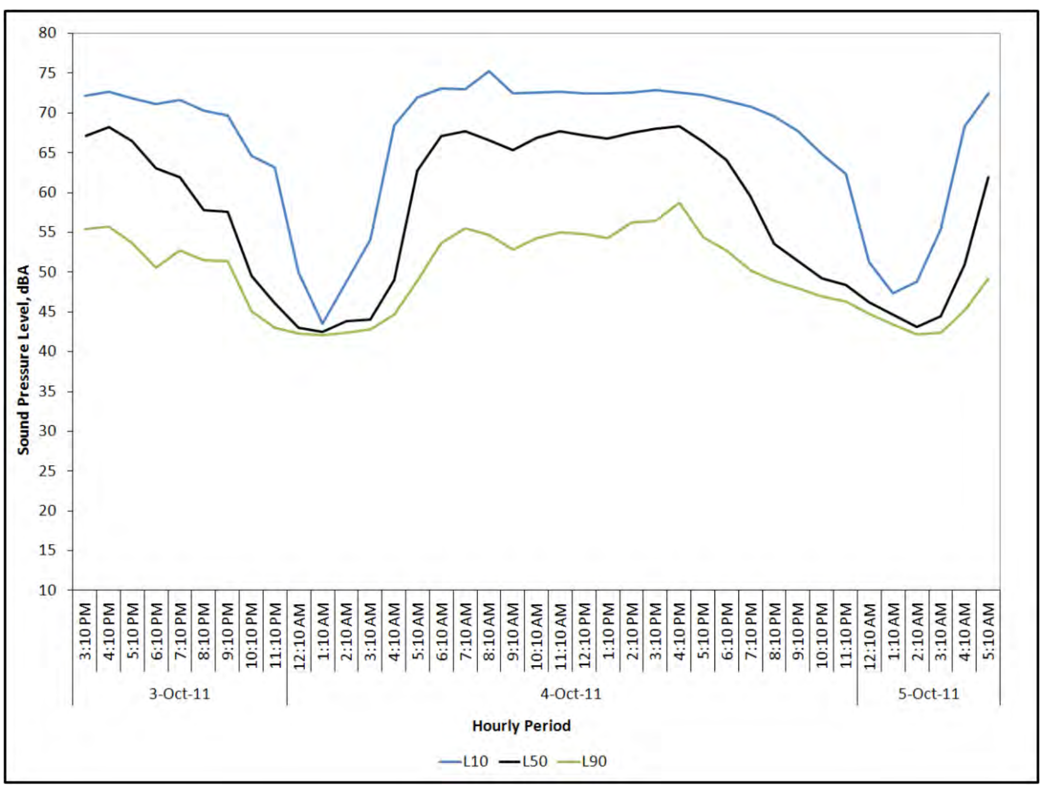


Figure 4-2. Measured hourly sound levels at R2

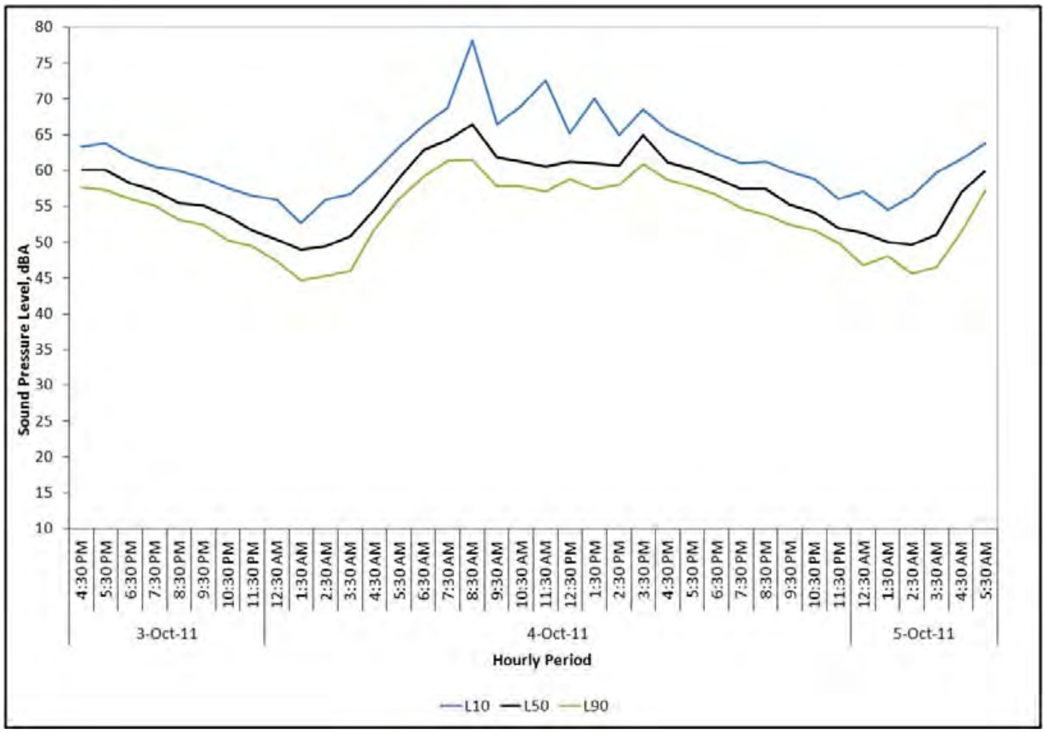


Figure 4-3. Measured hourly sound levels at R3.

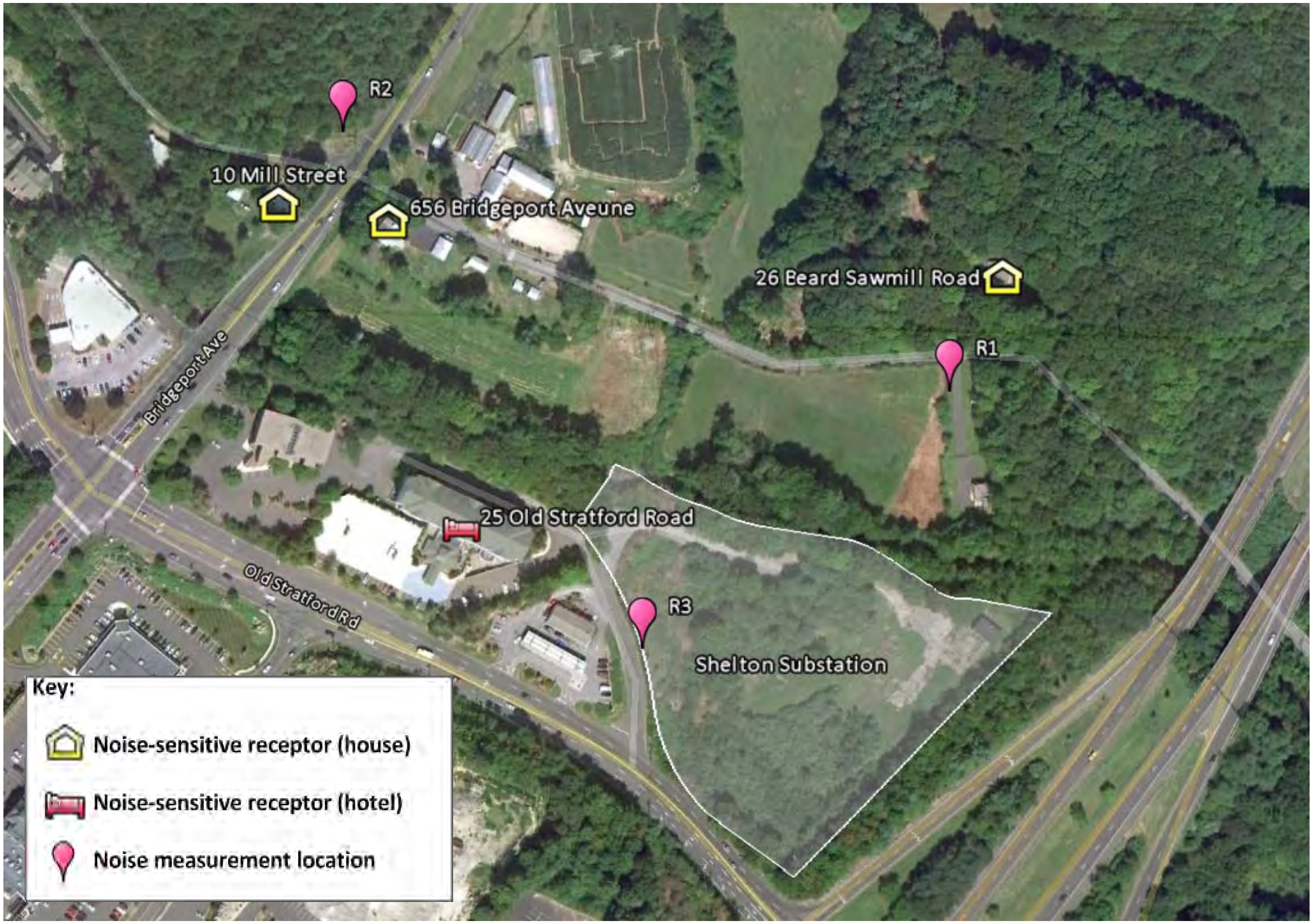


Figure 4-4. Ambient sound level survey measurement locations and nearest noise-sensitive receptors.

5.0 Substation Noise Emissions

The noise emissions from the proposed Substation have been predicted based on the design and specification information available to date.

5.1 NOISE MODELING

The noise emissions associated with the Substation has been modeled using noise prediction software (Cadna/A version 4.2.139), which is based on methodologies specified in ISO 9613. The model simulated the outdoor propagation of sound from each noise source and accounted for sound wave divergence, atmospheric and ground sound absorption, sound directivity, and sound shielding due to interceding barriers, buildings, and terrain. A database was developed which specified the location, octave-band sound levels, and sound directivity of each noise source. A receptor grid was specified which covered the entire area of interest. The model calculated the sound pressure levels within the receptor grid based on the octave-band sound level contribution of each noise source. Finally, a noise contour plot was produced based on the overall sound pressure levels within the receptor grid, including specific receptor locations.

Noise modeling was based on normal operation which excludes any abnormal or upset operating conditions. All facility structures associated with the Substation were included in the model as structures to account for their shielding effect.

5.2 PREDICTED SUBSTATION (ONLY) SOUND LEVELS

The proposed Substation will include two (2) 30/40/50 MVA transformers, a single control building, two (2) PDC units, and associated HVAC equipment. Equipment sound levels used to develop the acoustical model were based on available in-house data and are shown in Table 5-1. These specifications are anticipated to be consistent with standard-packaged equipment.

Please note that any deviations from the current site arrangement, the equipment specifications, or the acoustical design elements outlined herein may affect the overall Substation noise emissions. If such design or specification changes occur, the Substation noise emissions should be re-evaluated to determine the acceptability of the proposed design change.

Table 5-1. Anticipated Equipment Sound Levels for the Proposed Substation Equipment

EQUIPMENT	QUANTITY	EQUIPMENT SOUND LEVELS
30/40/50 MVA transformer	2	75 dBA per IEEE C57.12.90
5 Ton HVAC Unit (Control Building)	2	75 dBA @ 3 ft (1)
6 Ton HVAC Unit (PDC's)	4	75 dBA @ 3 ft (1)
Notes: 1. Average sound pressure level along the equipment envelope.		

5.3 CITY OF SHELTON NOISE ZONE COMPLIANCE EVALUATION

The resulting noise emissions associated with the proposed Substation are presented in Figure 5-1 as noise contours. The noise contours represent the overall A-weighted sound pressure levels at 5 dB intervals. It is important to note that the predicted Substation noise emissions only include noise resulting from the proposed Substation and are exclusive of any background noise. Also, the predicted Substation noise emissions do not include noise associated with site development or construction.

The predicted Substation sound pressure levels at the adjacent noise zones have been summarized in Table 5-2. The Substation sound pressure levels are anticipated to be compliant with the maximum permissible sound levels per the noise zone standards specified by the City of Shelton. Given the close proximity to the Substation compliance at these noise zones will subsequently result in compliance at all other noise zones.

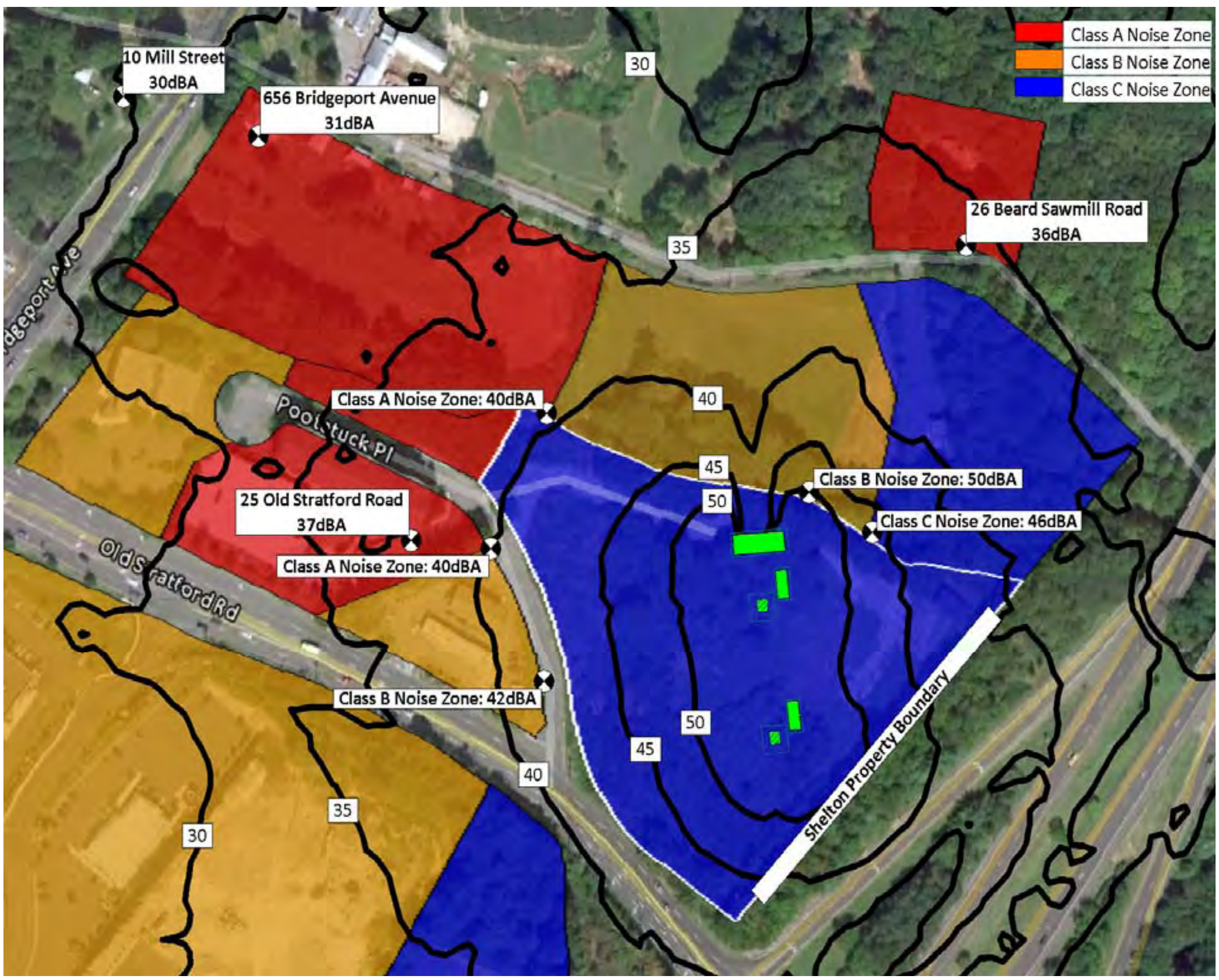


Figure 5-1. Calculated Substation (only) sound level contour plot (dBA).

Table 5-2. Summary of Substation Sound Levels and Corresponding Compliance Determination.

ADJACENT NOISE ZONE	CALCULATED SUBSTATION ONLY SOUND LEVEL AT NEAREST NOISE ZONE ADJACENCY	APPLICABLE NOISE ZONE LIMIT PER THE CITY OF SHELTON	COMPLIANCE DETERMINATION
Class A	40 dBA	61 dBA (Day) / 51 dBA (Night)	Compliant
Class B	50 dBA	66 dBA	Compliant
Class C	46 dBA	70 dBA	Compliant

5.4 IMPACTS ASSESSMENT AT NEAREST NOISE SENSITIVE LOCATIONS

In addition to regulatory limits, the potential impacts to the nearest noise-sensitive locations, shown in Figure 4-4, were also evaluated against the existing background sound levels measured during the ambient sound level survey. By combining the calculated Substation sound levels with the measured hourly L_{90} sound levels, the maximum potential increase to the ambient sound level was determined. As shown in Table 5-3, the potential increase to the ambient sound level at the nearest noise sensitive receptors is expected to range from 0 to 1 dB. For reference a 3 dB change in a continuous broadband noise is generally considered "just barely perceptible" to the average listener.

It is important to note that the possible increases are based on the measured background sound pressure levels (L_{90}). Periodically throughout the day, the sound levels were higher than these measured background sound levels due to transient events such as vehicles, aircraft, etc. During these louder periods, no change to the existing ambient sound levels would be expected. Additionally, at noise sensitive receptors located further from the Substation (i.e. residences South of Route 8) no change to the existing ambient sound levels would be expected.

In addition to the overall sound level, discrete tones (audible hums) are often a concern with transformer installations near residential neighbors. To minimize the potential impact of tonal noise from these transformers proper consideration should be given to the transformer specifications and performance to ensure the tonal impacts are minimized.

Table 5-3. A-weighted Sound Pressure Levels (SPL) Measured at Nearest Noise Sensitive Locations

NEAREST NOISE SENSITIVE LOCATION	COORESPONDING MEASUREMENT LOCATION	LOWEST MEASURED HOURLY SPL, L_{90}	PREDICTED SUBSTATION SOUND LEVELS	FUTURE SPL (MEASURED + SUBSTATION)	POTENTIAL INCREASE TO AMBIENT
26 Beard Sawmill Road	R1	45 dBA	36 dBA	46 dBA	0 dB
10 Mill Street	R2	42 dBA	30 dBA	42 dBA	0 dB
656 Bridgeport Avenue	R2	42 dBA	31 dBA	42 dBA	0 dB

NEAREST NOISE SENSITIVE LOCATION	COORESPONDING MEASUREMENT LOCATION	LOWEST MEASURED HOURLY SPL, L_{90}	PREDICTED SUBSTATION SOUND LEVELS	FUTURE SPL (MEASURED + SUBSTATION)	POTENTIAL INCREASE TO AMBIENT
25 Old Stratford Road (Hotel)	R3	45 dBA	37 dBA	46 dBA	1 dB

6.0 Conclusions

The proposed Shelton Substation is subject to local and state regulations regarding noise emissions. However, due to the earlier nighttime designation and later daytime designation, the City of Shelton regulations are more restrictive than those specified by the State of Connecticut. As such, the regulations set forth in the Shelton Code of Ordinances have been used to determine regulatory compliance. Given the current Substation site zoning designation and the noise zones specified by the Standard Land Use Classification Manual of Connecticut, the Substation must not exceed 51 dBA, 66 dBA, and 70 dBA at the adjacent Class A, Class B, and Class C noise zones, respectively.

Sound levels associated with the Substation equipment including two (2) 30/40/50 MVA transformers, a single control building, two (2) PDC units, and associated HVAC equipment have been calculated. Once operational, the Substation sound levels are expected to range from 40 dBA to 50 dBA at the neighboring noise zones. As such the Substation is expected to meet the limits specified by the City of Shelton and subsequently the State of Connecticut.

Additionally, by combining the calculated Substation sound levels with the hourly L_{90} sound levels measured during the ambient sound level survey, the maximum potential increase to the ambient sound level at the nearest noise sensitive receptors was determined. Given the existing ambient conditions, the potential increase to the ambient sound level at the nearest noise sensitive receptors is expected to range from 0 to 1 dB, equating to a less-than perceptible-increase.

Since the Substation is expected to meet the noise limits specified by the City of Shelton and cause a less-than-perceptible increase in the existing ambient sound levels, no mitigation measures are recommended.

Appendix A – Acoustical Terminology

SOUND ENERGY

Sound is generated by the propagation of energy in the form of pressure waves. Being a wave phenomenon, sound is characterized by amplitude (sound level) and frequency (pitch). Sound amplitude is measured in decibels, dB. The decibel is the logarithmic ratio of a sound pressure to a reference sound pressure. Typically, 0 dB corresponds to the threshold of human hearing. A 3 dB change in a continuous broadband noise is generally considered "just barely perceptible" to the average listener. A 5 dB change is generally considered "clearly noticeable" and a 10 dB change is generally considered a doubling (or halving) of the apparent loudness. For reference, the sound pressure levels and subjective loudness associated with common noise sources are shown in Table A-1.

Frequency is measured in hertz, Hz (cycles per second). Most sound sources (except those with pure tones) contain sound energy over a wide range of frequencies. In order to analyze sound energy over the range of frequencies, the sound energy is typically divided into sections called octave bands. Octave bands are identified by their center frequencies including 31.5, 63, 125, 250, 500 1000, 2000, 4000, and 8000 Hz. For more detailed analyses, narrow bands such as ⅓-octave bands or 1/12-octave bands are employed. The sum of the sound energy in all of the octave bands for a source represents the overall sound level of the source.

The normal human ear can hear frequencies ranging from 20 Hz to 20,000 Hz. At typical sound pressure levels, the human ear is more sensitive to sounds in the middle and high frequencies (1,000 to 8,000 Hz) than sounds in the low frequencies. Various weighting networks have been developed to simulate the frequency response of the human ear. The A-weighting network was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighting network emphasizes sounds in the middle to high frequencies and de-emphasizes sounds in the low frequencies. Most sound level instruments can apply these weighting networks automatically. Any sound level to which the A-weighting network has been applied is expressed in A-weighted decibels, dBA. To characterize sound that contains relatively more low frequency energy—and to approximate the ear's response to relatively high sound levels—the C-weighting network was developed. C-weighting places more equal emphasis on low and high frequencies relative to A-weighting. Any sound level to which the C-weighting network has been applied is expressed in C-weighted decibels, dBC.

SOUND LEVEL METRICS

Noise in the environment is constantly fluctuating, such as when a car drives by, a dog barks, or a plane passes overhead. Therefore, noise metrics have been developed to quantify fluctuating environmental noise levels. These metrics include the equivalent-continuous sound level and the exceedance sound levels.

The equivalent-continuous sound level, L_{eq}, is used to represent the equivalent sound pressure level over a specified time period. The L_{eq} metric is the sound level of a steady-state sound that has the same (equivalent) total energy as the time-varying sound of interest, taken over a specified time period and covering a specified set of conditions. Thus, L_{eq} is a single-value level that expresses the time-averaged total energy of a widely varying or fluctuating sound level.

The exceedance sound level, L_x, is the sound level exceeded "x" percent of the sampling period and is referred to as a statistical sound level. The most common Lx values are L_{90}, L_{50}, and L_{10}. L_{90} is the sound level exceeded 90 percent of the sampling period. The L_{90} sound level represents the sound level without the influence of loud, transient noise sources and is therefore often referred to as the residual or background sound level. The L_{50} sound level is the sound level exceeded 50 percent of the sampling period or the median sound level. The L_{10} sound level is the sound level exceeded 10 percent of the sampling period. The L_{10} sound level represents the occasional louder noises and is often referred to as the intrusive sound level. As previously discussed, the L_{90} environmental sound level typically represents the background (residual) sound level.

The variation between the L_{90}, L_{50}, and L_{10} sound levels can provide an indication of the variability of the acoustical environment. If the acoustical environment is perfectly steady, all values are identical. A large variation between the values indicates the environment experiences highly fluctuating sound levels. For instance, measurements near a roadway with frequent passing vehicles may cause a large variation in the statistical sound levels.

TYPICAL COMMUNITY SOUND LEVELS

Typical background (residual) sound levels in various types of communities are outlined in Table A-2 for reference. However, it is important to remember that each community is unique with regard to the sources of noise that contribute to the background sound levels.

HUMAN RESPONSE TO SOUND

Human response to sound is highly individualized. Annoyance is the most common issue regarding community noise. The percentage of people claiming to be annoyed by noise will generally increase as environmental sound levels increase. However, many other factors will also influence people's response to noise. These factors can include the character of the noise, the variability of the sound level, the presence of tones or impulses, and the time of day of the occurrence. Additionally, non-acoustical factors, such as the person's opinion of the noise source, the ability to adapt to the noise, the attitude towards the noise and those associated with it, and the predictability of the noise can also influence people's response. Response to noise varies widely from one person to another and with any particular noise, individual responses will range from "highly annoyed" to "not annoyed".

Table A-1. Typical Sound Pressure Levels Associated with Common Noise Sources

SOUND PRESSURE LEVEL (dBA)	SUBJECTIVE EVALUATION	COMMON OUTDOOR ENVIRONMENT OR SOURCE	COMMON INDOOR ENVIRONMENT OR SOURCE
140	Deafening	Jet aircraft at 75 ft	
130	Threshold of pain	Jet aircraft during takeoff at a distance of 300 ft	
120	Threshold of feeling	Elevated Train	Hard rock band
110	Extremely Loud	Jet flyover at 1000 ft	Inside propeller plane
100	Very Loud	Power mower, motorcycle at 25 ft, auto horn at 10 ft,	
90	Very Loud	Propeller plane flyover at 1000 ft, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately Loud	Diesel truck (40 mph) at 50 ft	Inside auto at high speed, garbage disposal, dishwasher
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner, electric typewriter
60	Moderate	Air-conditioner condenser at 15 ft, near highway traffic	General office
50	Quiet		Private office
40	Quiet	Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence (without TV. and stereo)
20	Very quiet	Rustling leaves	Quiet theater, whisper
10	Just audible		Human breathing
0	Threshold of hearing		

Source: Adapted by Black & Veatch from *Architectural Acoustics*, by David M. Egan (1988) and *Architectural Graphic Standards*, by Ramsey and Sleeper (1994).

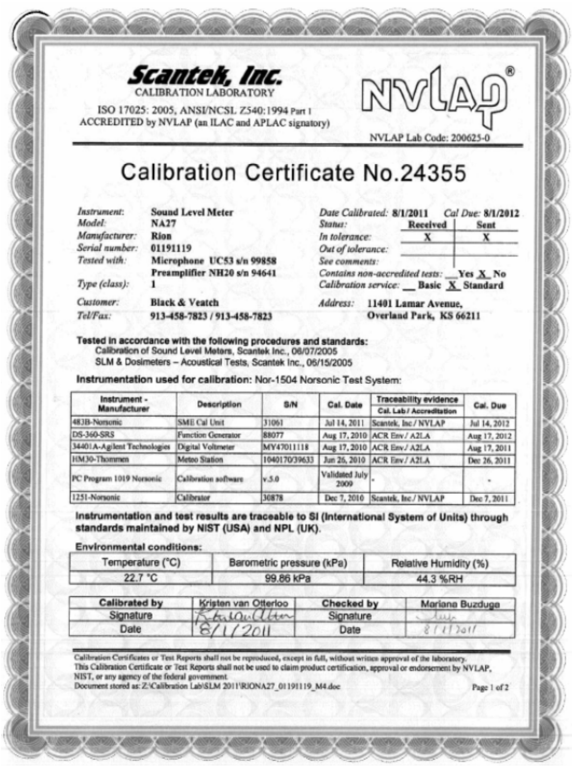
Table A-2. Typical Daytime Residual (Background) Sound Levels in Various Types of Communities

TYPE OF COMMUNITY	TYPICAL DAYTIME RESIDUAL (BACKGROUND) SOUND PRESSURE LEVEL
Very Quiet Rural Areas	31 to 35 dBA
Quiet Suburban Residential	36 to 40 dBA
Normal Suburban Residential	41 to 45 dBA
Urban Residential	46 to 50 dBA
Noisy Urban Residential	51 to 55 dBA
Very Noisy Urban Residential	56 to 60 dBA
Adjacent Freeway or Major Airport	n/a

Source: Adapted by Black & Veatch from *Community Noise*, by the U.S. Environmental Protection Agency, (December 1971).

Appendix B – Ambient Survey Test Equipment

Model	Serial Number	Last Calibration Date
Rion Model NA-27	01191119	08/01/2011
Rion Model NL-32	00630458	08/01/2011
Rion Model NL-22 (#1)	01110135	07/29/2011
Rion Model NL-22 (#3)	00362605	08/01/2011
Norsonic Type 1251 Acoustic Calibrator	25762	07/29/2011
Rion Model NC-73 Acoustic Calibrator	10527795	08/01/2011



Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)
NVLAP Lab Code: 200625-0

Calibration Certificate No.24355

Instrument: Sound Level Meter
Model: NA27
Manufacturer: Rion
Serial number: 01191119
Tested with: Microphone UC53 s/n 99858
Preamplifier NH20 s/n 94641
Type (class): 1
Customer: Black & Veatch
Tel/Fax: 913-458-7823 / 913-458-7823

Date Calibrated: 8/1/2011 *Cal Due:* 8/1/2012

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard
Address: 11401 Lamar Avenue, Overland Park, KS 66211

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., 06/07/2005
SLM & Dosimeters – Acoustical Tests, Scantek Inc., 06/15/2005

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31061	Jul 14, 2011	Scantek, Inc / NVLAP	Jul 14, 2012
DS-360-SRS	Function Generator	88077	Aug 17, 2010	ACR Env / A2LA	Aug 17, 2012
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Aug 17, 2010	ACR Env / A2LA	Aug 17, 2011
HM30-Thommen	Meteo Station	1040170/39633	Jun 26, 2010	ACR Env / A2LA	Dec 26, 2011
PC Program 1019 Norsonic	Calibration software	v.5.0	Validated July 2009	-	-
1251-Norsonic	Calibrator	30878	Dec 7, 2010	Scantek, Inc / NVLAP	Dec 7, 2011

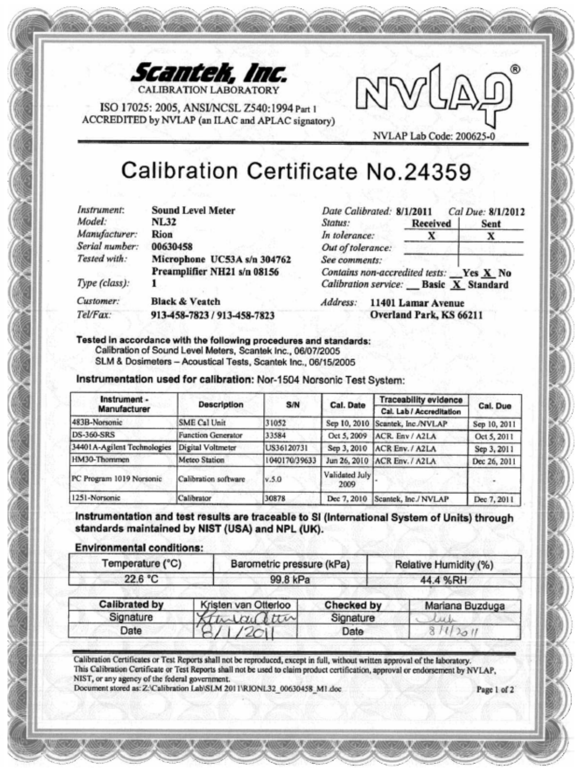
Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.7 °C	99.86 kPa	44.3 %RH

Calibrated by	Kristen van Otterloo	Checked by	Mariana Buzduga
Signature	K van Otterloo	Signature	
Date	8/1/2011	Date	8/1/2011

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory.
This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
Document stored as: Z:\Calibration Lab\SLM 2011\RIONA27_01191119_M4.doc
Page 1 of 2



Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)
NVLAP Lab Code: 200625-0

Calibration Certificate No.24359

Instrument: Sound Level Meter
Model: NL32
Manufacturer: Rion
Serial number: 00630458
Tested with: Microphone UC53A s/n 304762
Preamplifier NH21 s/n 08156
Type (class): 1
Customer: Black & Veatch
Tel/Fax: 913-458-7823 / 913-458-7823

Date Calibrated: 8/1/2011 *Cal Due:* 8/1/2012

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard
Address: 11401 Lamar Avenue, Overland Park, KS 66211

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., 06/07/2005
SLM & Dosimeters – Acoustical Tests, Scantek Inc., 06/15/2005

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Sep 10, 2010	Scantek, Inc./NVLAP	Sep 10, 2011
DS-360-SRS	Function Generator	33584	Oct 5, 2009	ACR. Env / A2LA	Oct 5, 2011
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Sep 3, 2010	ACR Env. / A2LA	Sep 3, 2011
HM30-Thommen	Meteo Station	1040170/39633	Jun 26, 2010	ACR Env. / A2LA	Dec 26, 2011
PC Program 1019 Norsonic	Calibration software	v.5.0	Validated July 2009	-	-
1251-Norsonic	Calibrator	30878	Dec 7, 2010	Scantek, Inc./ NVLAP	Dec 7, 2011

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.6 °C	99.8 kPa	44.4 %RH

Calibrated by	Kristen van Otterloo	Checked by	Mariana Buzduga
Signature	K van Otterloo	Signature	
Date	8/1/2011	Date	8/1/2011

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory.
This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
Document stored as: Z:\Calibration Lab\SLM 2011\RIONL32_00630458_M1.doc
Page 1 of 2

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP Lab Code: 200625-0

Calibration Certificate No.24352

Instrument: **Sound Level Meter**
Model: **NL22**
Manufacturer: **Rion**
Serial number: **01110135**
Tested with: **Microphone UC52 s/n 82749**
Preamplifier NH21 s/n 02904
Type (class): **2**

Date Calibrated: **7/29/2011** *Cal Due:* **7/29/2012**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard

Customer: **Black & Veatch**
Tel/Fax: **913-458-7823 / 913-458-7823**
Address: **11401 Lamar Avenue, Overland Park, KS 66211**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., 06/07/2005
SLM & Dosimeters – Acoustical Tests, Scantek Inc., 06/15/2005

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31061	Jul 14, 2011	Scantek, Inc./ NVLAP	Jul 14, 2012
DS-360-SRS	Function Generator	88077	Aug 17, 2010	ACR Env./ A2LA	Aug 17, 2012
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Aug 17, 2010	ACR Env./ A2LA	Aug 17, 2011
HM30-Thommen	Meteo Station	1040170/39633	Jun 26, 2010	ACR Env./ A2LA	Dec 26, 2011
PC Program 1019 Norsonic	Calibration software	v.5.0	Validated July 2009	-	-
1251-Norsonic	Calibrator	30878	Dec 7, 2010	Scantek, Inc./ NVLAP	Dec 7, 2011
4226-Bruel&Kjaer	Multifunction calibrator	2305103	Apr 13, 2011	Scantek, Inc./ NVLAP	Apr 13, 2012

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.2 °C	99.600 kPa	51.7 %RH

Calibrated by	Kristen van Otterloo	Checked by	Mariana Buzduga
Signature		Signature	
Date	7/29/2011	Date	8/1/2011

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory.
This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
Document stored as: Z:\Calibration Lab\SLM 2011\RIONL22_01110135_M1.doc

Page 1 of 2

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP Lab Code: 200625-0

Calibration Certificate No.24354

Instrument: **Sound Level Meter**
Model: **NL22**
Manufacturer: **Rion**
Serial number: **00362605**
Tested with: **Microphone UC52 s/n 107428**
Preamplifier NH21 s/n 19086
Type (class): **2**

Date Calibrated: **8/1/2011** *Cal Due:* **8/1/2012**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard

Customer: **Black & Veatch**
Tel/Fax: **913-458-7823 / 913-458-7823**
Address: **11401 Lamar Avenue Overland Park, KS 66211**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., 06/07/2005
SLM & Dosimeters – Acoustical Tests, Scantek Inc., 06/15/2005

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Sep 10, 2010	Scantek, Inc./NVLAP	Sep 10, 2011
DS-360-SRS	Function Generator	33584	Oct 5, 2009	ACR. Env / A2LA	Oct 5, 2011
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Sep 3, 2010	ACR Env. / A2LA	Sep 3, 2011
HM30-Thommen	Meteo Station	1040170/39633	Jun 26, 2010	ACR Env. / A2LA	Dec 26, 2011
PC Program 1019 Norsonic	Calibration software	v.5.0	Validated July 2009	-	-
1251-Norsonic	Calibrator	30878	Dec 7, 2010	Scantek, Inc./ NVLAP	Dec 7, 2011
4226-Brüel&Kjær	Multifunction calibrator	2305103	Apr 13, 2011	Scantek, Inc./ NVLAP	Apr 13, 2012

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
24.4 °C	100.06 kPa	53.5 %RH

Calibrated by	Kristen van Otterloo	Checked by	Mariana Buzduga
Signature		Signature	
Date	8/1/2011	Date	8/1/2011

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory.
This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
Document stored as: Z:\Calibration Lab\SLM 2011\RIONL22_00362605_M1.doc

Page 1 of 2

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP Lab Code: 200625-0

Calibration Certificate No.24362

Instrument: **Acoustical Calibrator**
Model: **1251**
Manufacturer: **Norsonic**
Serial number: **25762**
Class (IEC 60942): **1**
Barometer type:
Barometer s/n:

Date Calibrated: **7/29/2011** *Cal Due:* **7/29/2012**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No

Customer: **Black & Veatch**
Tel/Fax: **913-458-7823 / 913-458-7823**
Address: **11401 Lamar Avenue Overland Park, KS 66211**

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., 06/06/2005

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Sep 10, 2010	Scantek, Inc./NVLAP	Sep 10, 2011
DS-360-SRS	Function Generator	33584	Oct 5, 2009	ACR. Env / A2LA	Oct 5, 2011
34401A-Agilent	Digital Voltmeter	US36120731	Sep 3, 2010	ACR Env. / A2LA	Sep 3, 2011
HM30-Thommen	Meteo Station	1040170/39633	Jun 26, 2010	ACR Env. / A2LA	Dec 26, 2011
8903-HP	Audio Analyzer	2514A05691	Dec 1, 2010	ACR Env. / A2LA	Dec 1, 2013
PC Program 1018 Norsonic	Calibration software	v.5.0	Validated July 2009	-	-
1253-Norsonic	Calibrator	28326	Dec 6, 2010	Scantek, Inc./ NVLAP	Dec 6, 2011
1203-Norsonic	Preamplifier	92268	Dec 6, 2010	Scantek, Inc./ NVLAP	Dec 6, 2011
4180-Brüel&Kjær	Microphone	2246115	Dec 14, 2009	NPL (UK) / UKAS	Dec 14, 2011

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by	Kristen van Otterloo	Checked by	Mariana Buzduga
Signature		Signature	
Date	7/29/2011	Date	8/1/2011

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory.
This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
Document stored as: Z:\Calibration Lab\Cal 2011\NOR1251_25762_M1.doc

Page 1 of 2

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC and APLAC signatory)

NVLAP Lab Code: 200625-0

Calibration Certificate No.24361

Instrument: **Acoustical Calibrator**
Model: **NC-73**
Manufacturer: **Rion**
Serial number: **10527795**
Class (IEC 60942): **2**
Barometer type:
Barometer s/n:

Date Calibrated: **7/29/2011** *Cal Due:* **7/29/2012**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No

Customer: **Black & Veatch**
Tel/Fax: **913-458-7823 / 913-458-7823**
Address: **11401 Lamar Avenue Overland Park, KS 66211**

Tested in accordance with the following procedures and standards:
Calibration of Acoustical Calibrators, Scantek Inc., 06/06/2005

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Sep 10, 2010	Scantek, Inc./NVLAP	Sep 10, 2011
DS-360-SRS	Function Generator	33584	Oct 5, 2009	ACR. Env / A2LA	Oct 5, 2011
34401A-Agilent	Digital Voltmeter	US36120731	Sep 3, 2010	ACR Env. / A2LA	Sep 3, 2011
HM30-Thommen	Meteo Station	1040170/39633	Jun 26, 2010	ACR Env. / A2LA	Dec 26, 2011
8903-HP	Audio Analyzer	2514A05691	Dec 1, 2010	ACR Env. / A2LA	Dec 1, 2013
PC Program 1018 Norsonic	Calibration software	v.5.0	Validated July 2009	-	-
1253-Norsonic	Calibrator	28326	Dec 6, 2010	Scantek, Inc./ NVLAP	Dec 6, 2011
1203-Norsonic	Preamplifier	92268	Dec 6, 2010	Scantek, Inc./ NVLAP	Dec 6, 2011
4180-Brüel&Kjær	Microphone	2246115	Dec 14, 2009	NPL (UK) / UKAS	Dec 14, 2011

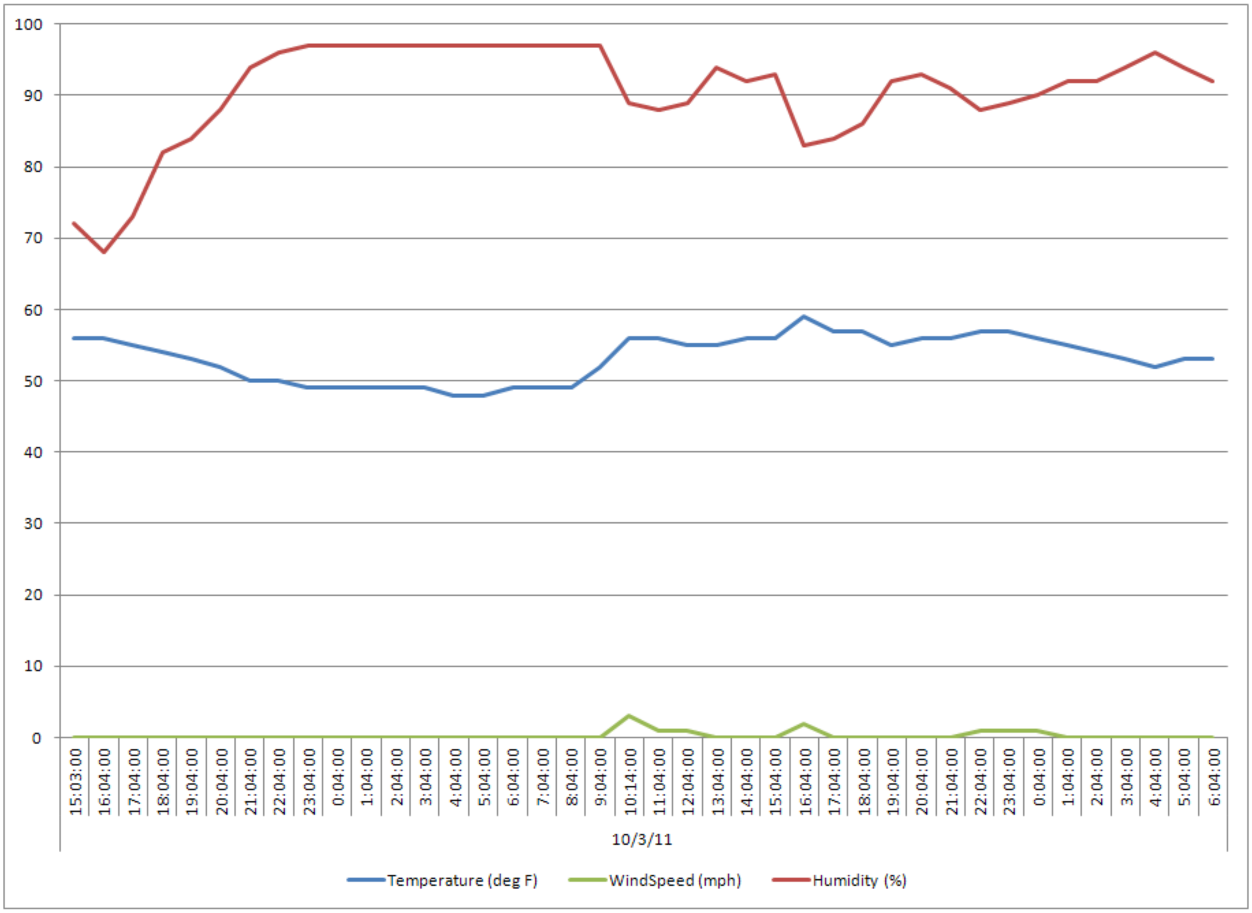
Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by	Kristen van Otterloo	Checked by	Mariana Buzduga
Signature		Signature	
Date	7/29/2011	Date	8/1/2011

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory.
This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.
Document stored as: Z:\Calibration Lab\Cal 2011\RIONNC73_10527795_M1.doc

Page 1 of 2

Appendix C – Meteorological Trends



Appendix D – Survey Data Sheets

AMBIENT SOUND LEVEL SURVEY

PROJECT		SURVEY LOCATION				SURVEY EQUIPMENT			
PROJECT	Shelton Substation	UTM Zone	18	m E	657705	MEASUREMENT EQUIPMENT	RION NA-27 S/N 01191119	CAL CERT	8/1/2011
CLIENT	UI			m N	4571273		PRE 114.0 POST 114.0		
B&V PN	174811			DESCRIPTION	Pump station entrance off of Beard Sawmill Rd.	MONITORING EQUIPMENT	RION NL-22(1) S/N 01110135	CAL CERT	7/29/2011
							PRE 94.0 POST 94.0		
SURVEY DATE	October 3-5, 2011								

SHORT-TERM MEASUREMENT RESULTS

Location:	R1														
Address in Meter:	1					9					11				
Date:	October 3, 2011					October 4, 2011					October 4, 2011				
Start Time:	3:05 PM					3:40 AM					7:20 PM				
Duration:	1200 sec					1200 sec					1200 sec				
Time Constant:	Fast					Fast					Fast				
Weighting:	Flat					Flat					Flat				
Sub Time Constant:	Fast					Fast					Fast				
Sub Weighting:	A					A					A				
	Leq	L1	L10	L50	L90	Leq	L1	L10	L50	L90	Leq	L1	L10	L50	L90
Main:	70.1	77.7	72.5	68.8	66.3	62.8	72.2	65.6	59.8	56.5	67.2	74.9	68.9	66.1	64.3
Sub:	58.4	64.1	60.2	57.8	55.9	51.3	56.1	52.4	47.9	45.9	58.6	68.6	58.5	57	56.2
1/1 Octaves															
16 Hz	62.6	72.3	65.4	59.9	54.7	57.5	68.3	60.0	52.4	46.7	59.1	68.8	61.3	56.1	51.4
31 Hz	63.7	71.7	66.4	62.2	58.1	57.3	67.6	60.0	53.0	47.8	61.6	69.5	64.0	59.6	55.7
63 Hz	65.1	74.9	67.6	62.2	58.3	56.4	66.1	59.2	53.7	49.8	61.7	70.3	64.3	59.5	56.0
125 Hz	61.9	72.6	64.2	57.7	54.0	49.6	59.5	52.4	46.0	41.8	57.9	66.4	60.9	55.7	52.1
250 Hz	53.4	61.4	54.5	50.5	47.7	45.3	54.5	46.4	39.8	37.2	52.8	63.3	56.0	48.6	44.9
500 Hz	54.5	61.9	57.2	53.1	50.3	46.9	56.0	49.4	42.4	39.6	51.8	62.1	53.3	49.1	47.0
1 kHz	55.8	60.7	57.6	55.4	53.5	47.9	53.0	49.0	44.0	41.0	54.3	65.6	54.1	51.7	49.8
2 kHz	48.7	55.6	50.1	47.6	46.0	43.6	48.9	43.5	40.4	38.9	49.1	61.0	48.2	45.5	43.9
4 kHz	41.0	48.0	42.5	39.2	37.1	38.9	41.5	38.9	37.6	36.8	52.4	56.1	53.2	52.3	51.6
8 kHz	35.3	43.6	37.0	33.0	30.3	29.1	32.8	26.3	25.3	24.7	36.2	46.6	36.6	34.0	31.9
1/3 Octaves															
12.5 Hz	55.5	64.1	58.8	53.5	47.9	50.6	61.6	52.2	45.5	39.9	51.1	59.6	54.0	49.0	43.8
16 Hz	58.0	66.7	61.0	55.7	50.5	53.6	64.3	56.5	48.8	42.9	54.8	64.5	57.1	52.0	47.2
20 Hz	59.2	69.9	61.5	55.8	50.9	53.4	64.3	56.0	48.0	42.3	55.8	65.8	57.6	52.4	47.9
25 Hz	58.6	65.8	61.3	57.0	52.6	53.4	64.3	55.5	48.1	42.6	56.2	64.1	59.0	54.6	50.3
31.5 Hz	59.1	65.8	61.9	58.0	54.0	52.4	62.3	55.4	48.6	43.5	57.4	65.3	59.4	55.1	51.1
40 Hz	59.2	68.6	61.7	57.3	53.4	51.5	61.5	54.7	47.9	42.9	56.7	64.6	59.2	54.9	51.2
50 Hz	58.9	66.7	61.8	57.3	53.7	53.0	60.4	55.7	51.4	48.2	57.2	65.4	59.5	55.2	51.5
63 Hz	60.6	71.6	63.1	57.3	53.4	50.4	59.3	53.6	47.8	42.3	56.9	65.7	59.5	54.6	51.2
80 Hz	61.1	70.8	63.3	57.7	53.6	50.9	63.2	53.5	45.4	40.6	56.8	65.6	59.6	54.4	51.1
100 Hz	59.3	69.1	62.1	55.7	52.0	46.3	56.0	49.2	43.4	38.8	54.7	62.5	58.0	52.8	49.3
125 Hz	57.3	68.8	59.1	52.2	48.6	44.5	53.9	47.2	41.2	37.4	53.7	62.9	56.2	50.9	47.4
160 Hz	52.4	64.3	52.8	47.1	43.5	42.9	54.0	45.6	36.8	33.3	49.6	57.9	52.7	47.5	43.8
200 Hz	47.9	57.5	49.4	44.2	40.9	40.9	52.1	42.7	34.5	31.4	48.4	58.7	51.5	44.6	40.3
250 Hz	49.3	55.9	49.9	46.1	43.5	39.7	48.1	40.8	35.0	32.5	48.1	58.6	51.4	43.5	39.9
315 Hz	48.6	56.2	50.0	46.6	43.8	41.0	47.5	41.3	35.5	33.2	47.7	58.3	50.8	43.4	40.2
400 Hz	48.9	56.6	51.4	47.4	44.5	40.8	47.7	42.4	36.9	34.5	46.2	56.0	48.4	43.4	41.0
500 Hz	49.8	57.1	52.9	48.1	45.2	42.4	52.1	45.5	37.3	34.7	47.0	57.3	49.0	44.0	42.0
630 Hz	50.4	57.5	52.7	49.3	46.7	43.0	52.4	45.4	38.5	35.2	47.7	58.4	48.1	45.3	43.3
800 Hz	51.6	56.9	53.5	51.2	49.0	43.5	49.6	45.1	39.7	36.2	49.7	61.0	49.3	47.0	45.1
1 kHz	51.6	56.0	53.4	51.2	49.4	43.6	48.3	44.8	39.5	36.5	50.3	61.7	50.2	47.8	45.8
1.25 kHz	49.6	54.7	51.3	49.1	47.4	42.1	46.3	42.4	38.3	35.9	48.4	59.7	48.4	45.9	44.0
1.6 kHz	46.6	52.9	48.1	45.8	44.1	40.9	46.7	40.6	37.0	35.1	46.6	58.5	45.7	43.2	41.4
2 kHz	43.0	50.5	44.3	41.6	40.0	38.4	42.9	38.4	35.4	34.2	43.6	55.3	42.6	39.7	38.2
2.5 kHz	39.1	47.4	40.8	37.1	35.7	35.9	40.4	35.9	33.8	32.9	40.9	53.2	40.2	37.1	36.3
3.15 kHz	36.5	44.9	37.9	33.5	32.5	34.6	37.8	34.4	32.8	32.0	51.8	54.4	52.6	51.8	51.1
4 kHz	35.2	42.4	36.3	33.2	31.5	35.6	37.8	36.0	34.9	34.1	42.8	49.6	43.6	42.2	41.3
5 kHz	36.8	41.8	38.6	36.0	32.9	30.7	32.9	29.9	28.8	28.1	35.2	46.3	34.9	32.2	30.9
6.3 kHz	33.5	40.7	35.1	32.0	29.8	26.7	30.0	24.0	23.2	22.6	33.0	44.0	32.7	30.5	29.0
8 kHz	29.5	39.6	31.8	25.3	18.8	24.0	27.5	21.5	20.3	19.7	28.4	41.1	27.6	22.6	21.5
10 kHz	23.7	33.2	24.8	19.5	16.7	19.7	25.4	15.5	13.9	13.4	31.6	38.7	33.2	30.9	27.8
12.5 kHz	19.6	28.7	20.0	14.7	13.4	16.1	21.5	12.4	11.0	10.3	31.3	35.9	33.9	30.8	25.0
dBA	58.4	64.1	60.2	57.8	55.9	51.3	56.1	52.4	47.9	45.9	58.6	68.6	58.5	57.0	56.2

MONITORING RESULTS

Address	Date	Start	Duration	Leq	Le	Lmax	Lmin	L1	L10	L50	L90	L95
1		3:10 PM	1:00:00	58.4	94	79.4	51.4	69.8	59.3	56	54.1	53.6
2		4:10 PM	1:00:00	55.2	90.8	71.7	49.8	60.9	57	54.3	52.4	52
3		5:10 PM	1:00:00	55	90.6	73.5	48.7	61.7	56.8	54	52.4	52.1
4		6:10 PM	1:00:00	54	89.6	68.7	48.8	60.1	55.7	53.2	51.6	51.2
5	3-Oct-11	7:10 PM	1:00:00	54.3	89.9	88.7	48.8	60.8	54.7	52.2	50.8	50.4
6		8:10 PM	1:00:00	55.7	91.3	82.7	48.9	64.9	56.3	52.8	50.8	50.4
7		9:10 PM	1:00:00	57	92.6	83.5	48.6	66.4	58.4	54.4	51.4	50.7
8		10:10 PM	1:00:00	58.2	93.8	89.8	47.3	68.2	58.8	54.6	50.1	49.5
9		11:10 PM	1:00:00	50.8	86.4	76.4	45.4	57.3	53.3	49.2	47.5	47.1
10		12:10 AM	1:00:00	49.1	84.7	63.7	45	56	50.7	48.1	46.8	46.5
11		1:10 AM	1:00:00	47.4	83	59.4	44.3	53.8	48.9	46.5	45.5	45.2
12		2:10 AM	1:00:00	47.4	83	64.2	44.1	54.9	49.2	45.9	45.1	44.9
13		3:10 AM	1:00:00	49.7	85.3	83.8	44	56.9	51.6	46.8	45.3	45
14		4:10 AM	1:00:00	51	86.6	72	44.3	59.2	53.1	48.9	46.3	45.8
15		5:10 AM	1:00:00	54.1	89.7	68.3	46.6	59.7	56.4	53.5	50.1	49.2
16		6:10 AM	1:00:00	56.4	92	71	51	62.2	58	55.7	53.8	53.2
17		7:10 AM	1:00:00	56.5	92.1	71.5	51.8	62.1	58.2	55.7	54.1	53.7
18		8:10 AM	1:00:00	57.3	92.9	79.2	52	64.1	59.3	56.2	54.4	53.9
19		9:10 AM	1:00:00	55.5	91.1	71.8	48.8	61.2	57.4	54.7	52.2	51.6
20		10:10 AM	1:00:00	55.3	90.9	79.9	49	62.3	57	53.7	51.6	51.1
21	4-Oct-11	11:10 AM	1:00:00	54.5	90.1	67.8	49.1	61	56.6	53.4	51.4	50.9
22		12:10 PM	1:00:00	54.7	90.3	69.1	49	61.8	56.7	53.5	51.8	51.3
23		1:10 PM	1:00:00	55.1	90.7	79	48.7	63.1	56.6	53.5	51.7	51.4
24		2:10 PM	1:00:00	55.2	90.8	80.6	49.5	60.8	56.8	54.3	52.6	52.2
25		3:10 PM	1:00:00	56.8	92.4	77.2	51.6	63.2	57.9	55.3	53.9	53.5
26		4:10 PM	1:00:00	56	91.6	71.4	49.8	62.9	58.2	54.7	53	52.5
27		5:10 PM	1:00:00	55.5	91.1	78	49.3	63.2	58.2	53.6	51.7	51.4
28		6:10 PM	1:00:00	55	90.6	65.9	51.3	60	56.5	54.5	53.3	53
29		7:10 PM	1:00:00	54.4	90	80	50.2	59.8	55.7	53.7	52.4	52
30		8:10 PM	1:00:00	54.2	89.8	73.4	49.9	59.6	55.1	53	51.8	51.5
31		9:10 PM	1:00:00	53	88.6	65.9	49.4	58	54.4	52.3	51.2	50.9
32		10:10 PM	1:00:00	51.9	87.5	65.9	49	56.6	53	51.3	50.3	50.1
33		11:10 PM	1:00:00	51.3	86.9	64.1	47.8	56.4	52.6	50.6	49.5	49.2
34		12:10 AM	1:00:00	50.7	86.3	66	46.8	57.9	51.8	49.5	48.4	48.2
35		1:10 AM	1:00:00	49.4	85	64.2	45.7	56.3	51	48.3	47.2	47
36	5-Oct-11	2:10 AM	1:00:00	50.1	85.7	65.3	44.5	59.1	52.5	47.6	46.2	45.9
37		3:10 AM	1:00:00	50.8	86.4	65.1	44.1	58.9	53.9	48.4	45.6	45.3
38		4:10 AM	1:00:00	52.4	88	68.2	44.5	59.7	55	50.6	46.8	46
39		5:10 AM	1:00:00	54.9	90.5	69.6	48.3	60.5	57.3	54.1	51.2	50.5
		Overall	Max	58.4	94.0	89.8	52.0	69.8	59.3	56.2	54.4	53.9
			Median	54.5	90.1	71.5	48.8	60.5	56.4	53.5	51.4	50.9
			Min	47.4	83.0	59.4	44.0	53.8	48.9	45.9	45.1	44.9
		Daytime	Max	58.4	94.0	88.7	52.0	69.8	59.3	56.2	54.4	53.9
			Median	55.2	90.8	75.4	49.4	61.8	56.8	53.9	52.3	51.8
			Min	54.0	89.6	65.9	48.7	59.6	54.7	52.2	50.8	50.4
		Nighttime	Max	58.2	93.8	89.8	51.0	68.2	58.8	55.7	53.8	53.2
			Median	51.0	86.6	66.0	45.7	58.0	53.1	49.5	47.5	47.1
			Min	47.4	83.0	59.4	44.0	53.8	48.9	45.9	45.1	44.9

AMBIENT SOUND LEVEL SURVEY

PROJECT		SURVEY LOCATION		SURVEY EQUIPMENT			
PROJECT	Shelton Substation	UTM Zone 18, m E	657407	MEASUREMENT EQUIPMENT	RION NA-27 S/N 01191119	CAL CERT	8/1/2011
CLIENT	UI	m N	4571382		PRE 114.0 POST 114.0		
B&V PN	174811	DESCRIPTION	Intersection of Bridgeport Ave and Beard Sawmill Rd.	MONITORING EQUIPMENT	RION NL-22(3) S/N 01110133	CAL CERT	7/29/2011
					PRE 94.0 POST 94.0		
SURVEY DATE	October 3-5, 2011						

SHORT-TERM MEASUREMENT RESULTS

Location:			R2		
Address in Meter:	3		8		13
Date:	October 3, 2011		October 4, 2011		October 4, 2011
Start Time:	3:44 PM		3:16 AM		8:09 PM
Duration:	1200 sec		1200 sec		1200 sec
Time Constant:	Fast		Fast		Fast
Weighting:	Flat		Flat		Flat
Sub Time Constant:	Fast		Fast		Fast
Sub Weighting:	A		A		A

	Leq	L1	L10	L50	L90	Leq	L1	L10 SO	L50 SC	L90 SOUN	Leq	L1	L10	L50	L90
Main:	78.1	88.6	81.3	74.6	69.5	60	72.3	59.6	56.5	54.4	71.6	81.2	75.1	67.8	62.3
Sub:	70.1	76.8	73.6	68.7	58.1	54.3	69.7	48.3	45.9	44.9	66.9	75.1	71.3	60.8	53.7
1/1 Octaves															
16 Hz	68.9	81.2	67.3	59.8	54.4	52.1	60.9	54.9	49.7	45.0	57.0	66.4	60.1	54.4	49.4
31 Hz	68.8	79.2	71.5	64.6	59.6	51.9	60.7	54.3	49.7	45.9	62.8	72.7	65.3	58.9	54.2
63 Hz	73.2	85.3	74.5	66.1	60.1	53.3	63.8	53.2	48.5	44.8	66.1	76.2	67.9	59.4	54.2
125 Hz	71.8	83.4	73.9	64.9	57.7	51.3	63.4	49.5	44.6	41.3	63.6	75.2	66.2	57.0	50.5
250 Hz	64.8	75.7	67.3	60.8	52.3	44.9	58.9	44.0	38.7	35.4	58.8	67.7	62.0	52.7	43.6
500 Hz	64.6	73.0	68.1	62.1	50.9	47.3	60.8	46.7	40.6	37.8	61.2	70.1	64.7	52.6	44.3
1 kHz	67.4	74.4	71.1	65.6	53.8	52.0	67.5	43.5	40.7	39.5	64.2	73.5	68.9	56.6	46.7
2 kHz	62.3	69.8	65.9	60.8	50.5	46.6	61.6	40.4	39.1	38.5	59.3	68.1	63.8	53.8	43.5
4 kHz	55.3	64.9	58.2	53.2	44.1	40.4	53.4	38.5	37.3	36.7	53.5	59.8	56.0	51.3	49.4
8 kHz	47.5	57.3	50.3	44.6	34.4	31.5	45.9	28.4	24.8	24.0	43.4	52.4	46.7	37.6	29.9
1/3 Octaves															
12.5 Hz	57.0	67.7	58.8	52.5	47.0	44.0	52.3	46.9	41.6	36.4	50.0	58.9	53.3	47.5	42.0
16 Hz	65.1	78.1	63.1	55.5	50.1	47.5	57.3	50.0	44.5	39.3	53.2	63.0	56.1	50.4	45.4
20 Hz	66.0	77.9	64.2	56.2	50.9	49.1	57.3	52.0	47.1	42.8	52.9	61.9	56.0	50.5	45.6
25 Hz	63.3	73.2	65.6	58.9	53.5	46.1	54.8	49.4	43.8	39.7	55.5	63.7	58.9	53.4	48.6
31.5 Hz	63.5	73.6	66.2	59.6	54.9	48.2	56.7	50.3	46.0	42.0	56.9	66.9	59.7	54.3	50.2
40 Hz	65.0	75.9	67.9	60.8	55.8	46.8	56.0	48.7	44.7	41.3	60.3	70.5	62.2	54.5	49.3
50 Hz	65.0	75.0	68.4	60.7	55.2	46.6	58.0	47.8	43.2	39.9	62.8	71.7	63.3	54.8	49.4
63 Hz	68.2	80.2	69.9	61.2	55.5	47.2	57.9	47.7	43.5	40.3	60.4	71.5	63.4	54.6	49.8
80 Hz	70.4	83.0	70.7	62.0	55.3	50.7	60.6	49.6	44.4	40.0	60.2	71.0	62.7	54.5	49.0
100 Hz	68.6	80.2	70.9	61.6	54.1	48.3	60.0	45.9	41.2	38.2	60.8	72.4	62.8	53.6	47.3
125 Hz	67.6	79.6	68.9	59.9	53.0	47.1	59.1	45.0	40.3	36.9	58.7	70.9	61.5	52.0	45.8
160 Hz	63.2	74.0	66.6	58.3	51.0	42.2	55.5	42.5	37.1	32.9	55.5	65.1	59.3	50.5	43.2
200 Hz	61.8	73.2	64.3	57.4	49.2	40.9	55.2	39.9	34.6	31.2	54.7	63.8	58.4	49.0	40.1
250 Hz	59.7	69.5	62.3	55.8	46.8	40.4	54.1	40.0	34.5	30.9	54.1	62.8	57.2	47.9	38.1
315 Hz	57.7	68.5	60.0	54.2	45.8	38.7	52.8	37.2	32.5	29.6	53.1	62.1	55.7	46.7	38.0
400 Hz	57.3	66.8	60.4	54.5	45.3	40.5	54.6	38.8	34.3	31.5	55.7	62.4	56.6	46.8	39.0
500 Hz	59.5	68.1	62.9	57.2	45.9	42.5	55.0	44.3	36.7	33.2	55.3	64.2	59.5	47.8	39.5
630 Hz	61.6	69.5	65.3	59.2	47.0	43.9	57.7	40.7	36.1	34.1	57.9	67.6	62.1	48.8	39.9
800 Hz	63.3	70.7	67.0	61.0	48.8	47.0	61.6	39.1	36.1	34.5	59.7	69.7	64.5	51.2	41.6
1 kHz	62.9	69.7	66.7	61.4	49.4	48.3	64.3	39.1	36.1	34.8	59.9	69.0	64.8	52.2	42.5
1.25 kHz	61.4	68.1	65.1	59.9	48.9	46.0	61.8	37.9	35.7	34.8	58.4	67.2	63.0	52.0	41.6
1.6 kHz	59.6	66.4	63.3	58.2	47.7	43.8	59.2	36.7	35.1	34.4	56.8	65.6	61.5	51.2	40.2
2 kHz	57.0	64.6	60.6	55.5	45.4	41.6	56.2	35.7	34.5	33.9	53.9	63.0	58.3	48.5	38.4
2.5 kHz	54.6	63.6	57.9	52.7	42.9	38.8	53.2	34.2	33.2	32.7	50.7	59.3	54.8	46.0	36.8
3.15 kHz	52.8	62.6	55.7	50.6	41.4	36.6	50.8	33.2	31.9	31.4	51.7	57.1	54.0	50.2	48.7
4 kHz	49.7	58.8	52.5	47.8	38.9	36.8	48.0	36.0	35.0	34.2	47.0	54.3	50.0	43.8	40.8
5 kHz	47.7	57.2	50.4	45.1	36.3	32.1	45.3	29.8	28.5	27.9	44.3	52.3	46.8	38.2	31.3
6.3 kHz	45.2	55.2	47.8	42.3	32.3	28.7	43.1	25.7	21.8	20.9	41.0	50.0	44.3	35.5	27.6
8 kHz	42.1	51.6	45.0	39.3	28.9	26.7	41.0	23.7	21.1	20.3	37.8	46.6	41.3	31.6	21.9
10 kHz	38.7	48.1	41.5	35.5	24.9	23.2	38.0	19.7	13.5	12.7	34.8	44.2	37.8	28.9	23.9
12.5 kHz	34.6	44.3	37.3	30.6	20.1	19.1	33.4	16.5	10.8	10.3	30.7	39.2	33.0	23.1	16.1
dBA	70.1	76.8	73.6	68.7	58.1	54.3	69.7	48.3	45.9	44.9	66.9	75.1	71.3	60.8	53.7

MONITORING RESULTS

Address	Date	Start	Duration	Leq	Le	Lmax	Lmin	L1	L10	L50	L90	L95
1		4:00 PM	1:00:00	68.7	104	86.5	47.2	75.9	72.2	67.1	55.4	53.3
2		5:00 PM	1:00:00	69.2	105	81.4	47.8	75.6	72.7	68.2	55.7	53.2
3		6:00 PM	1:00:00	69.6	105	99.9	46.7	75.3	71.8	66.5	53.7	51.5
4	3-Oct-11	7:00 PM	1:00:00	67	103	87.5	45.6	75.1	71.1	63.1	50.6	49.1
5		8:00 PM	1:00:00	67.6	103	99.1	47.9	75.2	71.6	61.9	52.7	51.7
6		9:00 PM	1:00:00	65.7	101	93.9	46.4	75.3	70.3	57.8	51.5	50.1
7		10:00 PM	1:00:00	65.5	101	93.9	46.2	75.7	69.7	57.6	51.4	50.1
8		11:00 PM	1:00:00	61.2	96.8	82	42.8	73.1	64.6	49.5	45.1	44.5
9		12:00 AM	1:00:00	59.8	95.4	77.6	41.9	72.2	63.2	46.1	43	42.8
10		1:00 AM	1:00:00	55.6	91.2	79.9	41.5	69.8	49.9	43	42.3	42.2
11		2:00 AM	1:00:00	51.7	87.3	81	41.4	61.7	43.5	42.5	42.1	42
12		3:00 AM	1:00:00	54.8	90.4	79.6	41.1	68.6	48.8	43.8	42.4	42.2
13		4:00 AM	1:00:00	57.6	93.2	79.4	41.6	71.2	54.1	44	42.8	42.6
14		5:00 AM	1:00:00	64.1	99.7	89.3	42.3	75	68.4	49	44.7	44.2
15		6:00 AM	1:00:00	67.4	103	82.9	44.6	75.3	71.9	62.8	48.9	47.7
16		7:00 AM	1:00:00	69.9	106	93.1	47	77.2	73.1	67.1	53.7	51.4
17		8:00 AM	1:00:00	70.2	106	96.1	47.9	77.1	73	67.7	55.5	53.2
18		9:00 AM	1:00:00	73.6	109	100.5	46.3	85.8	75.3	66.6	54.7	52.6
19		10:00 AM	1:00:00	68.5	104	87	46.5	76.4	72.5	65.3	52.8	50.9
20		11:00 AM	1:00:00	68.9	105	83.8	46.5	76.2	72.6	66.9	54.3	52.3
21	4-Oct-11	12:00 PM	1:00:00	69.1	105	82.4	46.6	76.1	72.7	67.7	55	52.4
22		1:00 PM	1:00:00	68.8	104	87	46.3	75.5	72.5	67.2	54.8	52.5
23		2:00 PM	1:00:00	68.6	104	86.9	47.1	75.5	72.5	66.8	54.3	52.6
24		3:00 PM	1:00:00	69.8	105	96.3	47.3	76.7	72.6	67.5	56.2	53.8
25		4:00 PM	1:00:00	70.7	106	100.8	49.4	76.6	72.9	68	56.4	54.2
26		5:00 PM	1:00:00	70.9	107	98.8	48.7	76.3	72.6	68.3	58.7	55.7
27		6:00 PM	1:00:00	68.3	104	82	48	75.4	72.3	66.4	54.4	52.4
28		7:00 PM	1:00:00	67.3	103	85.3	47.8	74.8	71.5	64.1	52.7	51.3
29		8:00 PM	1:00:00	66.2	102	82.5	48	74.7	70.8	59.5	50.2	49.6
30		9:00 PM	1:00:00	64.3	99.9	82.4	46.7	73.8	69.6	53.6	48.9	48.5
31		10:00 PM	1:00:00	62.7	98.3	80.1	46.1	73.8	67.7	51.4	48	47.7
32		11:00 PM	1:00:00	60.7	96.3	77.5	45	72.9	64.8	49.2	46.9	46.6
33		12:00 AM	1:00:00	59.7	95.3	77.5	44.7	72.2	62.3	48.4	46.3	46
34		1:00 AM	1:00:00	56.6	92.2	79	43.2	70.9	51.3	46.2	44.8	44.6
35		2:00 AM	1:00:00	55.3	90.9	80.6	42	69.9	47.4	44.7	43.4	43.1
36	5-Oct-11	3:00 AM	1:00:00	57.2	92.8	85.3	41.1	69.5	48.8	43.1	42.2	42
37		4:00 AM	1:00:00	58.1	93.7	80.8	41.3	71.5	55.4	44.5	42.4	42.2
38		5:00 AM	1:00:00	64.4	100	88.2	42.5	75.4	68.3	51	45.2	44.3
39		6:00 AM	1:00:00	68.3	104	87.6	43.6	77.3	72.5	62	49.2	47.9
		Overall	Max	73.6	109.2	100.8	49.4	85.8	75.3	68.3	58.7	55.7
			Median	67.0	102.6	85.3	46.3	75.3	71.1	61.9	50.6	49.6
			Min	51.7	87.3	77.5	41.1	61.7	43.5	42.5	42.1	42.0
		Daytime	Max	73.6	109.2	100.8	49.4	85.8	75.3	68.3	58.7	55.7
			Median	68.7	104.3	87.0	46.9	75.6	72.4	66.6	54.3	52.4
			Min	62.7	98.3	80.1	45.6	73.8	67.7	51.4	48.0	47.7
		Nighttime	Max	69.9	105.5	93.1	47.0	77.3	73.1	67.1	53.7	51.4
			Median	59.7	95.3	80.8	42.3	72.2	62.3	46.2	44.7	44.2
			Min	51.7	87.3	77.5	41.1	61.7	43.5	42.5	42.1	42.0

AMBIENT SOUND LEVEL SURVEY

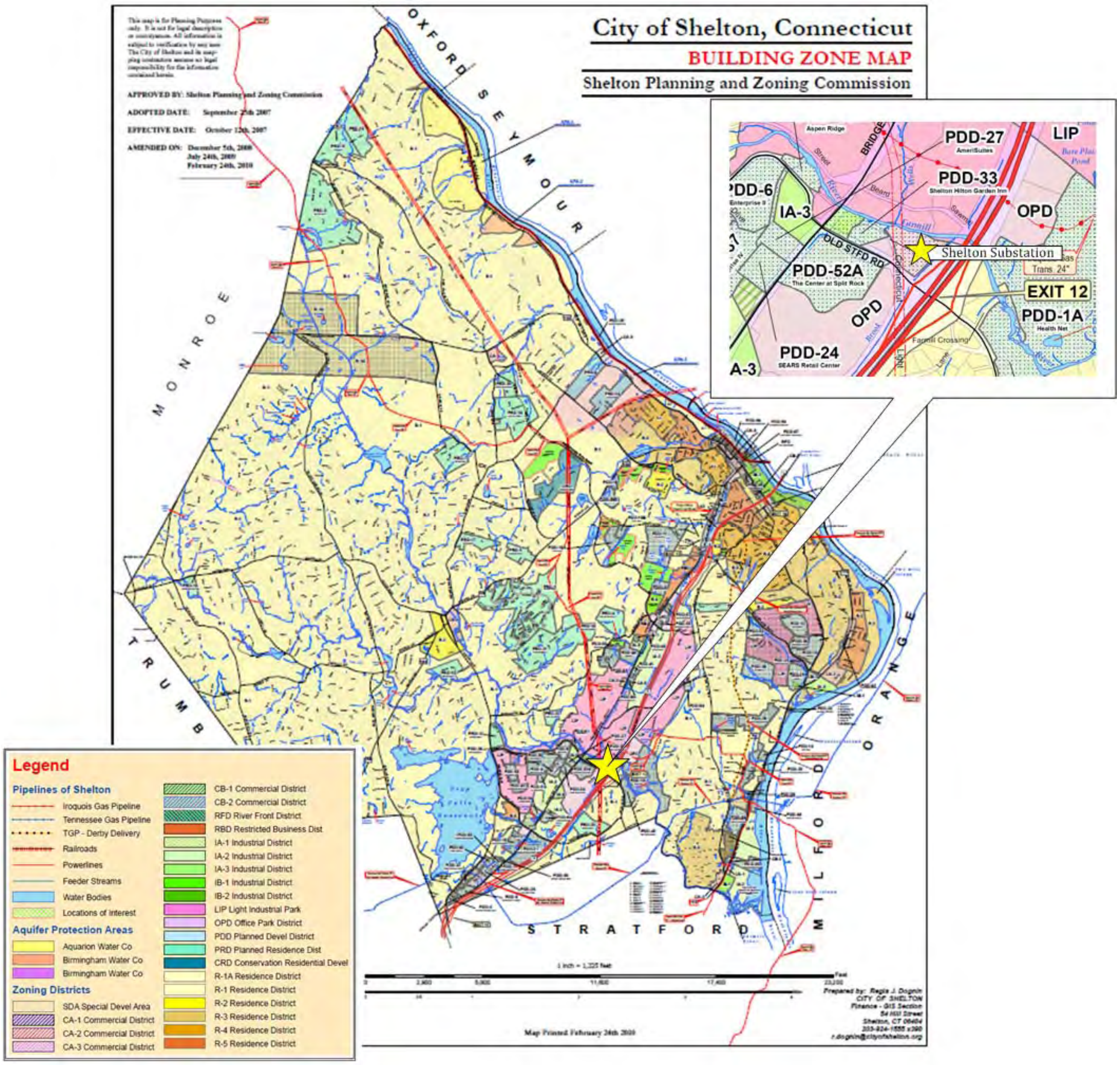
PROJECT		SURVEY LOCATION		SURVEY EQUIPMENT	
PROJECT	Shelton Substation	UTM Zone	18		
		m E	657559		
CLIENT	UI	m N	4571139		
B&V PN	174811	DESCRIPTION	Along Substation PB at an equal setback to Old Stratford Rd. as Hotel (BP Gas Station)	MONITORING EQUIPMENT	RION NA-32 S/N 00240684; CAL CERT 8/1/2011; PRE 94.0 POST 94.0
SURVEY DATE	October 3-5, 2011				

Location: R3

MONITORING RESULTS

Address	Date	Start	Duration	Leq	Le	Lmax	Lmin	L1	L10	L50	L90	L95
1		4:30 PM	1:00:00	61.3	96.9	84.7	54.1	67.9	63.3	60.1	57.7	57.1
2		5:30 PM	1:00:00	61.5	97.1	77	53.2	69.1	63.8	60.1	57.3	56.7
3		6:30 PM	1:00:00	60	95.6	79.2	52.1	68.7	61.8	58.3	56	55.5
4	3-Oct-11	7:30 PM	1:00:00	58.6	94.2	79.8	51.2	65.9	60.6	57.2	55.1	54.5
5		8:30 PM	1:00:00	57.9	93.5	77.6	49.7	67	60	55.5	53.1	52.6
6		9:30 PM	1:00:00	57	92.6	87.6	48.2	64.5	58.9	55.1	52.5	51.7
7		10:30 PM	1:00:00	55.3	90.9	77	44.9	62.9	57.6	53.6	50.3	49.4
8		11:30 PM	1:00:00	54	89.6	69.1	44	63.5	56.5	51.6	49.4	48.6
9		12:30 AM	1:00:00	53.5	89.1	73.9	42.9	62.9	55.9	50.4	47.4	46.4
10		1:30 AM	1:00:00	50.4	86	67.5	40.6	58.7	52.7	49	44.7	43.8
11		2:30 AM	1:00:00	59.7	95.3	87.8	41.5	72.9	55.9	49.4	45.3	44.7
12		3:30 AM	1:00:00	54.2	89.8	73.8	41.6	63.9	56.7	50.8	46	45.1
13		4:30 AM	1:00:00	58.3	93.9	80.8	45.8	67	59.7	54.5	51.8	51.2
14		5:30 AM	1:00:00	60.5	96.1	75.9	51.8	68.2	63.2	58.9	56.1	55.4
15		6:30 AM	1:00:00	64.5	100	84.3	53.8	72.3	66.4	62.9	59.2	58.1
16		7:30 AM	1:00:00	65.8	101	81.5	56.5	71.7	68.8	64.3	61.4	60.6
17		8:30 AM	1:00:00	73.4	109	83.6	55.8	79.3	78.1	66.5	61.5	60.7
18		9:30 AM	1:00:00	63.9	99.5	85.9	52.3	70.4	66.5	61.8	57.8	56.9
19		10:30 AM	1:00:00	64.4	100	83.9	53.5	72.2	69	61.2	57.8	57
20	4-Oct-11	11:30 AM	1:00:00	67.2	103	88.1	51.8	74.3	72.6	60.6	57.1	56.3
21		12:30 PM	1:00:00	63.6	99.2	83.5	53.5	72.5	65.2	61.3	58.8	58
22		1:30 PM	1:00:00	65.3	101	83.9	52.4	72.5	70.1	61	57.4	56.7
23		2:30 PM	1:00:00	62.8	98.4	84.1	53.6	71.5	65	60.7	58	57.4
24		3:30 PM	1:00:00	66.2	102	83.4	54.6	73.4	68.5	65	60.9	59.8
25		4:30 PM	1:00:00	63.7	99.3	84.7	54.6	73.3	65.7	61.1	58.7	58.2
26		5:30 PM	1:00:00	61.9	97.5	78.5	53.8	70.3	64	60.2	57.8	57.2
27		6:30 PM	1:00:00	61.6	97.2	84.9	53.1	70.9	62.4	58.9	56.6	56.1
28		7:30 PM	1:00:00	59.3	94.9	83.1	49.8	66.8	61	57.4	54.8	54.1
29		8:30 PM	1:00:00	59.1	94.7	85.8	48.4	66.8	61.3	57.4	53.8	53
30		9:30 PM	1:00:00	57.7	93.3	79.1	47.6	66.7	59.9	55.2	52.4	51.8
31		10:30 PM	1:00:00	57	92.6	80.4	48.4	67.1	58.8	54.2	51.6	51.1
32		11:30 PM	1:00:00	54	89.6	75	47.1	61.9	56.1	52	49.9	49.5
33		12:30 AM	1:00:00	55.3	90.9	84	41.4	65.8	57.1	51.3	46.8	45.8
34		1:30 AM	1:00:00	52.7	88.3	74	41	61.2	54.5	50	48	45.8
35	5-Oct-11	2:30 AM	1:00:00	53	88.6	71.5	40.3	62.5	56.4	49.7	45.6	44.6
36		3:30 AM	1:00:00	57.2	92.8	84.7	41.8	68.4	59.7	51.1	46.6	45.7
37		4:30 AM	1:00:00	59.8	95.4	78.1	44.4	70.3	61.6	57	51.4	49.7
38		5:30 AM	1:00:00	61.3	96.9	76.2	52.1	68.8	63.8	60	57.2	56.5
		Overall	Max	73.4	109.0	88.1	56.5	79.3	78.1	66.5	61.5	60.7
			Median	59.8	95.4	81.2	50.5	68.3	61.5	57.4	55.0	54.3
			Min	50.4	86.0	67.5	40.3	58.7	52.7	49.0	44.7	43.8
		Daytime	Max	73.4	109.0	88.1	56.5	79.3	78.1	66.5	61.5	60.7
			Median	62.8	98.4	83.6	53.2	70.9	65.0	60.6	57.7	56.9
			Min	57.9	93.5	77.0	48.4	65.9	60.0	55.5	53.1	52.6
		Nighttime	Max	64.5	100.1	87.8	53.8	72.9	66.4	62.9	59.2	58.1
			Median	57.0	92.6	77.0	44.4	65.8	57.6	52.0	49.9	49.4
			Min	50.4	86.0	67.5	40.3	58.7	52.7	49.0	44.7	43.8

Appendix E – Zoning



Source: http://www.cityofshelton.org/images/stories/shelton/Zoning_Map-11-29-11.pdf

APPENDIX E

VISIBILITY ANALYSIS

INITIAL VISUAL ASSESSMENT

June 28, 2012

Municipal Consultation Filing
Proposed Substation
14 Old Stratford Road
Shelton, Connecticut

At the request of the United Illuminating Company ("UIC"), All-Points Technology Corporation, P.C. ("APT") prepared this Visibility Analysis to evaluate potential views associated with a new Substation proposed for development at 14 Old Stratford Road in Shelton, Connecticut (the "Site").

The proposed Substation would be located generally in the central portion of the 5.9± acre Site and would contain electrical equipment and other infrastructure, most notably:

- Two new transmission support poles in-line with the existing overhead transmission circuit west of the fence-enclosed Substation; one to the north measuring 70 feet above ground level ("AGL") in height and the second located south at a height of 95 feet AGL.
- Two interconnection support structures within the Substation measuring 65 feet AGL.
- Four lightning masts along the eastern edge of the Substation measuring 55 feet AGL.
- A 90-foot tall radio tower pole just outside the northeast corner of the Substation enclosure.

The Site is surrounded by Stratford Road to the south, Pootatuck Place to the west, the Farmill River (and beyond, Beard Sawmill Road) to the north, and the Route 8 transportation corridor to the east. An existing overhead transmission corridor extends generally north to south through the western portion of the Site.

Land use within the vicinity of the Site consists primarily of commercial/commercial development along Stratford Road and Bridgeport Avenue, along with Route 8 and its access/egress, the electrical transmission corridor and scattered residences to the north/northeast along Beard Sawmill Road.

3 SADDLEBROOK DRIVE · KILLINGWORTH, CT 06419 · PHONE 860-663-1697 · FAX 860-663-0935

The topography within the Study Area is generally characterized as relatively level in the immediate area of the Site, which sits in a shallow valley associated with the Farmill River, with gently rolling to somewhat steep hills rising in all directions. The tree cover within the vicinity of the Site consists mainly of mixed deciduous hardwood species with an average canopy height of 50 feet.

To evaluate the visibility associated with the proposed Substation, APT used the combination of a predictive computer model and in-field analysis. The predictive model provided an assessment of potential visibility throughout the entire Study Area, including private properties and other areas inaccessible for direct observations. A truck-mounted boom (raised to a height of 64 feet AGL) was also used to assist in field verifying the model, inventory visible and nonvisible locations, and provide photographic documentation from publicly accessible areas. A description of the procedures used in the analysis is provided in Attachment 1.

The results of our analysis are graphically displayed on the Visibility Analysis Map provided in Attachment 2. In general, year-round views of the Facility would be limited to a modest geographic footprint by the combination of the relatively short height of the monopole and the intervening topography and mature vegetation within the project area.

Year-round views of the Substation yard would be confined to locations on and within the immediate area of the Site, and extend approximately 500 feet south and westward. The tops of taller structures associated with the facility could be visible from some locations farther west and northward for distance of up to about 1,000 feet, with the exception of the existing transmission corridor to the north, where vegetative clearings would allow direct views upwards to a quarter-mile and a bit beyond. Views to east are significantly shielded by the elevated Route 8 transportation corridor, where limited views of the tallest structures would be seen intermittently by passing motorists in the immediate area of Exit 12, near the Site. Similarly, the tops of the tallest of the proposed structures (those extending to heights above 60 feet) would be visible above the trees and from portions of Old Stratford Road as it extends southeastward approximately 1,500 feet beyond Route 8. Views to the south are limited to portions of the parking lot at the Split rock Plaza Center, which although significantly elevated above the Site, is separated visually by either dense tree cover or the cut of the hill itself.

Additional areas have the potential to offer some views of the Substation through the trees during "leaf-off" conditions. Most of this seasonal visibility appears limited to within approximately 1,500 feet of the proposed Substation. Taller structures may be seen through the trees from up to approximately 500 feet beyond those areas where year-round visibility is anticipated.

Photographic renderings of the proposed Substation were generated to portray scaled representations of the facility from four locations. Additional photographs of the existing conditions at the Site (with the bucket truck) obtained on April 12, 2012 are also presented to provide a representation of views from several surrounding areas. The table below summarizes characteristics of the photographs presented in the attachment to this report including a description of each location, view orientation and the distance from where the photo was taken relative to the proposed Facility. The views that were rendered and presented herein are highlighted in bold type.

Photo No.	Location	View Orientation	Distance to Facility
1	**West Of Hilton Garden Inn Rear Parking Lot**	**Southeast**	**±0.13-Mile**
2	Pet Supplies Plus - Looking East Across Bridgeport Ave	Southeast	± 0.20-Mile
3	Near #656 Bridgeport Avenue	Southeast	± 0.19-Mile
4	**Well's Hollow Creamery, Beard Saw Mill Road**	**Southeast**	**± 0.13-Mile**
5	Beard Saw Mill Road	South	± 0.08-Mile
6	26 Beard Saw Mill Road	Southwest	± 0.09-Mile
7	Hilton – East Parking Lot Area	East	± 0.09-Mile
8	Split Rock Plaza Center	Northeast	± 0.11-Mile
9	Split Rock Plaza Parking Lot – East Side	Northeast	± 0.15-Mile
10	Old Stratford Road Across from BP Gas Station	Northeast	± 0.07-Mile
11	**BP Gas Station– East Side of Building**	**Northeast**	**± 0.05-Mile**
12	Old Stratford Road in Front of Proposed Substation Yard	Northeast	± 0.05-Mile
13	**Old Stratford Road t & Route 8 Southbound Entrance**	**Northeast**	**± 0.06-Mile**
14	Old Stratford Road & Route 8 Southbound Entrance	North	± 0.09-Mile

Photo-documentation and renderings are presented in Attachment 3.

Attachment 1

Methodology and Procedures

To conduct the visibility analysis, APT used the combination of a predictive computer model and in-field investigations. The predictive model provided an assessment of potential visibility throughout the project area, including private properties and other areas inaccessible for direct observations. A truck-mounted boom and bucket (raised to a height of 64 feet above ground level [“AGL”]) was also used to assist in field verifying the model, inventorying visible and nonvisible locations, and providing opportunities for photographic documentation from publicly accessible areas.

Preliminary Computer Modeling

APT uses ArcGIS® Spatial Analyst, a computer modeling tool developed by Environmental Systems Research Institute, Inc. to calculate those areas from which at least the tops of newly proposed structures associated with the substation are estimated to be visible. Project-area-specific data were incorporated into the computer model, including the structure locations, heights, and ground elevations, as well as the surrounding topography and existing vegetation which are two primary features that might serve to prohibit direct lines of sight. The specific structures used in the analysis included:

- New transmission support pole in-line with the existing overhead transmission circuit northwest of the fence-enclosed substation at a height of 70 feet AGL.
- New transmission support pole in-line with the existing overhead transmission circuit located south of the substation’s southwest corner, at a height of 95 feet AGL.
- Two interconnection support structures within the substation measuring 65 feet AGL.
- Four lightning masts along the eastern edge of the substation measuring 55 feet AGL.
- A 90-foot tall radio tower pole just outside the northeast corner of the substation.

Information used in the model included Connecticut LiDAR1-based digital elevation data and a digital forest (or tree canopy) layer developed specifically for the Study Area. The LiDAR-based Digital Elevation Model (“DEM”) represents topographic information for the state of Connecticut that was derived through the spatial interpolation of airborne LiDAR-based data

[1] LiDAR is an acronym for Light Detection and Ranging. It is a technology that utilized lasers to determine the distance to an object or surface. LiDAR is similar to radar, but incorporates laser pulses rather than sound waves. It measures the time delay between transmission and reflection of the laser pulse.

collected in the year 2000 and has a horizontal resolution of ten (10) feet. The data was edited in 2007 and made available by the University of Connecticut through its Center for Land Use Education and Research. Mature trees and woodland areas depicted on digital ortho- (aerial) photographs (with one-foot pixel resolution) were manually digitized (hand-traced) in ArcGIS®, creating a geographic data layer for inclusion in the computer model. The aerial photographs used in this analysis are 2010 ESRI/Bing digital orthophotos with 1-foot pixel resolution.

Once the data layers were entered, the ArcGIS® Spatial Analyst Viewshed tool was applied to achieve an estimate of locations where the Facility might be visible. First, only topography was used as a possible visual constraint; the tree canopy was omitted to evaluate potential visibility with no intervening vegetative screening. The initial omission of this data layer results in an excessive over-prediction, but provides an opportunity to identify and evaluate those areas with direct sight lines towards the Substation.

In-Field Activities

To supplement and substantiate the results of the computer modeling efforts, APT completed in-field verification activities consisting of vehicular and pedestrian reconnaissance and photo-documentation.

Field Reconnaissance

On April 18, 2012, APT coordinated with UIC to situate a bucket truck on the Site at the approximate center of the proposed Substation. The truck's boom was extended to its maximum length such that the top of the bucket was at a height of 64 feet AGL. Once the bucket was secured at the known height, APT performed both a pedestrian reconnaissance of the immediate project vicinity and a drive-by inspection of the local and State roads. Those locations where the Site, truck and/or bucket could be seen were inventoried. Visual observations from the reconnaissance were also used to evaluate the results of the preliminary visibility mapping and identify any discrepancies in the initial modeling.

During the April 18th activities, several trees were randomly surveyed using a hand-held infrared laser range finder and Suunto clinometer to ascertain their heights. Numerous locations were selected to obtain tree canopy heights, including along the roadways, wooded lots, and high- and low-lying areas to provide for the irregularities associated with different land characteristics. The average canopy height was developed based on measurements and comparative observations, in this case approximately 50 feet AGL.

Information obtained during the field reconnaissance was subsequently incorporated into the computer model to refine the visibility map.

Photographic Documentation

During the field reconnaissance, APT photo-documented conditions from areas where the truck boom and bucket were and were not visible. Photographs were obtained from several vantage points to document the view towards the proposed Substation. At each photo location, the geographic coordinates of the camera's position were logged using global positioning system ("GPS") equipment technology.

Photographs were taken with a Nikon D-3000 digital camera body and Nikon 18 to 135 mm zoom lens. For several views the lens was set to 50mm. Seven (7) photographs were taken using a24 mm focal length in order to provide a greater depth of field for presentation purposes. Focal lengths ranging from 24 mm to 50 mm approximate views similar to that achieved by the human eye. However, two key aspects of an image can be directly affected by the specific focal length that is selected: field of view and relation of sizes between objects in the frame. In this analysis, a 24 mm focal length provides a wider field of view, representative of the extent the human eyes may see (including some peripheral vision), but the relation of sizes between objects at the edges of the photos can become minimally skewed. A 50 mm focal length has a narrower field of view than the human eye but the relation of sizes between objects is represented similar to what the human eye might perceive.

> *"The lens that most closely approximates the view of the unaided human eye is known as the normal focal-length lens. For the 35 mm camera format, which gives a 24x36 mm image, the normal focal length is about 50 mm.*[2]*"*

When taking photographs for these analyses, APT prefers a focal length of 50 mm; however there are times when wider views (requiring the use of the 24 mm lens setting) can better reflect "real world" viewing conditions by providing greater context to the scene. Regardless of the lens setting, the scale of subject in the photo (the Substation and/or supporting structures) remains proportional to its surroundings.

[2] Warren, Bruce. Photography, West Publishing Company, Eagan, MN, c. 1993, (page 70).

Final Visibility Mapping

Field data and observations were incorporated into the mapping data layers, including the photo locations, areas that experienced land use changes since the 2010 aerial photo flight, and those places where the initial model was found to either under or over-predict visibility.

The average tree canopy height data layer (50 feet AGL) was merged with the DEM and added to the base ground elevations. Once the additional data was integrated into the model, APT re-calculated the visibility of the Facility from within the Study Area to produce the Visibility Analysis Map.

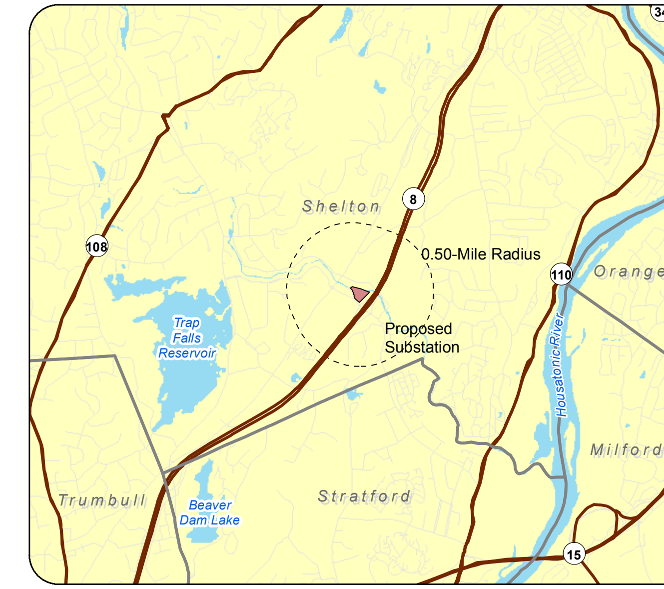
Photographic Documentation and Renderings

Renderings of the proposed Substation were generated to portray representative, scaled representations of the facility from select locations. Using field data, site plan information and 3-dimension (3D) modeling software, spatially referenced models of the site area and Facility were generated and merged. The geographic coordinates obtained in the field for the photograph locations were incorporated into the model to produce virtual camera positions within the spatial 3D model. Photo renderings were then created using a combination of images generated in the 3D model and photo-rendering software programs.

As stated earlier, APT has elected to use a 50 mm focal length whenever possible; however, there are occasions when the use of a wider-angle lens setting is preferred. For presentation purposes in this report, the photographs are produced in an approximate 7” by 10.5” format. When viewing in this format size, we believe it is important to provide the largest representational image while maintaining an accurate relation of sizes between objects within the frame of the photograph. Seven of the photographs presented in this report were taken with either a 35 mm focal length to balance preserving the integrity of the scene’s setting while depicting the subject (the locations of the Substation and associated support structures) in a way similar to what an observer might see, to the greatest extent possible.

Attachment 2

Visibility Analysis Map



PROJECT AREA AND VICINITY

STATE OF CONNECTICUT

Legend

- Proposed 55-Foot Tall Lightning Masts
- Proposed 65-Foot Tall Interconnection Structures
- Proposed 70-Foot Tall Transmission Support Structure
- Proposed 95-Foot Tall Transmission Support Structure
- Proposed 90-Foot Tall Radio Tower
- Approx. Boundary Proposed Facility
- Year-Round Visibility On-Site (All Structures Analyzed)
- Year-Round Visibility Proposed 90-Foot Tall and 95-Foot Tall Structures
- Year-Round Visibility Proposed 55-Foot Tall Lightning Masses
- Year-Round Visibility Proposed 70-Foot Tall and 65-Foot Tall Structures

VISIBILITY ANALYSIS MAP

PROPOSED UNITED ILLUMINATING
SHELTON SUBSTATION
SHELTON, CONNECTICUT

NOTE:
- *Map compiled May 2012*
- *Viewshed analysis conducted using ESRI's Spatial Analyst.*
- *Visibility calculated for a 0.50-mile radius surrounding the proposed facility*
- *Heights of proposed structures are depicted on map*
- *Existing tree canopy height estimated at 50 feet.*

DATA SOURCES:
- *Digital elevation model (DEM) derived from Connecticut LiDAR-based Digital Elevation Data (collected in 2000) with a 10-foot spatial resolution produced by the University of Connecticut and the Center for Land Use Education and Research (CLEAR); 2007*
- *Forest areas derived from 2010 ESRI/Bing digital orthophotos with 1-foot pixel resolution; digitized by All-Points Technology Corp., 2012*
- *Base map comprised of 2010 ESRI/Bing digital orthophotos with 1-foot pixel resolution;*

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

Attachment 3

Photo-Documentation and Renderings

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
1	WEST OF HILTON GARDEN INN REAR PARKING LOT	SOUTHEAST	+/- 0.13 MILE	YEAR ROUND

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

RENDERING

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
1	WEST OF HILTON GARDEN INN REAR PARKING LOT	SOUTHEAST	+/- 0.13 MILE	YEAR ROUND

ALL-POINTS TECHNOLOGY CORPORATION
The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
2	**PET SUPPLIES PLUS PARKING AREA LOOKING EAST ACROSS BRIDGEPORT AVENUE**	**SOUTHEAST**	**+/- 0.20 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
3	**SOUTH OF MILL STREET-BRIDGEPORT AVENUE INTERSECTION - #656 BRIDGEPORT AVENUE** (24mm Focal Length)	**SOUTHEAST**	**+/- 0.19 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
4	**WELL'S HOLLOW CREAMERY, BEARD SAW MILL ROAD**	**SOUTHEAST**	**+/- 0.13 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

RENDERING

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
4	**WELL'S HOLLOW CREAMERY, BEARD SAW MILL ROAD**	**SOUTHEAST**	**+/- 0.13 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
5	**BEARD SAW MILL ROAD (24mm Focal Length)**	**SOUTH**	**+/- 0.08 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION
The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
6	**26 BEARD SAW MILL ROAD (24mm Focal Length)**	**SOUTHWEST**	**+/- 0.12 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
7	**HILTON – EAST PARKING LOT AREA** (24mm Focal Length)	**EAST**	**+/- 0.09 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
8	SPLIT ROCK PLAZA CENTER	NORTHEAST	+/- 0.11 MILE	SEASONAL

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
9	**SPLIT ROCK PLAZA PARKING LOT – EAST SIDE**	**NORTHEAST**	**+/- 0.15 MILE**	**SEASONAL**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
10	**OLD STRATFORD ROAD ACROSS FROM BP GAS STATION**	**NORTHEAST**	**+/- 0.07 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
11	**BP GAS STATION – EAST SIDE OF BUILDING (24mm Focal Length)**	**NORTHEAST**	**+/- 0.05 MILE**	**YEAR ROUND**

All-Points Technology Corporation
ui The United Illuminating Company

RENDERING

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
11	**BP GAS STATION – EAST SIDE OF BUILDING (24mm Focal Length)**	**NORTHEAST**	**+/- 0.05 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION
The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
12	OLD STRATFORD ROAD IN FRONT OF PROPOSED SUBSTATION YARD (24mm Focal Length)	NORTHEAST	+/- 0.05 MILE	YEAR ROUND

ALL-POINTS TECHNOLOGY CORPORATION
The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
13	**INTERSECTION OF OLD STRATFORD ROAD & ROUTE 8 SOUTHBOUND ENTRANCE** **(24mm Focal Length)**	**NORTHEAST**	**+/- 0.06 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

RENDERING

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
13	**ACROSS OLD STRATFORD ROAD LOOKING NORTH AT SUBSTATION YARD** **(24mm Focal Length)**	**NORTHEAST**	**+/- 0.06 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
14	**INTERSECTION OF OLD STRATFORD ROAD & ROUTE 8 SOUTHBOUND ENTRANCE** **(24mm Focal Length)**	**NORTH**	**+/- 0.09 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
15	**SOUTHBOUND LANE OF ROUTE 8 - EXIT 12 OFF RAMP AREA** **(24mm Focal Length)**	**WEST**	**+/- 0.05 MILE**	**SEASONAL**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
16	**NORTHBOUND LANE OF ROUTE 8 - NEAR EXIT 12** **(24mm Focal Length)**	**NORTH**	**+/- 0.17 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

SIMULATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
16	NORTHBOUND LANE OF ROUTE 8 - NEAR EXIT 12 (24mm Focal Length)	NORTH	+/- 0.17 MILE	YEAR ROUND

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
17	**NORTHBOUND LANE OF ROUTE 8 AT OLD STRATFORD ROAD OVERPASS** **(24mm Focal Length)**	**NORTHWEST**	**+/- 0.10 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

SIMULATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
17	**NORTHBOUND LANE OF ROUTE 8 AT OLD STRATFORD ROAD OVERPASS** (24mm Focal Length)	**NORTHWEST**	**+/- 0.10 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION
The United Illuminating Company

DOCUMENTATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
18	**NORTHBOUND LANE OF ROUTE 8, LOOKING WEST AT SOUTHBOUND EXIT 12**	**WEST**	**+/- 0.12 MILE**	**YEAR ROUND**

ALL-POINTS TECHNOLOGY CORPORATION

The United Illuminating Company

SIMULATION

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
18	NORTHBOUND LANE OF ROUTE 8, LOOKING WEST AT SOUTHBOUND EXIT 12	WEST	+/- 0.12 MILE	YEAR ROUND

ALL-POINTS TECHNOLOGY CORPORATION
The United Illuminating Company

APPENDIX F

SHELTON AREA CAPACITY ANALYSIS

Shelton Area Capacity Analysis

May 2, 2008

Revised May 21, 2012

By: System Integrity Team

The United Illuminating Company
Electric System Work Center
801 Bridgeport Avenue
Shelton, CT 06484-4714

Table of Contents

List of Figures

Executive Summary

This report analyzes the capacity issues affecting the Greater Shelton Area, which includes Shelton, Trumbull, Ansonia, Derby and portions of Stratford and Orange Connecticut. The United Illuminating Company ("UI" or the "Company") prepared this report based on its Ten-Year Transmission & Substation Infrastructure Planning Study 2012-2021 and associated 90/10 Substation Level Load Forecast model with 2011 as the base year. "UI's Transmission and Distribution Substation Design and Rating Philosophy" is used as the methodology for this analysis. This report is an update to the Shelton Area Capacity Needs Assessment Study completed in 2007 and revised in 2008. The report describes the load characteristics and forecasted load growth for the four substations that currently supply the Greater Shelton Area, Trap Falls, Indian Well, Ansonia and Trumbull. As described in this report, the Company's analysis concludes that there is a capacity need in the Greater Shelton Area by the 2015 summer peak.

The Greater Shelton Area is projected to experience a combined load growth of nearly 37 MVA over the next ten years. This load growth is composed of 13 MVA from specific new loads in the area as identified by UI's Economic Development Department and 24 MVA from the total ambient load growth of all four substations in the area as identified by UI's econometric model developed by Black & Veatch. The Company intends to make use of all available capacity in order to keep the substations in the area under their firm ratings. However, no distribution load transfers are feasible within the area after 2014. The Shelton Area reaches the 85% capacity level by the year 2012 and 95% of capacity by the year 2017.

In 2009, the results of a voltage stability study performed by UI Transmission Planning and Quanta Technology determined that Indian Well Substation should be de-rated from its thermal limit of 74.5 MVA to 53.9 MVA. This rating was revised in 2012 by UI's Transmission Planning Group by using an improved modeling technique which further decreased the rating of Indian Well Substation to 49.0 MVA. This new rating represents the voltage stability limit for this substation. This de-rating resulted in a capacity decrease of approximately 25.5 MVA for Indian Well Substation and for the entire Shelton Area. As a result, Indian Well Substation is presently over its new rating. Operational procedures have been implemented at Indian Well Substation in order to mitigate voltage collapse risks during high load levels. However, if a contingency condition occurs during high load periods, the company may be required to implement load shedding and/or rolling blackouts in order to avoid voltage collapse at this substation. Therefore, the risk associated with this temporary operational procedure should be eliminated as soon as possible. Significant effort has been placed in the last three years to relieve Indian Well Substation using feeder load transfers to neighboring substations, mainly Trap Falls Substation. Due to the load transfers from Indian Well and the load growth in the area, the load at Trap Falls Substation is currently over the 85% of capacity level and exceeds the 95% of capacity rating by the year 2016. By the year 2015, Trumbull Substation also exceeds the 85% of capacity load level.

As a result of the projected load growth in the Greater Shelton Area and the voltage collapse risk associated with the temporary operational procedure implemented at Indian Well Substation, a capacity need is projected by the 2015 summer peak, which can best be met by adding new 115/13.8 kV substation capacity to the area. Temporary or short term distribution solutions must be developed and implemented before 2015 in order to keep the individual substations in the area below their firm ratings. This determination follows UI's Transmission and Distribution Substation Design and Rating Philosophy Standard, approved by the Company in 2007 and revised in 2008. This new capacity would be located preferably close to the Route 8 corridor, where most of the new load is expected to materialize.

1 Background

The Greater Shelton Area is supplied by four substations: Trap Falls, Indian Well, Ansonia and Trumbull. These substations serve mainly the municipalities of Shelton, Ansonia, Trumbull and Derby. Figure 1 below shows the circuits in the service area supplied by these four substations.

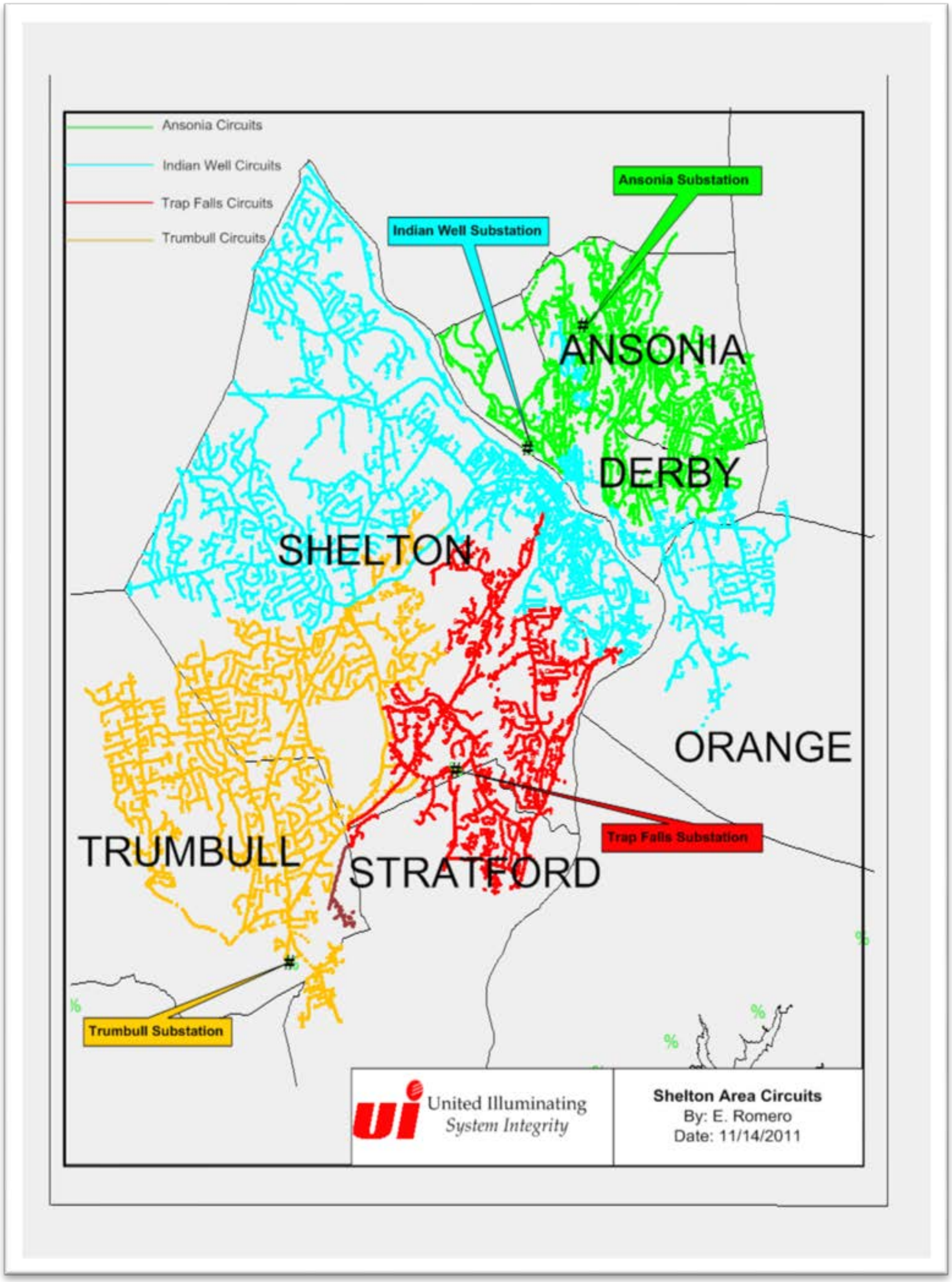


Figure 1: Shelton Area Circuits

Based on 2006 summer peak load data and the 2008 - 2017 Ten Year Plan (TYP) and its associated 90/10 Substation Level Load forecast model[1], the Shelton Area was projected to experience a combined load growth of nearly 60 MVA over the next five years (2009 – 2013). Approximately 71 percent of this new load was attributable to three large commercial customers that were to be located within the area served by the Trap Falls and Indian Well Substations. A Needs Assessment study for this area was completed in 2007 and revised in early 2008[2]. The study concluded that there were going to be significant capacity shortfalls in the Greater Shelton Area soon after the 2010 peak which could best be met by adding new capacity in the area. Due to the economic downturn, the projected load growth did not materialize as expected and the need for additional capacity in the area was delayed by more than five years.

However, the most recent refresh of the Ten Year Plan (2012 – 2021 TYP[3]) and its associated 90/10 Substation Level Forecast indicates that there is a potential capacity need in the Shelton Area in the near future once again. This report is therefore an update to the Needs Assessment study completed in 2007 and 2008. The sections that follow will analyze the current load growth projected for the area, provide the methodology used to perform the analyses, provide a capacity analysis of each individual substation in the area and a capacity analysis of the overall Shelton Area.

1.1 New Loads

The load in the Shelton Area is currently projected to grow by approximately 37 MVA over the next ten years. This load growth is composed of 13 MVA from specific new loads in the area as identified by UI's Economic Development Department and 24 MVA from the total ambient load growth of all four substations in the area as identified by UI's econometric model developed by Black & Veatch. Please note that UI's Economic Development Department has only identified new loads for the area through the year 2015 based on information that is known to be reliable. Figure 2 below shows the cumulative load growth for the Shelton Area from 2012 to 2021.

[1] *Ten-Year Transmission & Substation Infrastructure Planning Study 2008-2017, June 2, 2008*

[2] *Shelton Area Capacity Analysis, May 2, 2008, by System Integrity.*

[3] *Ten-Year Transmission & Substation Infrastructure Planning Study 2012-2021*

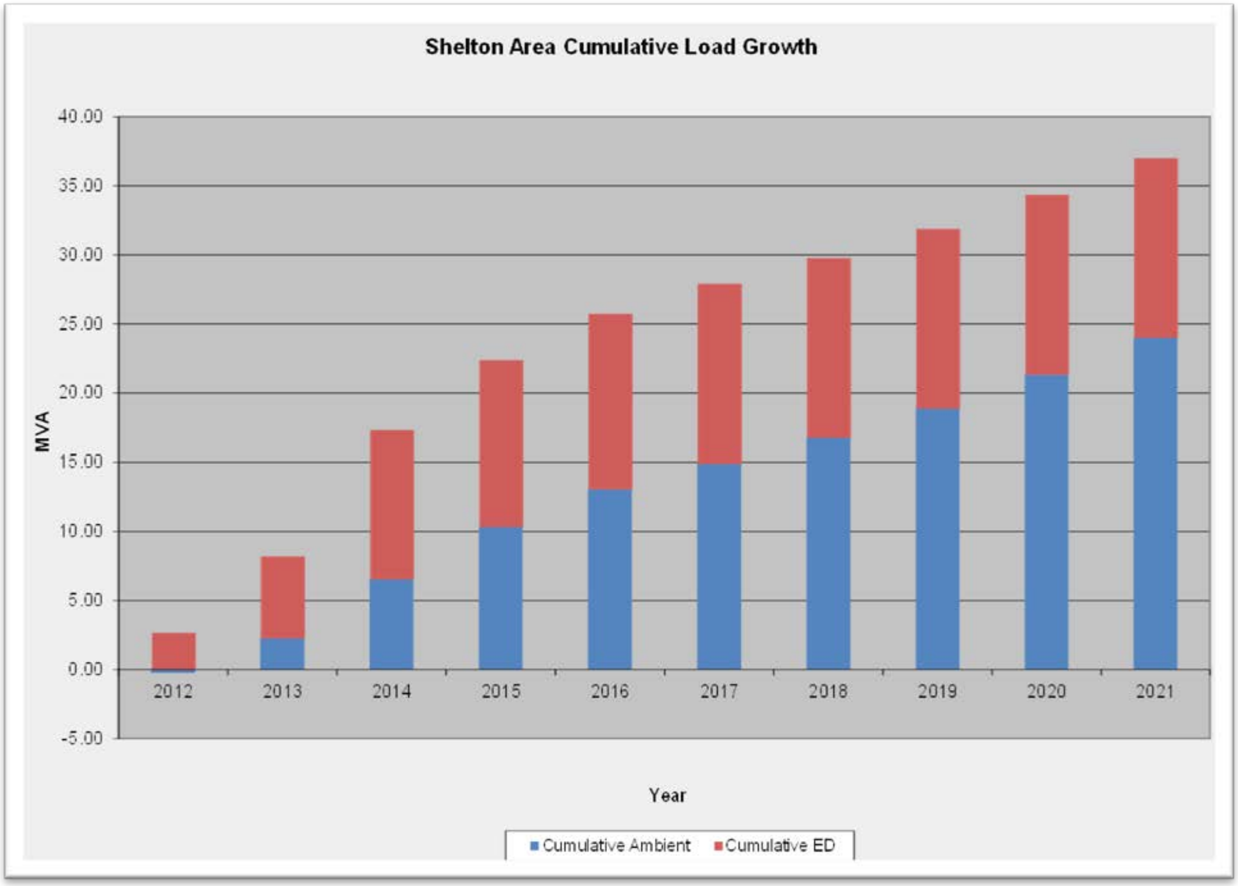


Figure 2: Shelton Area Cumulative Load Growth

Geographically, these new loads are projected to materialize in the southern part of Shelton and the south east part of Trumbull mostly along the Route 8 corridor and fall mainly within the service area of Trap Falls, Trumbull and Indian Well Substations.

2 Analysis Methodology

An 85% load level is used as the planning criteria at the substation level as well as at the regional level in accordance to, "UI's Transmission and Distribution Substation Design and Rating Philosophy". This standard states that, "[e]xpansion of any individual existing substation should be considered as solution to capacity needs where the coincident peak load of that substation has reached 85% of its summer normal capacity rating after exhausting all possible load transfers." Further, "[c]onstruction of a new substation should also be considered as solution to area capacity needs where the coincident peak load of two or more area substations having distribution ties have reached 85% of their summer normal capacity rating after exhausting all possible load transfers[4]."

[4] *The United Illuminating Company Transmission and Distribution Substation Design and Rating Philosophy, Revised February 14, 2008.*

The above criteria assumes that lead time to construct a new 115/13.8 kV substation, from concept to completion, requires approximately five years. This includes regulatory applications and hearings, design, equipment and land purchase and construction.

Also, assuming a 2% load growth per year, over 5 years is approximately 10%, which would increase the load at the substations to 95% of their ratings. With another 5% margin for contingencies such as, delay in plans, regulatory delays, long lead times for materials and equipment or higher than normal load growth, a prudent time to plan major substation additions or new substations should begin when the load on a substation or in an area is at approximately 85% of its summer normal capacity rating.

The above criteria is a general guideline intended to trigger a capacity analysis of an area. Please note that load growth rates may vary by region. Also, the time required for regulatory applications and hearings as well as material procurement and land purchase will vary on a case by case basis.

The loads at each substation are based on the 2012 – 2021 TYP refresh and its associated 90/10 Substation Level Load Forecast with 2011 as the base year. The peak load forecast for the substations in the area is based on the 2011 weather normalized system peak load forecast and the individual substations non-coincident peak load. The load growth at each substation includes new specific customer load growth as identified by UI's Economic Development as well as ambient load growth as identified by UI's econometric model[5]. The power factor at the substation level for new loads was assumed to be 0.995. The "Do Nothing" scenarios do not include any planned load transfers between substations, only those projects that occurred after the 2011 summer peak or before the 2012 summer peak. Approved projects that are currently under construction are also included as part of this case.

3 Substation Capacity Analysis

The sections that follow provide detailed analysis of the load versus capacity at each of the substations in the Shelton Area.

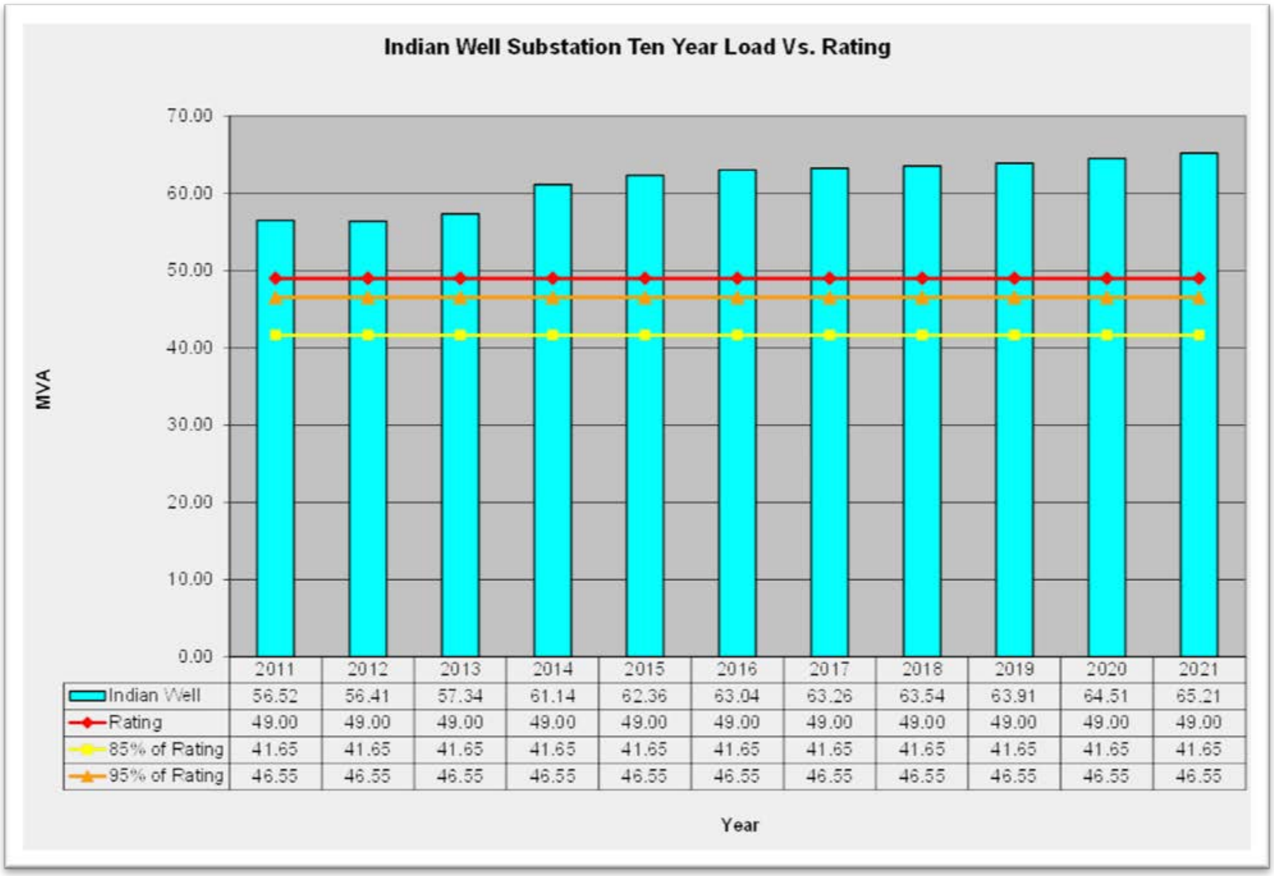
3.1 Indian Well Substation

Indian Well Substation mainly supplies the municipality of Shelton and parts of the municipalities of Ansonia, Orange and Derby. This substation is physically located in Derby on the east side of the Housatonic River. Indian Well Substation has distribution ties to the following substations: Trap Falls, Ansonia, Allings Crossing, Milvon, Old Town and Trumbull. Figure 1 above shows the distribution circuits from Indian Well Substation in light blue.

The load growth at Indian Well Substation is projected to be approximately 8.7 MVA over the next ten years. This load growth is made up of 2.3 MVA of new customer load and 6.4 MVA of ambient econometric growth. The firm rating of Indian Well Substation is 49 MVA. This rating is voltage limited rather than thermal limited. Figure 3 below presents the base (Do Nothing)

[5] *This model is based on forecasts of UI sales, by customer class, using UI's historical normalized sales data, and third party data for economic and demographic drivers.*

case over the ten year horizon with projected load growth versus capacity for Indian Well Substation.



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Indian Well	56.52	56.41	57.34	61.14	62.36	63.04	63.26	63.54	63.91	64.51	65.21
Rating	49.00	49.00	49.00	49.00	49.00	49.00	49.00	49.00	49.00	49.00	49.00
85% of Rating	41.65	41.65	41.65	41.65	41.65	41.65	41.65	41.65	41.65	41.65	41.65
95% of Rating	46.55	46.55	46.55	46.55	46.55	46.55	46.55	46.55	46.55	46.55	46.55

Figure 3: Indian Well Substation Ten-Year Load Vs Rating

As can be seen from figure 3 above, Indian Well Substation is currently over its rating and remains over its rating for the ten year planning period without implementing any additional load relief projects or capacity additions at this substation. By the end of the ten year planning period, Indian Well Substation would require approximately 24 MVA of load relief in order to keep the load at this substation below 85% of its rating in accordance with UI's Transmission and Distribution Substation Design and Rating Philosophy. Based on the 2011 peak load data, Indian Well Substation was over its rating 23 hours out of the year, therefore, the risk of overload is significant. This risk only increases with time, by the year 2021, the number of hours that the load at Indian Well is over the substation's rating is projected to be 99 hours.

Two additional potential distribution load transfer projects have been identified in the 2012 - 2021 Substation Level Load Forecast to transfer load from Indian Well Substation to Ansonia Substation. These distribution load transfers are proposed in 2013 and 2014 respectively and are both on the east side of the Housatonic River. However, as can be seen from Figure 1, most of the circuits from Indian Well Substation cross the Housatic River to supply load in Shelton.

Therefore, after 2014, no feasible load transfer projects can be implemented to further relieve Indian Well Substation.

The transfer capability to or from Indian Well Substation is also limited because this facility is physically located on the opposite side of the Housatonic River from Shelton. There are two ductlines crossing the bridge from Roosevelt Drive in Derby to Canal Street in Shelton. These ductlines have six and seven available ducts, respectively. However, there is only one available duct in the ductline on Roosevelt Drive leading to the bridge crossing, since most of the feeders from Indian Well Substation use this ductline as the substation getaway route. Therefore, the current available ducts on the bridge crossing ductlines cannot be fully utilized to install additional cables.

3.1.1 Indian Well Substation Rating Change

Up until 2009, the rating for Indian Well Substation was considered to be 74.5 MVA. This rating was based on the lowest thermal rating of the two 115/13.8 kV substation transformers connected in parallel. However, in 2009, UI Transmission Planning and Quanta Technology performed a study to determine the risk of voltage collapse at UI's 115/13.8 kV distribution substations. The study determined that the load level at Indian Well Substation will result in reactive power deficiencies and voltage instability under certain contingency conditions. According to the study "This is a potentially serious concern in that the station is exposed to a risk of voltage collapse if certain contingency events occur[6]". The study results concluded that Indian Well Substation should be de-rated from its thermal limit of 74.5 MVA to 53.9 MVA. This analysis was revised in 2012 by Transmission Planning based on improved analysis techniques and the voltage limited rating for Indian Well Substation was further decreased from 53.9 MVA to 49.0 MVA, which now represents the voltage stability limit for this substation. As a result, operational procedures were put into place to mitigate voltage collapse risks during high load levels. However, if a contingency condition occurs during high load periods, the company may be required to implement load shedding and/or rolling blackouts in order to avoid voltage collapse at this substation.

This de-rating resulted in a capacity decrease of 25.5 MVA for Indian Well Substation and for the entire Shelton Area. Significant effort has been placed in the last three years to try to relieve Indian Well Substation to a load level below its new voltage limited rating using feeder load transfers to neighboring substations (mainly Trap Falls Substation). However, despite these efforts, Indian Well Substation remains above its voltage limited rating due to the significant decrease in substation capacity.

3.2 Trap Falls Substation

Trap Falls Substation is located in the south region of the town of Shelton along the Route 8 corridor and mainly supplies this municipality and part of the municipality of Stratford. Trap

[6] *Voltage Stability Need Analysis Report November 6th, 2009, rev 0 by UI Transmission Planning and Quanta Technology.*

Falls Substation has distribution ties to the following substations: Indian Well, Trumbull, and Barnum. Figure 1 above shows the distribution circuits from Trap Falls Substation in red.

The load growth at Trap Falls Substation is projected to be approximately 12.16 MVA over the next ten years. This load growth is made up entirely of ambient econometric growth. No new customer load growth has been identified by UI's Economic Development in the Trap Falls Substation area of service for the next five years. The firm rating of Trap Falls Substation is 76.78 MVA. This rating is based on the lowest thermal rating of the two 115/13.8 kV substation transformers. Figure 4 below presents the base (Do Nothing) case over the ten year horizon with projected load growth versus capacity for Trap Falls Substation.

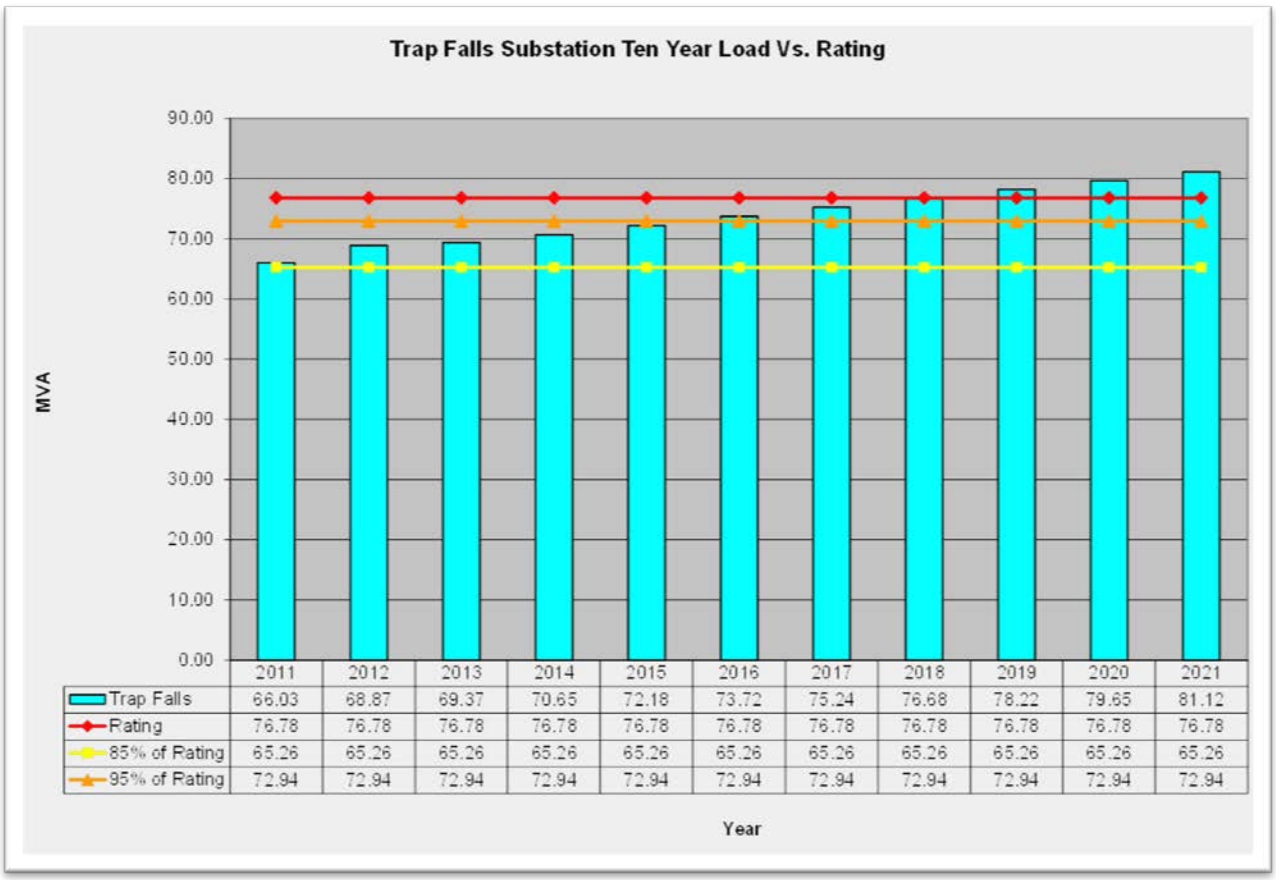


Figure 4: Trap Falls Substation Ten-Year Load Vs Rating

As can be seen from figure 4 above, the load at Trap Falls Substation is currently over the 85% level of its capacity rating. By 2016 the load at this substation is projected to exceed the 95% of its capacity rating level and by 2019 it exceeds the substation's rating. By the end of the ten year planning period, Trap Falls Substation would require approximately 16 MVA of load relief in order to keep the load at this substation below 85% of its rating in accordance with UI's Transmission and Distribution Substation Design and Rating Philosophy. Based on the 2011 peak load data, Trap Falls Substation is projected to be over its rating for 10 hours during the summer of 2019 and 18 hours during the summer of 2021.

Trap Falls Substation was relieved of significant load by the new Trumbull Substation in 2008 and 2009 (approximately 19 MVA in total). However, due to the capacity deficiency at Indian Well caused by the change in rating, Trap Falls Substation was used to relieve Indian Well Substation of significant load in 2010 and 2011.

3.2.1 Distributed Generation Impact

UI also considered the impact of potential distributed generation ("DG"). One of the largest customers in the Greater Shelton Area supplied from Trap Falls Substation recently installed a 10 MW DG unit for on-site use of power. However, it is UI's Distribution Planning practice not to include the potential peak reducing output of DG units in its forecast of system peak loads. This is done because UI cannot control the operation of these units and their operation is not guaranteed when needed during peak load periods. Therefore, UI is required to provide full backup service to these customers in case the DG units fail or are not running, which may occur during peak load conditions. As such, this load remains part of Trap Falls Substation's load forecast and this DG unit is not considered to add any quantifiable relief for Trap Falls Substation.

3.3. Ansonia Substation

Ansonia Substation is located in the west region of Ansonia and supplies the municipalities of Ansonia and Derby. Like Indian Well Substation, Ansonia Substation is on the east side of the Housatonic River. Ansonia Substation has distribution ties to only Indian Well Substation. Figure 1 above shows the distribution circuits from Ansonia Substation in green.

The load growth at Ansonia Substation is projected to be approximately 3.25 MVA over the next ten years. This load growth is made up entirely of ambient econometric growth. No new customer load growth has been identified by UI's Economic Development in the Ansonia Substation area of service for the next five years. The firm rating of Ansonia Substation is currently 59.01 MVA. This firm rating is the lowest thermal rating of the two 115/13.8 kV substation transformers. Figure 5 below presents the base (Do Nothing) case over the ten year horizon with projected load growth versus capacity for Ansonia Substation.

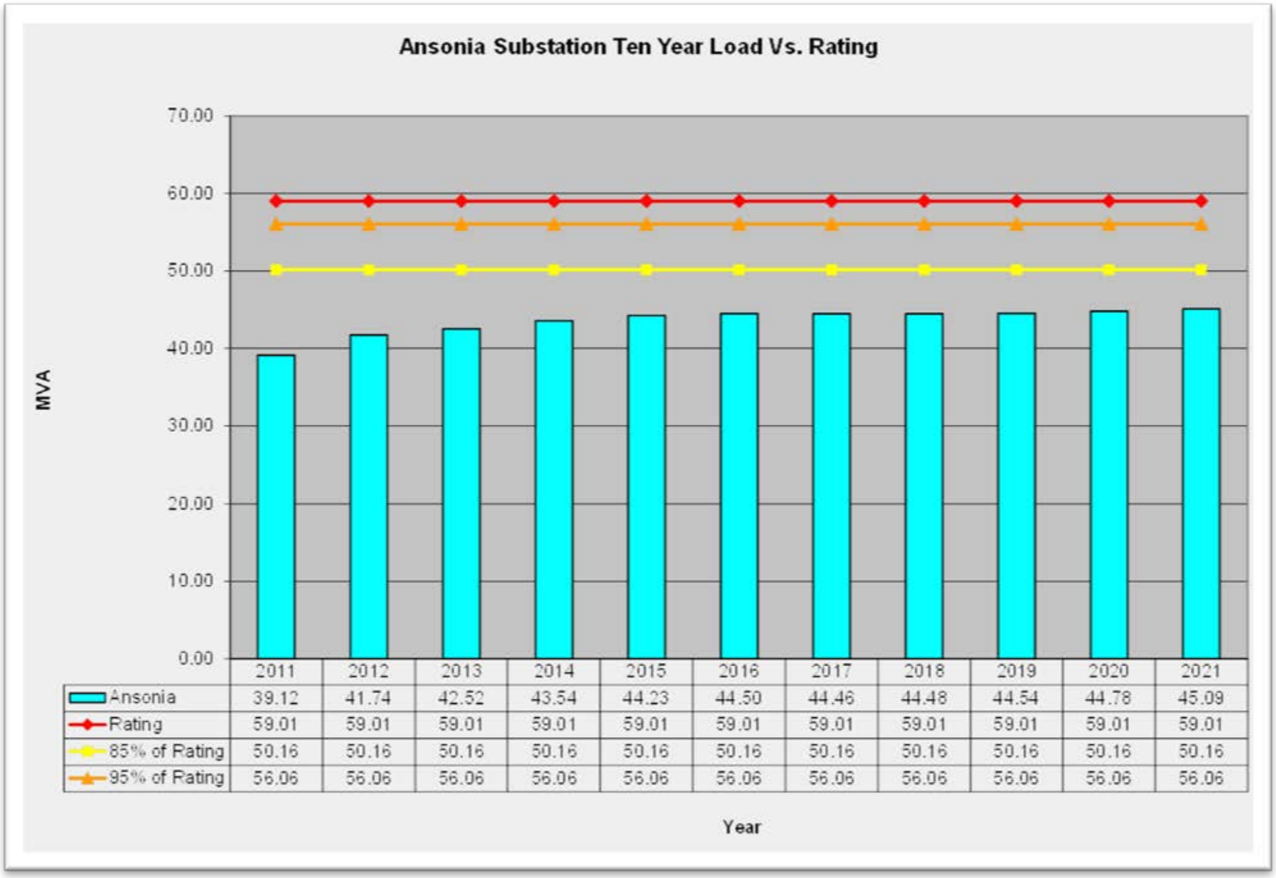


Figure 5: Ansonia Substation Ten-Year Load Vs Rating

As can be seen from Figure 5 above, the load at Ansonia Substation is below the 85% of capacity level. The capacity at Ansonia Substation increased in 2011 from 48.0 MVA to 59.01 MVA after the completion of a 13.8 kV bus addition project. The load at Ansonia Substation is increasing from 2011 to 2012 due to a distribution load transfer from Indian Well Substation to Ansonia Substation, which is under construction. By the year 2021, the end of the ten year planning period, the load at Ansonia Substation does not reach the 85% of capacity level, which is the threshold level recommended by UI's Transmission and Distribution Substation Design and Rating Philosophy. The available capacity at Ansonia Substation by the year 2021 before it reaches the 85% load level is approximately 5 MVA.

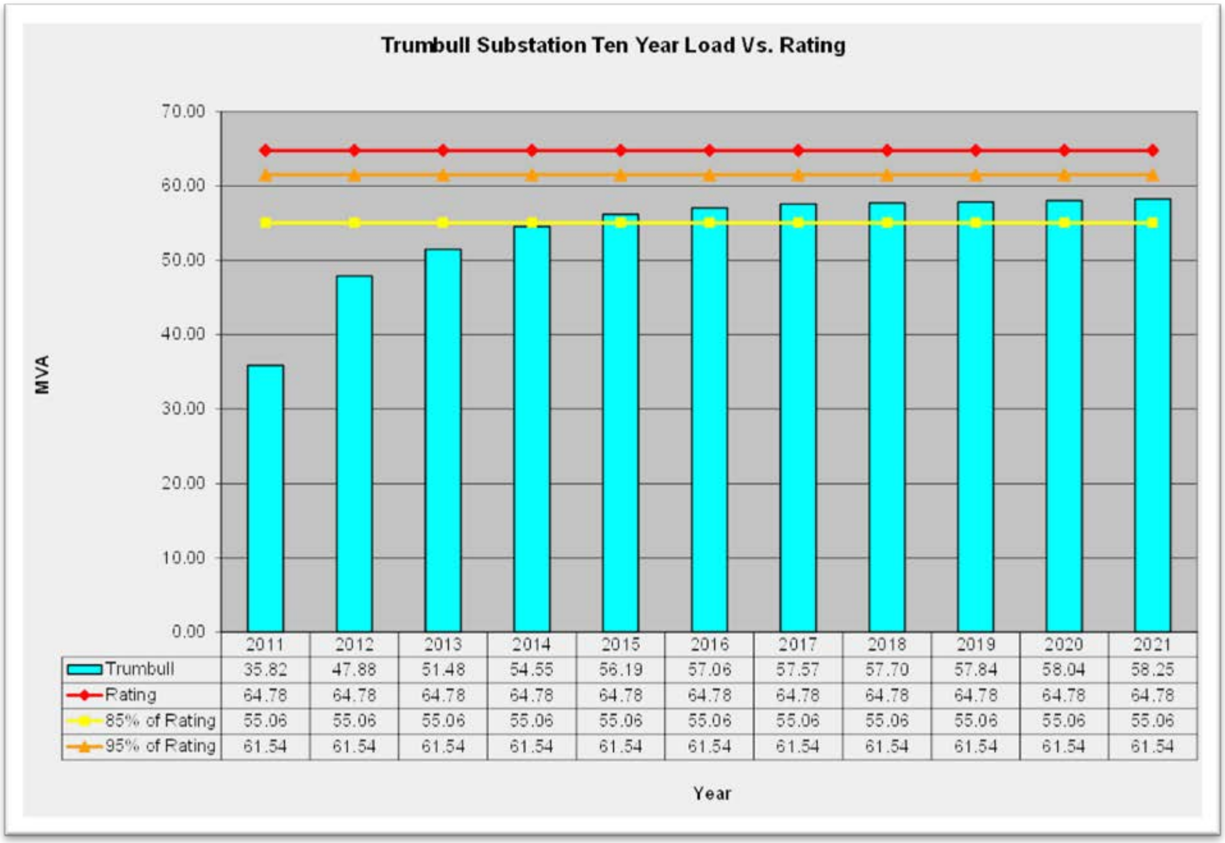
As mentioned in a previous section, two additional potential distribution load transfer projects have been identified in 2013 and 2014 from Indian Well Substation to Ansonia Substation. These distribution load transfers are are both on the east side of the Housatonic River. However, after 2014, no feasible load transfer projects can be implemented to further relieve Indian Well Substation since most of the circuits from Indian Well supply load on the west side of the Housatonic River in Shelton. Furthermore, adding significant load to this substation would increase its load level beyond the 85% of capacity level and exceed the level recommended by UI's Transmission and Distribution Substation Design and Rating Philosophy. This available capacity at Ansonia should be reserved to supply potential but as of yet unidentified load growth in the Ansonia Substation area of service, since one large new customer load could exhaust this capacity immediately. Therefore, Ansonia Substation cannot be used to provide additional load relief to Indian Well Substation and/or Trap Falls Substation.

3.4 Trumbull Substation

Trumbull Substation is located in the southeast region of the town of Trumbull and mainly supplies the municipalities of Trumbull and Shelton and part of the municipality of Stratford. Trumbull Substation has distribution ties to the following substations: Trap Falls, Indian Well, Barnum, New Congress and Old Town. Figure 1 above shows the distribution circuits from Trumbull Substation in orange.

Trumbull Substation was energized in 2008 and its primary need was to provide load relief for Trap Falls Substation and Old Town Substation. As mentioned before, Trumbull Substation provided much needed load relief to Trap Falls and Old Town Substations in 2008 and 2009. Trumbull Substation also provided load relief to New Congress and Barnum Substations. At the time of the Trumbull Substation site selection and siting process, the load growth for the Shelton Area identified by UI's 2012 – 2021 TYP Substation Level Load Forecast and the capacity deficiency at Indian Well Substation due to the voltage collapse risk were not known.

The load growth at Trumbull Substation is projected to be approximately 13 MVA over the next ten years. This load growth is made up of 10.8 MVA of new customer load and 2.2 MVA of ambient econometric growth. The firm rating of Trumbull Substation is currently 64.78 MVA. This rating is based on the lowest thermal rating of the two 115/13.8 kV substation transformers. Figure 6 below presents the base (Do Nothing) case over the ten year horizon with projected load growth versus capacity for Trumbull Substation.



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Trumbull	35.82	47.88	51.48	54.55	56.19	57.06	57.57	57.70	57.84	58.04	58.25
Rating	64.78	64.78	64.78	64.78	64.78	64.78	64.78	64.78	64.78	64.78	64.78
85% of Rating	55.06	55.06	55.06	55.06	55.06	55.06	55.06	55.06	55.06	55.06	55.06
95% of Rating	61.54	61.54	61.54	61.54	61.54	61.54	61.54	61.54	61.54	61.54	61.54

Figure 6: Trumbull Substation Ten-Year Load Vs Rating

As can be seen from Figure 6 above, the load at Trumbull Substation increases significantly from 2011 to 2012. This is due to a distribution load transfer from Old Town Substation (which is outside of the Shelton Area) to Trumbull Substation (9.4 MVA) and 2.66 MVA of load growth. The load at Trumbull Substation continues to grow and by the year 2015, this load exceeds the 85% of capacity level. Adding any more load to Trumbull Substation would cause the rating of this substation to be exceeded. By the end of the ten year planning period, Trumbull Substation only has approximately 6 MVA of available capacity before reaching the substation’s firm rating.

Therefore, Trumbull Substation cannot be used to provide further load relief to Trap Falls and/or Indian Well Substation. By 2021, Trumbull Substation is projected to require approximately 3.2 MVA of load relief itself in order to bring the station load below the 85% of capacity, which is the threshold level recommended by UI’s Transmission and Distribution Substation Design and Rating Philosophy.

The section that follows provides a combined analysis of the load versus capacity for the overall Shelton Area.

4. Greater Shelton Area Capacity Analysis

Figure 7 below shows the Shelton Area load versus capacity for the ten year period 2012 – 2021 and the individual contribution from each substation in the area. This figure also shows the 85% and 95% capacity marks as these are important levels as explained in the previous sections.

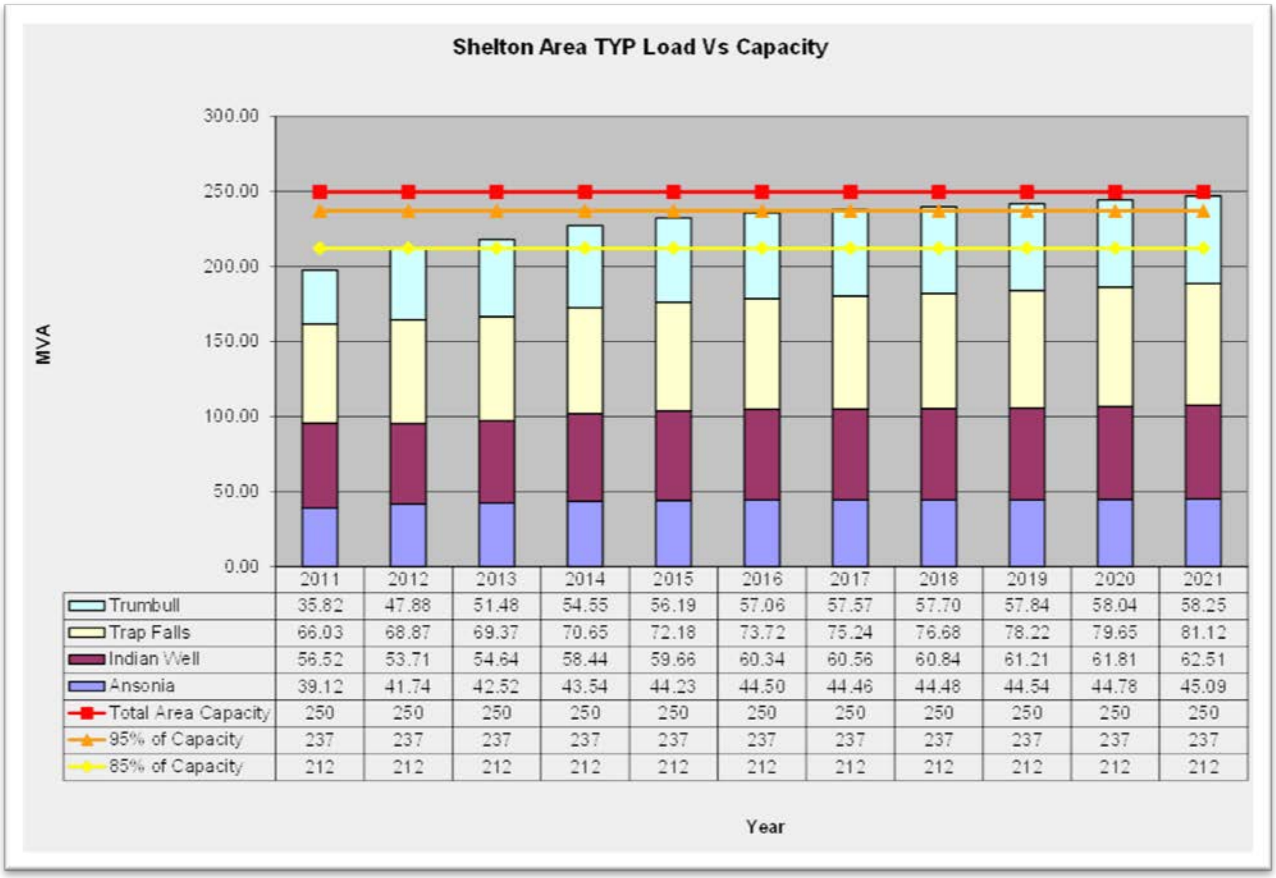


Figure 7: Shelton Area Ten Year Load Vs Capacity

Figure 8 below shows the load versus capacity for the ten year planning period for each of the substations in the area as well as the area as a whole in detailed tabular form. This figure represents the load at each substation with no distribution solutions implemented.

Shelton Region Load Forecast - Ten Year Plan Base Case 2011 - 2020											
Load Schedule											
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Ansonia	39.12	41.74	42.52	43.54	44.23	44.50	44.46	44.48	44.54	44.78	45.09
Indian Well	56.52	53.71	54.64	58.44	59.66	60.34	60.56	60.84	61.21	61.81	62.51
Trap Falls	66.03	68.87	69.37	70.65	72.18	73.72	75.24	76.68	78.22	79.65	81.12
Trumbull	35.82	47.88	51.48	54.55	56.19	57.06	57.57	57.70	57.84	58.04	58.25
Total	**197**	**212**	**218**	**227**	**232**	**236**	**238**	**240**	**242**	**244**	**247**
Substation Ratings											
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Ansonia	**59.01**	**59.01**	**59.01**	**59.01**	**59.01**	**59.01**	**59.01**	**59.01**	**59.01**	**59.01**	**59.01**
85% of Rating	50.16	50.16	50.16	50.16	50.16	50.16	50.16	50.16	50.16	50.16	50.16
95% of Rating	56.06	56.06	56.06	56.06	56.06	56.06	56.06	56.06	56.06	56.06	56.06
Indian Well*	**49.00**	**49.00**	**49.00**	**49.00**	**49.00**	**49.00**	**49.00**	**49.00**	**49.00**	**49.00**	**49.00**
85% of Rating	41.65	41.65	41.65	41.65	41.65	41.65	41.65	41.65	41.65	41.65	41.65
95% of Rating	46.55	46.55	46.55	46.55	46.55	46.55	46.55	46.55	46.55	46.55	46.55
Trap Falls	**76.78**	**76.78**	**76.78**	**76.78**	**76.78**	**76.78**	**76.78**	**76.78**	**76.78**	**76.78**	**76.78**
85% of Rating	65.26	65.26	65.26	65.26	65.26	65.26	65.26	65.26	65.26	65.26	65.26
95% of Rating	72.94	72.94	72.94	72.94	72.94	72.94	72.94	72.94	72.94	72.94	72.94
Trumbull	**64.78**	**64.78**	**64.78**	**64.78**	**64.78**	**64.78**	**64.78**	**64.78**	**64.78**	**64.78**	**64.78**
85% of Rating	55.06	55.06	55.06	55.06	55.06	55.06	55.06	55.06	55.06	55.06	55.06
95% of Rating	61.54	61.54	61.54	61.54	61.54	61.54	61.54	61.54	61.54	61.54	61.54
Total	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**250**	**250**
Total Area Load	197	212	218	227	232	236	238	240	242	244	247
Total Area Capacity	250	250	250	250	250	250	250	250	250	250	250
95% of Capacity	237	237	237	237	237	237	237	237	237	237	237
85% of Capacity	212	212	212	212	212	212	212	212	212	212	212
Total Area % Load	79.1%	85.0%	87.4%	91.0%	93.1%	94.4%	95.3%	96.0%	96.9%	97.9%	99.0%
*Denotes a substation whose rating changed from thermal to voltage limiting as determined a transmission voltage stability											
Legend:	(yellow)	Load is greater than or equal to 85%, but less than 95% of the substation or region's capacity.									
	(orange)	Load is greater than or equal to 95%, but less than 100% of the substation or region's capacity.									
	(red)	Load is greater than 100% of the substation or region's capacity.									

Figure 8: Shelton Area Substations Load Vs Capacity

As can be seen from figures 7 & 8 above, the load in the Shelton Area is currently projected to exceed the 85% capacity level by the year 2012. This load exceeds 95% of the area capacity by 2017. Distribution load transfers are exhausted by the year 2014.

Figure 8 above shows that three out of the four substations in the area are above 85% of their ratings by 2015, which is the threshold level recommended by UI's Transmission and Distribution Substation Design and Rating Philosophy. Also, Indian Well Substation remains above 100% of its rating for the entire ten year planning period.

As the graphs above show, the projected load in the Shelton Area meets the UI's Transmission and Distribution Substation Design and Rating Philosophy requirements for new capacity to be installed in the area since three of the four substations in the region are projected to be above their 85% of capacity by 2015. Although the Shelton Region does not reach the 95% of capacity load level until 2017, the risk associated with the temporary operational procedure implemented at Indian Well Substation should be eliminated as soon as possible since a contingency condition during high load periods can result in load shedding and/or rolling blackouts to be implemented in order to avoid voltage collapse at this substation. The load in this area is approaching the 95% capacity value. The timing of reaching this limit has varied between 2014 and 2018 in the last three years and is greatly influenced by slight changes in load growth projections. Additionally, by 2015, reasonable feeder level solutions in the area will be exhausted and Indian Well Substation cannot be relieved any further. Therefore, a substation capacity addition project will be required in this region by the year 2015.

By 2021, the Shelton Area would require approximately 35 MVA of load relief or additional capacity in order to bring the total load in the area below the 85% of capacity level in accordance with UI's Transmission and Distribution Substation Design and Rating Philosophy.

5. Conclusion

UI needs a capacity addition to accommodate the load growth in the Greater Shelton Area and eliminate the risk associated with the temporary operational procedure implemented at Indian Well Substation. This load growth is projected to be approximately 37 MVA over the next ten years, and cannot be served by the Company's existing area substations. The lack of capacity in the Greater Shelton Area, especially at Indian Well and Trap Falls Substation, poses a major challenge to UI's ability to supply customers in this area. Therefore, it is not practical to expect these new loads to be served from either Trap Falls or Indian Well Substation without significant, additional load relief from other substations.

As noted previously, UI's Transmission and Distribution Substation Design and Rating Philosophy Standard states that construction of new capacity should be considered as a "solution to area capacity needs where the coincident peak load of two or more area substations having distribution ties have reached 85% of their summer normal capacity rating after exhausting all possible load transfers." As can be seen from Figures 7 & 8 above, the Greater Shelton Area load surpasses the 85 percent mark by the year 2012 and by the year 2015, three out of the four substations in the area are above the 85% of capacity load level . Additionally, no load transfers are feasible within the area after 2014. Accordingly, these factors satisfy the Company's Substation Design and Rating Philosophy Standard planning criteria. The preceding analysis clearly depicts that there is a capacity need for the Greater Shelton Area. It will be impractical to supply the new loads from the current substations in the area given the current loading conditions at these facilities.

Therefore, the Shelton Area requires additional 115/13.8 kV substation capacity to be in place by the year 2015, which is when three of the four substations exceed the 85% of capacity load level. However, temporary or short term distribution solutions must be developed and implemented before 2015 in order to keep the individual substations in the area below their firm ratings. The recommended capacity addition is necessary to enable the Company to provide safe and reliable service to customers in the coming years.

APPENDIX G

SHELTON SUBSTATION ALTERNATIVES

Shelton Substation Alternatives

June, 2012

By:

System Integrity

Transmission & Substation Engineering

The United Illuminating Company
Electric System Work Center
801 Bridgeport Avenue
Shelton, CT 06484-4714

Table of Contents

List of Figures

List of Tables

Executive Summary

This report analyzes the distribution solutions considered to address the capacity issues affecting the Greater Shelton Area, which were documented in the Shelton Area Capacity Analysis dated May, 2012. The report concluded that there is a projected capacity deficiency in the Greater Shelton Area by the 2015 summer peak. The United Illuminating Company ("UI" or the "Company") prepared this report based on Distribution Planning and Transmission and Substation Engineering Analysis. Ten potential distribution solutions were evaluated. These potential solutions considered are:

1. No Action
2. Distribution Load Transfers
3. Implement Conservation and Load Management Programs
4. Install Distribution Interconnected Generation (DG)
5. Replace (Increase Size of) Transformers at Indian Well and/or Trap Falls Substations
6. Installation of a Single 40 MVA 115 / 13.8 kV Transformer Distribution Substation along the Existing 115 kV Transmission Corridor.
7. Install a New Third 115/13.8 kV Transformer at the Existing Trap Falls Substation Site.
8. Install a New Third 115/13.8 kV Transformer at the Existing Trumbull Substation Site.
9. Install a New Third 115/13.8 kV Transformer and 13.8 kV Switchgear at Site Adjacent to Trap Falls Substation.
10. Build a New 115/13.8 kV Distribution Substation

These potential distribution solutions were evaluated based on economics and system performance (capacity, availability, and reliability) as well as engineering considerations. This evaluation concluded that only the construction of a new 115 kV/13.8 kV distribution substation in the Greater Shelton Area meets the long term capacity needs of the area safely and reliably. Two different sites were identified through a Site Selection Study and evaluated from an engineering perspective (Distribution Planning and Transmission & Substation Engineering) as potential locations for a new substation. These sites are:

1. Trap Falls, located at 102 Armstrong Road.
2. Old Stratford Road, located at 14 Old Stratford Road.

Both of these sites can accommodate an open air substation design compliant with UI's Transmission and Substation Design and Rating Philosophy, which states that the UI Standard Area Distribution Substation will be a two transformer substation that is expandable to three transformers. The sites are large enough to accommodate an additional third transformer in the future as well as two PDC's. However, the future expandability of distribution infrastructure to support the utilization of a three transformer substation represents a challenge at the Trap Falls site. In order to get the capacity out from this site with a three transformer substation would require routing a new ductline towards the back of the station and acquire the necessary land or rights of way to accomplish this since it would not be feasible to install a third ductline on an already congested Armstrong Road. Additionally, the Trap Falls site cannot accommodate future expansion to address transmission needs identified by the South West Connecticut (SWCT) Study Group. Underground infrastructure congestion is not an issue at the Old Stratford Road site since there are currently no UI ductlines installed on this road. The overall cost for the construction and distribution interconnection at the Trap Falls site is also significantly higher (approximately 29% higher) when compared to the cost at the Old Stratford Road site. Old Stratford Road is also closer to the assumed load center than the Trap Falls site. The Old Stratford Road site can also support future transmission expansion to accommodate potential proposed projects identified by the South West Connecticut Study Group.

Therefore, based on the preceding analysis, the Old Stratford Road site represents the most cost effective and reliable solution to address the Greater Shelton Area capacity need. This recommendation is based on an extensive review of distribution alternative solutions given below, which used different criteria to evaluate the two candidate sites in order to ensure the safe, reliable and economic operation of the UI transmission and distribution system.

1. Introduction

The Greater Shelton Area is projected to experience a combined load growth of nearly 37 MVA over the next ten years based on UI's Ten-Year Transmission & Substation Infrastructure Planning Study 2012 - 2021 and associated 90/10 Substation Level Load Forecast model with 2011 as the base year. The Greater Shelton Area is defined as the service area supplied by these four substations: Trap Falls, Indian Well, Ansonia and Trumbull. These substations serve mainly the municipalities of Shelton, Ansonia, Trumbull and Derby. A Capacity Analysis study for this area was completed in 2008 by UI's System Integrity Team and revised in May of 2012, which concluded that there will be a 115/13.8 kV distribution substation capacity need in the Greater Shelton Area by the 2015 summer peak. The study recommends the addition of substation capacity in this area, preferably close to the Route 8 corridor.

The results of the Needs Assessment study led to the commencement of this Solution Alternatives Study and a Site Selection Study. Various options were investigated to determine the best possible alternative to meet the capacity needs of the area.

This analysis evaluates the different alternatives considered by UI in order to address the load growth in the Greater Shelton Area. The following section presents ten potential solution alternatives that could possibly address this load growth. These alternatives were evaluated against seven different criteria and against each other. The section concludes with a discussion of the alternative(s) that meet the long term capacity needs of the area safely and reliably. Based on the results of this discussion, one viable solution is recommended for further engineering analysis. This viable solutions is, construct a new two (expandable to three) 115/13.8 kV transformer substation in the Greater Shelton Area.

The remaining sections discuss the engineering assessment of two alternative sites. These sites were identified through a Site Selection Study process, as two candidate locations with the highest potential for the installation of a new 115/13.8 kV substation. A Distribution Planning and Transmission & Substation Engineering assessment is then performed on these two potential sites. The Distribution Planning assessment for each site consists of the proposed distribution get-away route, distribution circuit routing, the load to be relieved by these circuits, the feeder one-line, and estimate to interconnect to these circuits. The Transmission & Substation Engineering assessment for each site includes the proposed scope of work, a summary of the estimate for the substation portion of the project at each site, the proposed substation layout and plot-plan. The discussion on each site concludes with a summary of the combined Distribution Planning and Transmission & Substation Engineering evaluation including a summary of the combined cost estimates for each site. Please note that this is strictly an engineering analysis of the two sites and does not consider environmental and/or social factors specific to these sites. Finally, a recommendation as to the preferred site for the construction of a new 115 kV/13.8 kV Shelton Substation is made based on the analysis mentioned above.

2. Potential Distribution Solution Alternatives

There were ten alternatives proposed to address the load growth and resulting distribution capacity need in the Greater Shelton Area. The list of alternatives evaluated includes the following:

a. No Action
b. Distribution Load Transfers
c. Implement Conservation and Load Management Programs
d. Install Distribution Interconnected Generation (DG)
e. Replace (Increase Size of) Transformers at Indian Well and/or Trap Falls Substations
f. Installation of a Single 40 MVA 115 / 13.8 kV Transformer Distribution Substation along the Existing 115 kV Transmission Corridor.
g. Install a New Third 115/13.8 kV Transformer at the Existing Trap Falls Substation Site.
h. Install a New Third 115/13.8 kV Transformer at the Existing Trumbull Substation Site.
i. Install a New Third 115/13.8 kV Transformer and 13.8 kV Switchgear at Site Adjacent to Trap Falls Substation.
j. Build a New 115/13.8 kV Distribution Substation

Evaluation Criteria

The options were evaluated based on economics and system performance (capacity, availability, and reliability) as well as engineering considerations. The list below represents the criteria used to evaluate and eliminate the different alternatives:

a. Maintain Substation Load Below Firm Rating
b. Physical Space (Existing Facilities)
    i. Clearances
    ii. Operability
c. Cost
d. Distribution Get-Aways
    i. Thermal Capacity
    ii. Congestion
e. Reliability – Strategic Measured Against a New Substation

A. No Action

The no action option is, as the name implies, take no action and maintain the status quo. The company must accept the risks and consequences associated with this option. This option assumes the possibility of shedding load during a transmission line contingency at Indian Well or upon loss of a substation transformer at Trap Falls or Indian Well during summer peak periods if the substation loading exceeds the remaining transformer thermal capacity. As discussed in the Capacity Analysis study, temporary operational procedures were put into place at Indian Well Substation after the substation was de-rated as a result of a voltage stability analysis. These temporary operational procedures were put in place to mitigate voltage collapse risks during high load levels. However, if a contingency condition occurs during high load periods, the company may be required to implement load shedding and/or rolling blackouts in order to avoid voltage collapse at this substation.

Failures of 115 / 13.8 kV substation transformers are rare events, however, it is worth noting that the actual probability of a transformer failure may be greater than the perceived failure rate, because the Trap Falls Substation transformers are over 40 years old. Additionally, one of the Trap Falls Substation transformers experienced problems with its load tap changing mechanism in 2006. A transformer failure with a “No Action” approach would have a significant impact to the overall System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI). UI is required to maintain reliability levels that existed on July 1998 according to Connecticut General Statutes §16-244i(d) and §16-245y(a). Load Shedding could also impact the economic vitality of the region.

The load forecast shows an approximate 13 MVA overload at Indian Well Substation by 2015. The identified and expected load growth for the Greater Shelton Area is growing at such a pace, that a no action option is unacceptable.

Evaluation Results:
Accepting the risk associated with the “No Action” option is not advisable and should be eliminated in this situation because it violates the following evaluation criteria:

1. Maintain Substation Load Below Firm Rating – this alternative results in an overload of 13 MVA at Indian Well and a regional load at 93% of total capacity by the 2015 summer peak.
2. Reliability – in case of a transmission system contingency or substation transformer failure, load shedding and/or rolling blackouts could be required, which would adversely impact reliability levels and in turn, customer satisfaction.

B. Distribution Load Transfers

Trap Falls and Indian Well Substations are expected to supply the majority of the load growth in the area and these substations require significant load relief. Therefore, the Distribution Load Transfers option involves transferring load from Indian Well and Trap Falls Substations to the other area substations via interconnecting circuits between these substations. This load can be transferred either through switching of overhead ties (assuming the circuits have sufficient capacity) or by constructing a new feeder from a neighboring substation (assuming open positions are available) to relieve one or more circuits from Indian Well and Trap Falls Substations.

The analysis in the body of the Shelton Area Capacity Analysis Report considered the four existing substations that supply the Greater Shelton Area (Trap Falls, Indian Well, Ansonia and Trumbull). The findings showed that Indian Well Substation is currently over its rating during high (summer) load periods. In an effort to relieve Indian Well Substation, permanent distribution load transfer projects have been implemented in the last three years from Indian Well Substation to other area substations, mainly Trap Falls Substation. Additional load transfer projects have been identified in the next two years to transfer load from Indian Well Substation to Ansonia Substation, which is the only substation in the area that has adequate available capacity. However, by 2015, these distribution load transfer solutions are exhausted and Indian Well Substation cannot be relieved any further and exceeds its rating due to the load growth in the area.

The increased load at Trap Falls Substation due to load transfers from Indian Well Substation and load growth in the area caused this substation to exceed the 85% of capacity mark. By the summer of 2015, the load at Trap Falls Substation is projected to be at 94% of its capacity. No additional load transfers are feasible within the area after 2014 without exceeding the substations’ firm ratings. By the end of the ten year planning horizon (2021), the load on both Trap Falls and Indian Well Substation exceed their respective capacity ratings while the load at Trumbull Substation exceeds 85% of its rating.

UI's Transmission and Distribution Substation Design and Rating Philosophy Standard states that construction of new capacity should be considered as a "solution to area capacity needs where the coincident peak load of two or more area substations having distribution ties have reached 85% of their summer normal capacity rating after exhausting all possible load transfers." With the exception of Ansonia Substation, the load on these area substations is projected to be over 85% of their firm ratings by 2015. The available capacity at Ansonia Substation is projected to be approximately 15 MVA or 75% of its firm rating by 2015, which is not sufficient to supply the load growth in the area. However, Ansonia Substation needs this available capacity in order to allow load growth in its own immediate service area. Also, Ansonia Substation, like Indian Well is located on the east side of the Housatonic River. As described in the Shelton Area Capacity Analysis, the existing ductline on Roosevelt Drive in Derby leading to the Housatonic River bridge crossing is heavily congested and cannot accommodate additional cables, which further limits the load transfer capability of this substation to the area of load growth.

Therefore, it is impractical to use adjacent substations to relieve Indian Well and Trap Falls since there is very limited available 115/13.8 kV distribution capacity at these substations. Feasible load transfer options are exhausted by the 2015 summer peak.

Evaluation Results:
This alternative does not meet the long term needs of the area. Distribution load transfers should only be considered as a stop gap measure and a short term alternative in the event that new capacity cannot be built in a timely manner to supply the projected load growth. If implemented, this option only cascades the distribution capacity deficiency problem to adjacent substations where such transfers are feasible.

Therefore, the distribution load transfers option is not a viable alternative and should be eliminated because it violates the following evaluation criteria:

1. Maintain Substation Load Below Firm Rating – by 2015 there are no additional load transfers feasible within this area.

C. Implement Conservation and Load Management Programs

Conservation and Load Management (C&LM) Programs are designed to reduce total energy usage on a utility's system by improving the efficiency with which energy is used by customers. UI has offered C&LM programs to its customers for over a decade. UI has long been a proponent of the benefits of C&LM activities and has developed a full complement of C&LM programs as part of Connecticut's restructured electric markets. The cumulative effects on the overall system of the programs are reflected in the load data that is used in developing the base case for the load forecast. The forecasted C&LM activity is included in identified customer load increases, system sales growth projections and the Economic Development Major Project Forecast. C&LM programs typically account for approximately 10 – 12 MVA per year, which is less than 1 MVA per substation on average and less than 1% of the total system peak load for a given year. The load reductions obtained from C&LM programs are usually canceled out by the system "background" growth. Therefore, this alternative does not provide sufficient capacity to accommodate the projected load growth identified in the Greater Shelton Area over the next ten years. Furthermore, these load reductions cannot be directly linked to specific substations, therefore load forecast projections at the substation level do not take into account C&LM load reductions. These programs are offered and implemented system wide and their net effect cannot be tied to a specific area. Also, the effectiveness of these programs cannot be guaranteed from year to year.

Evaluation Results:
As a result, C&LM programs are not a viable alternative and should be eliminated because it violates the following evaluation criteria:

1. Maintain Substation Load Below Firm Rating – the load reduction provided by C&LM programs is minimal and not sufficient to address the load growth in the area. Furthermore, these programs are implemented at a system level and cannot be directly linked to a specific area or substation.

D. Install Distribution Interconnected Generation (DG)

Distribution Interconnected Generation (DG) applications refers to technologies that are typically connected to a utility's distribution system located at or near the point of consumption. These DG units may vary from small solar panels on residences to multi-megawatt combined heat and power generators installed at commercial and industrial facilities. UI's forecast of DG includes only the new annual incremental increases from those base load units, in UI's service territory, that have received approval for grants under this legislation. Based on UI's Ten Year Peak Load Forecast 2012 – 2021 Report, the projected increase in DG is only 8.8 MW for the entire UI system. However, due to the volatile economic conditions and the cancellation of many planned projects in the past, UI assumed that only 50% (4.4 MW) of the currently planned DG capacity will be installed for the 2012-2021 TYP Forecast. UI currently has no known additional DG interconnections after 2012.

DGs could potentially be utilized to displace substation loading in some applications. However, UI does not include the peak-reducing capability of the existing larger DG units for its substation level forecast. The reason for this treatment is the lack of diversification at the substations level (small number, if any, of large DGs installed per substation). At the system level, DGs provide a more reliable diversified portfolio of generation output, as more DGs are installed in the territory. This lack of diversification at each substation amplifies the reliability impact of the each individual DG unit to their respective substation. Furthermore, UI must provide backup service to these sources in case these DG units are not available, which may be required at any time, including during system peak conditions. Therefore, UI cannot rely on these units operating at all times and must take this into account for capacity planning purposes. In order to supply the growing load in the area with DGs would require a significant number of units to achieve the sufficient, reliable capacity with the required diversity.

Additionally, there are technical issues that preclude the use of a DG solution in this specific application. For example, the existing available 13.8 kV short circuit levels at UI 115/13.8 kV substations are high and the available fault interrupting capabilities of UI substation equipment are near their limits. The addition of any sizable DG would contribute additional fault current which could cause equipment, such as circuit breakers and structural bracing, to be overdutied, possibly causing catastrophic damage to the equipment.

Evaluation Results:
Therefore, due to the reasons mentioned above, this option is not a viable alternative and should be eliminated because it violates the following evaluation criteria:

1. Maintain Substation Load Below Firm Rating – There amount of forecasted additional DG coming into the territory is 4.4 MW in the next ten years. Therefore, DG is not sufficient or a reliable option to provide capacity to supply the load growth in the area.
2. Reliability – the fault current issue of interconnecting to existing distribution facilities poses a major risk to the reliability of the equipment.

E. Replace Transformers at Indian Well and/or Trap Falls with Larger Units

The existing transformers at Indian Well and Trap Falls are 24/32/40 MVA and 30/40/50 MVA with a load cycle rating of 74.5 MVA and 76.78 MVA respectively. However, as mentioned in the Capacity Analysis Report, the capacity at Indian Well Substation is determined by their voltage stability limit, which is 49 MVA.

Replacing the transformers at Indian Well with larger and lower impedance units could potentially provide additional capacity for this area assuming that the transmission system in the area is also strengthened. This option was considered as it potentially offers a less costly alternative than a new, two (expandable to three) 115 kV / 13.8 kV transformer substation design. The option was also considered as a possible solution to expedite a substation capacity increase in the Greater Shelton Area since it would require significantly less local and state regulatory approvals and permitting compared to a new substation.

However, larger transformers would require a partial redesign of the 115 kV physical substation arrangements (move structures), as well as major 13.8 kV bus and feeder redesign in order for the added capacity to exit the substation. This option would also encroach upon the space reserved for the mobile transformer location. This would require the creation of a new space for the mobile transformer, increasing the size of the transformer foundation and the oil containment infrastructure. This work would require approximately four months of construction resulting in transformer unavailability for an extended period of time. The feeder redesign would entail significant distribution circuit get-away construction to allow the additional distribution substation transformer capacity to be utilized.

Even assuming a 70 MVA transformer could be installed and the additional capacity utilized, the marginal increase in firm rating for each substation would only be approximately 10-20 MVA. This capacity limitation is due to the 2,000 Amp current rating of the switchgear main buses, incoming main breakers, and incoming main transformer connections at both Trap Falls and Indian Well Substations. Current weaknesses in the transmission system in this area could also limit the additional capacity at these substations. Regardless, this additional capacity would not be sufficient since the projected load growth in the Greater Shelton Area is approximately 37 MVA over the next ten years.

There are also space considerations at Indian Well and Trap Falls Substations. Review of the current substation layout drawings for both Trap Falls and Indian Well Substations indicate that this alternative is not viable due to the physical layout of the existing facilities. Additionally, Trap Falls and Indian Well Substations currently have no spare 13.8 kV breaker positions available.
The use of lower impedance transformers may also introduce arc flash concerns at Indian Well Substation due to the increase in short circuit levels.

Evaluation Results:
In summary, the Replacement of the Transformers at Trap Falls and/or Indian Well with Larger Units option is not a viable alternative and should be eliminated because it violates the following evaluation criteria:

1. Maintain Substation Load Below Firm Rating – although the bigger transformers would provide additional capacity at these substations, this would not be sufficient to supply the forecasted load growth in the area due to a weak transmission system.
2. Physical Space – there are a number of space issues due to the physical layout of the existing facilities at Trap Falls and Indian Well Substations.

F. Installation of Single 40 MVA 115 kV / 13.8 kV Transformer along the 115 kV Transmission Corridor

Under this alternative, a single 40 MVA 115/13.8 kV transformer would be installed along the existing transmission corridor that extends between Trap Falls Substation and Derby Junction. However, according to UI's Transmission and Distribution Substation Design and Rating Philosophy, the UI Standard Area Distribution Substation will be a two transformer substation that is expandable to three transformers. Additionally, UI has historically followed what is known as an "N-1" design criterion. This means that UI customers would not experience an outage (other than perhaps a momentary outage) for serious single contingency events such as the failure of a 115 kV/13.8 kV transformer or loss of a transmission line. The capacity planning criteria for new substations herein maintains UI's requirement to not shed load for the loss of a substation power transformer or transmission line.

Since there is no 115/13.8 kV transformer redundancy, this option is less reliable than a new standard substation. In the event of a substation transformer failure, there would be a prolonged outage for the customers served from this transformer. Therefore, the installation of a 50 MVA single 115/13.8 kV Transformer along the 115 kV Transmission Corridor option violates UI's Transmission and Distribution Substation Design and Rating Philosophy. A single 40 MVA transformer substation also has less capacity than the standard two 115 kV / 13.8 kV transformer (expandable to three) substation design. Although this option is less costly than UI's standard two 115 kV / 13.8 kV transformer (expandable to three) substation design, and requires the procurement of less land than a new substation, it would require approximately the same design, permitting and construction time frame as a new substation.

Evaluation Results:
Therefore, the 40 MVA Single 115 /13.8 kV Transformer option is not a viable alternative and should be eliminated because it violates the following evaluation criteria:

1. Reliability – as stated above, this alternative violates UI's Transmission and Distribution Substation Design and Rating Philosophy and the N-1 design criterion. In the event of a substation transformer failure there would be a prolonged outage for the customers served from this transformer since there is no substation transformer redundancy.

G. Install a New Third Transformer at Existing Trap Falls Substation Site

The new third 115/13.8 kV transformer would be installed within the fenced area of the existing Trap Falls site. The MVA rating of the new transformer would be a 30/40/50 MVA and could potentially achieve a load cycle rating similar to the existing Trap Falls Substation transformers' firm rating.

The addition of a 115/13.8 kV third transformer of any size at Trap Falls, could change the limiting factor and firm rating of the substation from 76.78 MVA to the two incoming 2,000 Amp breakers, which could provide a maximum capacity of 96 MVA (2,000 A * 13.8 kV * Sqrt(3) * 2). Therefore a third transformer of any size at Trap Falls has the potential to increase the firm rating of the substation from 76.78 MVA to a maximum of 96 MVA, which would provide an additional capacity of approximately 20 MVA due to the 2,000 Amp switchgear limiting factor. However, Transmission Planning has not analyzed this scenario at Trap Falls Substation and the risk of voltage collapse with this added capacity. Also, the projected load growth in the Greater Shelton Area is approximately 37 MVA over the next ten years; therefore the additional capacity that a third transformer provides is not sufficient to supply this load.

Significant distribution underground work would also have to be done on Armstrong Road in order to get the additional distribution out from this site. In order to install a new ductline on Armstrong Road, a water main would have to be relocated and the existing ductline would have to be modified in order to build the get-away ductline out towards Old Stratford Road.

There is also not enough physical space within the existing fenced area to install a third transformer, connect it to the existing switchgear and maintain required clearances to the perimeter fence. The new third 115/13.8 kV transformer, associated 115kV terminal structure, 115kV bus and switches and 13.8 kV power distribution center (PDC) with metalclad switchgear, would have to be installed within an expanded fenced area to the east of the existing Trap Falls site. However, expanding the fence at this site and redesigning the 115 kV infrastructure is not possible due to limited space and different elevation of the adjacent site, which is approximately 10 feet higher than the Trap Falls site.

Evaluation Results:
Therefore, the installation of a new third 115/13.8 kV transformer at the existing Trap Falls Substation is not a viable alternative and should be eliminated because it violates the following evaluation criteria:

1. Maintain Substation Load Below Firm Rating – like the larger transformer option, a third transformer at Trap Falls Substation would provide an additional capacity of 20 MVA which is not sufficient to supply the forecasted load growth in the area.

2. Physical Space (Existing Facilities) – there is a number of space and elevation issues due to the physical layout of the existing infrastructure at Trap Falls Substation. The construction of a new third transformer would require significant redesign and rebuild of the existing 115 kV facilities which is not feasible within the existing fenced area.

H. Install a New Third Transformer at Existing Trumbull Substation Site

The new third 115/13.8 kV transformer would be installed within the area of the existing Trumbull site. The MVA rating of the new transformer would be a 30/40/50 MVA and could potentially achieve a load cycle rating higher than the existing Trumbull Substation transformers' firm rating.

The addition of a 115/13.8 kV third transformer of any size at Trumbull, could change the limiting factor and firm rating of the substation from 64.78 MVA to the two incoming 2,000 Amp breakers, which could provide a maximum capacity of 96 MVA (2,000 A * 13.8 kV * Sqrt(3) * 2). Therefore a third transformer of any size at Trumbull Substation has the potential to increase the firm rating of the substation from 64.78 MVA to a maximum of 96 MVA, which would provide an additional capacity of approximately 31 MVA due to the 2,000 Amp switchgear limiting factor. However, Transmission Planning has not analyzed this scenario at Trumbull Substation and the risk of voltage collapse with this added capacity.

The installation of the new third 115/13.8 kV transformer would also require the addition of a 13.8 kV power distribution center (PDC) with metalclad switchgear in order to create more feeder positions since there not sufficient spare feeder positions left at Trumbull Substation buses. The third transformer would also require a115kV terminal structure and 115kV bus and switches.

In order to get the additional capacity out of this substation an additional ductline would have to be built from the substation site out to Nichols Avenue. The ductline would then have to be extended south on Nichols Avenue towards Hawley Lane. Most of the new circuits would have to follow this get-away route to reach the load center since the ductline and pole line on Nichols Ave north of State Route 8 is becoming congested with the existing feeders from Trumbull Substation. The distribution interconnection cost from this site would be significant due to the amount of new ductline construction and the amount of cable that would be required for the get-away from the substation site and to reach the load center. The assumed load center is approximately 27,300 ft. (5.2 miles) away from Trumbull Substation.

The installation of a new third 115/13.8 kV transformer at Trumbull Substation would represent a costly, short term stop gap that would only delay the capacity need by a few years. The projected load growth in the Greater Shelton Area is approximately 37 MVA over the next ten years; therefore the additional capacity that a third transformer provides is not sufficient to supply this load.

Evaluation Results:
Therefore, the installation of a new third 115/13.8 kV transformer at the existing Trumbull Substation is not a viable alternative and should be eliminated because it violates the following evaluation criteria:

1. Maintain Substation Load Below Firm Rating – A third transformer at Trumbull Substation would provide an additional capacity of 31 MVA which is not sufficient to supply the forecasted load growth in the area.

2. Cost – As mentioned above, the installation of a third 115/13.8 kV transformer at Trumbull would represent a costly short term solution. This is due to the significant substation work required to interconnect the transformer as well as the UG infrastructure that would have to be built to get the capacity out of this site and the amount of cable to be installed to reach the load center.

I. Install a New Third 115/13.8 kV Transformer and 13.8 kV Switchgear at Site Adjacent to Trap Falls Substation

This option is similar to installing a third transformer at the Trap Falls Substation site, which was determined not to be physically possible while observing required clearances to the existing fence. The difference with this alternative is that the third 30/40/50 MVA 115/13.8 kV transformer would be installed on the site adjacent to the existing Trap Falls Substation, which is owned by UI. Additionally, in order to utilize the full capacity of the third transformer (72 MVA) the existing 13.8 kV switchgear at Trap Falls would have to be upgraded from its existing 2,000 amp rating to a 3,000 amp rating.

The third transformer and switchgear design option at the site adjacent to Trap Falls should be considered as a separate 115 kV line terminal/transformer/power distribution center arrangement. Construction of the third transformer at this site with a direct 115 kV bus connection would require extensive site preparation work including blasting and drilling in order to bring the level of the adjacent site down to the level of the existing Trap Falls Substation. Approximately 10 feet of rock would have to be removed. Additionally, the difference in elevation may cause problems in the construction of the required 13.8 kV ductline to connect the third transformer to the existing Trap Falls Substation.

A direct bus connection would also require extended transmission line outages to complete since it requires modifications to the existing 115 kV buses at Trap Falls Substation. This would jeopardize the reliability of the customers supplied from this substation. As an alternative to reduce the amount of site work required and reduce the transmission outage time, the transmission interconnection to the third transformer could be constructed as a short transmission line span that would circumvent the difference in grade (elevation) levels between the sites. Although this reduces the site work, it does require the addition of a 115 kV line terminal structure.

As mentioned above, the third transformer addition would also require replacing the existing 13.8 kV Trap Falls 2,000 amp rated switchgear with 3,000 amp rated switchgear in order to achieve the required capacity output of the transformer and meet the load growth requirement in the area as discussed above. The existing Trap Falls Substation switchgear main buses, incoming main breakers, and incoming main transformer connections have a 2,000 amp continuous current rating. This equates to 48 MVA[1] per transformer position. The firm rating of a substation is typically based on the single contingency loss of one transformer for an extended time period. Therefore, for a three transformer arrangement utilizing the existing 13.8 kV switchgear, the substation firm rating would be: 48 MVA + 48 MVA= 96 MVA. In order to achieve the higher substation capacity level with three 30/40/50 MVA 115/13.8 kV transformers interconnected at Trap Falls, both of the entire existing 13.8 kV switchgear line-ups must be replaced with switchgear rated for 3,000 amp continuous current. The new 13.8 kV switchgear for the third transformer would require a 3,000 amp continuous current rating as well. This would increase the substation's firm rating from 96 MVA to a maximum of 72 MVA + 72 MVA=144 MVA[2]. Please note that Transmission Planning has not analyzed this scenario at Trap Falls Substation and the risk of voltage collapse with this added capacity. Due to a weaknesses in the transmission

[1] *48 MVA = (2,000 Amps * 13.8 kV * Sqrt(3))*
[2] *72 MVA = (3,000 Amps * 13.8 kV * Sqrt(3))*

system in this area, the full expected capacity of the three 50 MVA transformers may not be achievable at this site.

Essentially, upgrading the existing switchgear at Trap Falls requires the decommissioning and reconstruction of each existing individual line-up of 13.8 kV switchgear while the associated 13.8 kV circuits are transferred somewhere else. This effort would require transferring the load of each 13.8 kV bus (8 circuits per bus) simultaneously to other 115/13.8 kV substations in the area during the construction period, assuming alternative substation (other than Trap Falls) 13.8 kV overhead circuit ties exist. However, there are currently six circuits from Trap Falls that are direct feeds to major customers and therefore have no alternative substation 13.8 kV overhead circuit ties, thus these circuits cannot be backed up from an alternate substation. Additionally, as described in the Capacity Analysis Report, available capacity in the area is very limited and backing up eight circuits from Trap Falls Substation at once would represent a significant challenge even if the necessary ties exist. Transferring this much load to other substations represents a significant challenge and would use up many contingencies for an extended period of time and would jeopardize the reliability of the customers supplied from these substations.

This situation is not acceptable from a reliability standpoint because it places considerable reliability risk for an extended period of time upon UI customers in the Greater Shelton Area.

The scope of work is summarized below:

Scope of Work
The scope of work for the transmission portion of the new third transformer at Trap Falls includes the following:

- The reconfiguration and relocation of the existing 115 kV transmission line tap at Trap Falls Substation to connect the new 115/13.8 kV transformer to the transmission system.
- The installation of one 115 kV tie breaker, one new 115 kV line terminal, one transformer position and new 115 kV interconnecting bus.

The scope of work for the distribution portion of the third transformer at Trap Falls includes the following:

- The installation of one 115/13.8 kV 30/40/50 MVA Load Tap Changer (LTC) transformer.
- The installation of (2) power distribution centers with 3,000 Amp 13.8 kV metal clad switchgear each including one main breaker, one tie breaker and (10) circuit breaker positions.
- Complete replacement of (2) line-ups of 13.8 kV metal clad switchgear including (4) transformer breakers and (16) circuit breaker positions at the existing Trap Falls Substation in order to attain the required switchgear rating change from 2,000 Amps to 3,000 Amps.
- Build (2) new 13.8 kV main tie buses to connect the existing 13.8 kV main buses at Trap Falls to the new 13.8 kV main buses associated with the new third transformer.

The construction timeline for this effort would be approximately three and a half years. The transmission, new transformer, new buses and PDC's construction duration is estimated to be approximately two years. The switchgear upgrade at Trap Falls and the distribution feeder cutovers would add approximately one and a half years to the overall project[3]. Therefore, the timeline for the entire project (transmission, substation and distribution) would extend beyond the required in-service date to serve the load growth in the area. If construction work for this project was to begin by early 2013, the project would be completed approximately by mid-2016. This can be compared with the original in-service need date of summer 2015 for the required capacity.

Evaluation Results:
This is a complex, risky, and costly alternative, which does not meet the need date schedule to address the capacity deficiency in the Greater Shelton Area. Furthermore, this alternative poses a reliability risk to the customers that would be supplied by the new third transformer at this site since it is not feasible to tie the Trap Falls 13.8 kV buses to the third transformer 13.8 kV buses or transfer the load to other area substations.

Therefore, the installation of a new third 115/13.8 kV transformer at the site adjacent to Trap Falls Substation along with upgrading the existing 2,000 amp switchgear to 3,000 amp is not a viable alternative and should be eliminated because it violates the following evaluation criteria:

1. Maintain Substation Load Below Firm Rating – This alternative would result in a loading of approximately 122% at Indian Well Substation, 94% at Trap Falls Substation and a regional capacity loading of 93% by the 2015 summer peak. The required substation capacity addition date of summer 2015 cannot be achieved because this alternative requires approximately 3 and a half years for completion.

2. Reliability – The inability to tie the 13.8 kV buses between the third transformer and Trap Falls Substation during construction or transfer the load to other area substations poses a reliability risk for the customers to be supplied by the new third transformer because loss of this transformer would cause large blocks of load to be dropped for an extended period of time until a mobile transformer can be brought to the site and connected. Furthermore, it is not possible to transfer the load from all the Trap Falls circuits to other substations during construction since Trap Falls has six dedicated feeders that supply large customers with no backups from other substations.

3. Physical Space (Existing Facilities) – The new transformer installation would require ties between the existing 13.8 kV buses from Trap Falls to the new third transformer 13.8 kV buses. However, there is no physical space or available breaker positions at the existing Trap Falls switchgear building to create these 13.8 kV ties.

J. Build A New 115 kV / 13.8 kV Distribution Substation

A new 115/113.8 kV distribution substation would be installed on the existing transmission corridor between Trap Falls Substation and Derby Junction, preferably along the Route 8 corridor. This would

[3] The one year and a half time frame is based on: 6 months of civil work construction and 13.8 kV duct bank construction, plus 6 months per 13.8 kV bus (2) for circuit cutovers and P&C work (3 weeks per circuit and 8 circuits per bus), plus 6 months of down time for high load periods. .

be a two 115/13.8 kV 30/40/50 MVA transformer (expandable to three) substation, along with a 3,000 Amp switchgear rating.

This option is consistent with UI's Transmission and Distribution Substation Design and Rating Philosophy. The proposed substation would initially provide 72 MVA of additional capacity with 30/40/50 MVA transformers to the Greater Shelton Area. The use of 30/40/50 MVA transformers for the initial build out would provide 144 MVA of total capacity when the substation is expanded to three transformers. This would allow the company to stay ahead of the load growth requirements in the area.

This alternative is also consistent with the "N-1" design and planning criterion mentioned before, which means that UI customers would not experience an outage (other than perhaps a momentary outage) for serious single contingency events such as the failure of a 115 kV/13.8 kV transformer. The capacity planning criteria for new substations herein maintains UI's requirement to not shed load for the loss of a substation power transformer or transmission line.

A new 115/13.8 kV distribution substation will need to go through local and state approvals and permitting. The estimated time frame to construct a new substation is normally three to four years. This option also has the potential to improve the reliability of the area by decreasing the size and exposure of the circuits assuming it is built relatively close to the load growth. It is assumed that underground facilities congestion and/or thermal capacity issues for the distribution get-away are not a concern. The distribution get-away from a new substation would consist of two new ductlines along with new required splicing chambers.

Evaluation Results:
This alternative provides sufficient capacity to meet the load growth in the Greater Shelton Area safely and reliably and therefore represents a viable solution. This alternative is also consistent with UI's Substation Design and Rating Philosophy as well as UI's "N-1" design and planning criterion. This solution would provide sufficient capacity margin for Trap Falls and Indian Well Substations as well as the Greater Shelton Area for the next ten years.

K. Recommendations

The Greater Shelton Area Capacity Analysis concluded that new capacity is required in this area by the 2015 summer peak due to the large projected load growth. There were 10 alternatives evaluated in the preceding sections. These alternatives were evaluated against a set of given criteria as well as each other. With the exception of one, these alternatives do not address the load growth in the Greater Shelton Area to allow the substations in the area to remain below their firm ratings and/or they present a reliability risk to the system. The one alternative that does address the capacity problem in the area reliably and is therefore a viable solution is a new 115/13.8 kV two transformer (expandable to three) substation in the Greater Shelton Area, preferably along the Route 8 corridor.

Therefore a new two 115/13.8 kV 30/40/50 MVA transformer (expandable to three) substation is recommended to be built in Shelton, preferably in a location along the Route 8 corridor. The use of 30/40/50 MVA transformers is recommended in order to obtain a higher capacity margin in the area from the initial build out of the substation and delay capital spending in the future for the installation of the third transformer. This solution is consistent with UI's Transmission and Distribution Substation Design and Rating Philosophy and the solutions identified in UI's 10 - Year Transmission and Substation Infrastructure Plan. This option is the best long term solution that will allow the company to safely and reliably meet the forecasted high load demand in the Greater Shelton Area.

3. Engineering Assessment of Viable Solution

A. Required Load Relief

The new substation should provide load relief to Trap Falls and Indian Well Substations since these two substations have or are projected to have capacity deficiencies in the near future. The approximate location of the load center is along Bridgeport Avenue at the intersection of Long Hill Cross Road. This location is assumed to be located, for the purpose of this analysis, approximately in the middle of the supplies from Trap Falls and Indian Well Substations. The load relief to these substations should be a minimum of 15% of their respective firm ratings in accordance with UI's Transmission and Distribution Substation Design and Rating Philosophy described in prior sections[4]. Table 1 below shows the base (2011) and projected load at Trap Falls and Indian Well Substations from 2011 – 2015 (based on the Shelton Capacity Analysis) as well as the load relief required to bring each substation to 85% of their firm ratings.

Table 1: Indian Well & Trap Falls Load Relief Requirements

Substation Load / Year	2011 (MVA)	2012 (MVA)	2013 (MVA)	2014 (MVA)	2015 (MVA)
Trap Falls Firm Rating	76.78	76.78	76.78	76.78	76.78
Trap Falls Load	66.03	68.87	69.37	70.65	72.18
Required Relief @ 85% of Rating	**0.78**	**3.61**	**4.11**	**5.39**	**6.92**
Indian Well Firm Rating	49.00	49.00	49.00	49.00	49.00
Indian Well Load	56.52	53.71	54.64	58.44	59.66
Required Relief @ 85% of Rating	**14.87**	**12.06**	**12.99**	**16.79**	**18.01**

As Table 1 above shows, in order to reduce the peak load at Trap Falls and Indian Well Substation to at least 85% of their firm ratings by 2015, a minimum of 7 MVA and 18 MVA of load must be transferred from Trap Falls and Indian Well Substations, respectively.

B. Shelton Substation Site Considerations

In order to meet the distribution capacity need in the Greater Shelton Area, the new 115/13.8 kV substation must be located so as to interconnect to the transmission system, and to provide reasonable access to existing distribution lines or to be situated in locations where new access could be cost

4 The capacity planning criteria for new substations herein maintains UI's requirement to not shed load for the loss of a substation power transformer or transmission line. Construction of a new substation should also be considered as solution to area capacity needs where the coincident peak load of two or more area substations having distribution ties have reached 85% of their summer normal capacity rating after exhausting all possible load transfers. A prudent time to plan major substation additions or new substations should begin when the load on a substation or in an area is at approximately 85% of its summer normal capacity rating.

effectively developed to reach existing and projected load areas. The factors used to assess the potential sites were:

1. Location of potential sites in relation to the load center. The Shelton Area Capacity Analysis determined that the primary areas of load growth in Shelton are in the southern portion of the City, generally in the vicinity of State Route 8 and along the Bridgeport Avenue corridor.

2. Location of potential sites in relation to existing distribution infrastructure such as ductlines and pole lines. For distribution interconnection, sites are typically preferred that are near existing uncongested distribution infrastructure or in areas where new distribution infrastructure could be economically constructed to supply the load center. Sites that are not near suitable distribution infrastructure would require the development of new distribution interconnections. In certain areas, the construction of new distribution infrastructure is constrained by land uses, physical limitations or by the presence of other utilities (which can limit options for the routing of either overhead or underground distribution lines).

3. Availability of land for development of a distribution substation. The required area for an air insulated "distribution only" substation, meaning a substation supplied by two transmission lines with one transmission tie circuit breaker and appropriate buffers and setbacks, is 1.5 to 2 acres. UI's general preference is to identify sites that are presently undeveloped or available for redevelopment.

4. Location of the substation near reliable transmission supply sources. The location of a substation close to multiple transmission line corridors provides for connection to multiple lines, thereby increasing supply redundancy and system reliability. Potential substation sites that are not situated near the existing 115 kV transmission corridors would have to be connected to these lines and thus would require the development of new overhead or underground transmission line interconnections, on new rights-of-way.

Based on the considerations given above and consistent with the development of a Site Selection Study, there were two sites identified for further evaluation from an engineering perspective (Distribution Planning and Transmission & Substation Engineering). These sites are,

- Trap Falls, located at 102 Armstrong Road.
- Old Stratford Road, located at 14 Old Stratford Road.

These sites are both UI owned.

C. Shelton Substation Distribution Planning Engineering Assumptions

The load to be transferred from each feeder was determined based on the July 2011 summer peak as well as any load transfers that have occurred after 2011 and have affected feeders from this area's substations. It is assumed that the load from the entire circuits would be transferred for each site, thus the actual load to be relieved from Trap Falls and Indian Well might be higher than the required load as stated in Table 1. This analysis only assumes load carrying circuits (i.e. no unloaded or dedicated backup circuits with the exception of circuits supplying large commercial customers). It is assumed that the original supply circuits (cables) will remain in place and be used to provide backup to the new circuits or may remain in place carrying a small portion of their original load. Ductline rating analysis was not performed for the two sites evaluated. With the exception of the Trap Falls site, the evaluation assumes two new 6X2 5” PVC ductlines exiting from the substation site initially. This would allow an initial maximum of eight circuits to exit from the substation with a potential total circuit capacity of 80 MVA (eight circuits times 10 MVA per circuit). To fully utilize the potential capacity of a three transformer substation, an additional ductline would be required to minimize thermal heating and maximize circuit capacity. All cost estimates are based on 2012 dollars.

D. Shelton Substation Transmission & Substation Engineering Assumptions

The substation design is based upon UI’s standard design criteria. The 115 kV portion of the substation will be built as an air-insulated switchyard. The substation firm rating will be 72 MVA (two 30/40/50 MVA transformers). The substation will be designed so that it can be expanded in the future to a three transformer, 144 MVA firm rating design. The Substation will operate with secondary bus ties opened, and will have a fast bus transfer scheme in the event of the loss of a single transformer. The substation switchgear and control buildings will be of a prefabricated design. The switchgear will be rated at 3,000 Amps and will be located in two separate power distribution center (PDCs) buildings and the high voltage control room will be located in a separate prefabricated control building. The project will be executed on an Engineer Procure and Construct (EP&C) basis. An 8’ chain link fence topped with 1’ of barbed wire has been assumed as the perimeter fencing. No environmental contamination of these substation sites has been assumed. No approvals other than local and CSC are required. All cost estimates are based on 2012 dollars. The following figure represents the generic one-line diagram for Shelton Substation that would be constructed at one of the two sites mentioned previously.

Shelton Substation One-Line

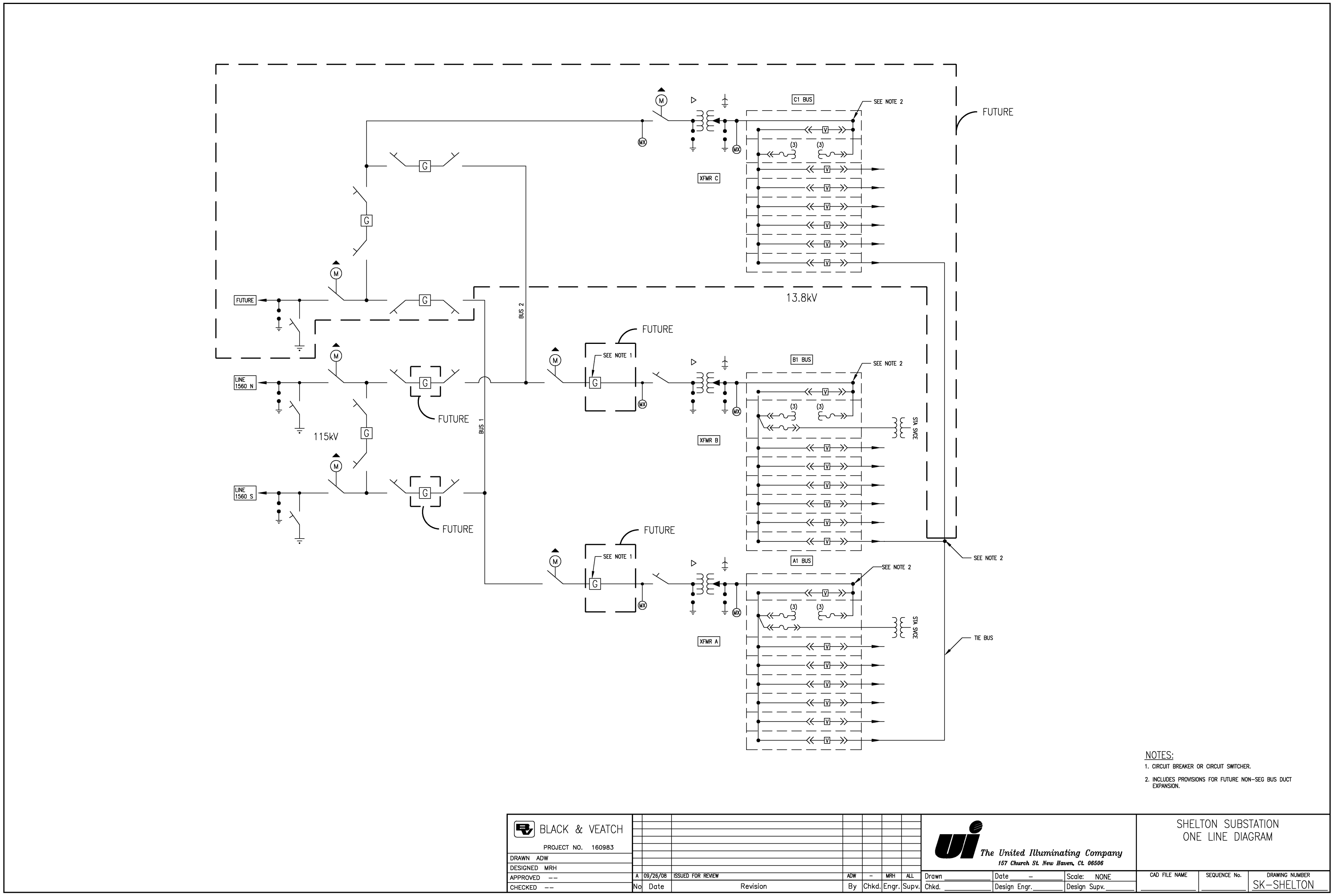


Figure 1: Shelton Substation Generic One-Line

UI's Transmission Planning Group analyzed a total of 15 different scenarios for a 115/13.8 kV substation to be connected to theexisting transmission corridor at various locations in the Greater Shelton Area. The impact of connecting a new 115/13.8 kV substation to each of the transmission lines in this corridor was evaluated. The study concluded that a new 115/13.8 kV substation in the Greater Shelton Area can be connected to the easternmost transmission line anywhere between, and including Trap Falls and Derby Junction with no adverse effect on the rest of the system[5].

4. Engineering Assessment of Site #1 – Trap Falls

A. Distribution Planning Analysis for Site #1 – Trap Falls

General Description

Trap Falls is owned by UI and located immediately adjacent to the existing Trap Falls Substation at 102 Armstrong Road in Shelton. The full lot is 3.1 acres but a large portion of the area is dedicated to the existing Trap Falls Substation. The remaining available area for a new substation is approximately 2.5 acres. This site is on the east side of Route 8, approximately 7,000 ft. from the assumed distribution load center. The new substation is proposed to have an initial capacity of 72 MVA with the potential to be expanded to 144 MVA with the installation of a third transformer in the future. However, to fully utilize this potential available capacity requires the availability of the distribution infrastructure (underground and overhead) to support the load. The underground path on Armstrong Road from Trap Falls Substation to Warner Hill Road /Old Stratford Road is currently occupied by one 8 duct 5" PVC UI ductline and splicing chamber system as well as City storm sewers. A feasibility analysis of installing a second ductline on Armstrong Road was performed by System Integrity, Distribution Infrastructure and Project Management. The analysis consisted of a review of UI's existing underground facility plans as well as existing foreign utility plans on this road. The analysis concluded that a new 8-duct 5" PVC ductline can be constructed on Armstrong Road toward Old Stratford Road, however, the existing ductline would have to be modified and a water company main pipe would have to be relocated. The relocation of the water main would cost approximately $1.5 million and would require approximately four weeks of construction based on preliminary estimates from the water company. However, in order to get the capacity out from this site with a three transformer substation would require routing a new ductline towards the back of the station either towards Daybreak Lane or Partridge Lane and acquiring the necessary land or rights of way to accomplish this, since it would not be feasible to install a third ductline on an already congested Armstrong Road.

Distribution Get-Away

The distribution get-away from the substation at this site is assumed to be one new ductline from the substation property exiting to a new splicing chamber located on Armstrong Road directly in front of the new substation. The new ductline would then extend northeast on Armstrong Road approximately 1,100 ft. to Old Stratford Road parallel to the existing ductline and southwest approximately 600 ft. to James Farm Road. From Old Stratford Road, two new ductlines would extend northwest approximately 4,000 ft. to the intersection of Old Stratford Road and Bridgeport Avenue.

---

[5] For a summary of the studies performed by UI's Transmission Planning, please see the MS Power Point Presentation titled "Shelton 115/13.8 kV Substation/Naugatuck Valley: Review and Evaluation of Alternatives and Study Results, dated July 25, 2008.

Underground laterals would be installed from the new splicing chambers in front of the substation. This would enable the underground get-away cables to rise and directly supply the existing 13.8 kV open wire distribution circuits in front of the substation or to transition to aerial cable and splice into the existing aerial cables feeding in either direction in front of the substation.

In addition to the new ductline installation, approximately five new splicing chambers would be required in the roadway on Armstrong Road to the intersection of Old Stratford Road and 10 new splicing chambers in the roadway on Old Stratford Road to the intersection of Old Stratford Road and Bridgeport Avenue. Underground laterals would also be installed from the new splicing chambers at the intersections of Armstrong Road and Old Stratford Road, Armstrong Road and James Farm Road, and Old Stratford Road and Bridgeport Avenue. These laterals will enable circuits to rise to open wire or aerial cable from these locations and supply overhead distribution circuits south on James Farm Road, on Old Stratford Road in both the north and south directions and on Bridgeport Avenue in the northeast and southwest directions.

Initial Distribution Circuit Routing

New Circuit for Indian Well Circuit 501 and Indian Well Substation Relief:
Start with 750 EPR underground cable in the ductline from the substation breaker to the new splicing chamber in front of the substation (150 ft.). Continue the 750 EPR underground cable in the new ductline on Armstrong Road to Old Stratford Road (1,100 ft.) and then from Old Stratford Road to Bridgeport Avenue (4,000 ft.). Rise to 500 AL EPR aerial cable on Bridgeport Avenue and run the aerial cable on Bridgeport Avenue to Long Hill Cross Road (2,000 ft.). Continue the 500 AL EPR aerial cable on Long Hill Cross Rd. to the Route 8 overpass (2,000 ft.). Transition from 500 AL EPR aerial cable to 500 EPR underground cable on Long Hill Cross Road for the Route 8 overpass (500 ft.) and back to 500 AL EPR aerial cable to Forest Parkway (800 ft.). Run the 500 AL EPR aerial cable north along Forest Parkway (1,200 ft.) and rise to the existing 397 AL open wire with a new normally closed Air Break Switch (ABS) and pick up the entire load from Indian Well Circuit 501.

Note: The Forest Parkway load needs to be transferred from Trap Falls Circuit 3546 back to Indian well Circuit 501 by closing the ABS on P.842 and opening the ABS on P.846 Long Hill Avenue. Also, currently there is no pole line on Forest Parkway north of Long Hill Cross Road. The existing pole line on Forest Parkway will be extended north of Long Hill Cross Road.

New Circuit for Indian Well Circuit 503 and 510 and Indian Well Substation Relief:
Start with 750 EPR underground cable in the ductline from the substation breaker to the new splicing chamber in front of substation (150 ft.). Continue the 750 EPR underground cable in the new ductline on Armstrong Road to Old Stratford Road (1,100 ft.) and then from Old Stratford Road to Bridgeport Avenue (4,000 ft.). Rise to 500 AL EPR aerial cable on Bridgeport Avenue and run the aerial cable on Bridgeport Avenue (12,500 ft.) north of Kneen St. and rise to the existing 397 AL open wire with a new normally closed air break switch and pick up the entire load from Indian Well Circuit 503 and Circuit 510.

Note: This requires picking up a portion of the load of Trap Falls Circuit 3551 on Bridgeport Avenue, but reduces the amount of aerial cable required. A portion of Trap Falls Circuit 3551 will be tied to Indian Well Circuit 503 by closing the ABS on P.6024 and Circuit 503 will be tied to Circuit 510 by closing the ABS on P.191 Bridgeport Avenue.

New Circuit for Indian Well Circuit 516 and Indian Well Substation Relief:
Start with 750 EPR underground cable in the ductline from the substation breaker to the new splicing chamber in front of substation (150 ft.). Continue the 750 EPR underground cable in the new ductline on Armstrong Road to Old Stratford Road (1,100 ft.) and then from Old Stratford Road to Bridgeport Avenue (4,000 ft.). Rise to 500 AL EPR aerial cable on Bridgeport Avenue and run the aerial cable on Bridgeport Avenue to Long Hill Cross Road (2,000 ft.). Continue the 500 AL EPR aerial cable on Long Hill Cross Rd. to the Route 8 overpass (2,000 ft.). Transition from 500 AL EPR aerial cable to 500 EPR underground cable on Long Hill Cross Road for the Route 8 overpass (500 ft.) and back to 500 AL EPR aerial cable to Long Hill Avenue (3,600 ft.). Continue the 500 AL EPR aerial cable on Long Hill Avenue north of Long Hill Cross Road to the intersection of South Constitution Boulevard (6,100 ft.). Continue the 500 AL EPR aerial cable on South Constitution Boulevard southeast of Long Hill Avenue passed Waterview Drive (5,000 ft.). Rise to the existing 397 AL open wire on South Constitution Boulevard with a new normally closed air break switch and pick up the entire load from Indian Well Circuit 516.

New Circuit for Trap Falls Circuit 3543 and Trap Falls Substation Relief:
Start with 750 EPR underground cable in the ductline from the substation breaker to the new splicing chamber in front of substation (150 ft.). Use one of the new laterals from the new splicing chamber in front of the substation (150 ft.) and rise to the existing 397 AL open wire on Armstrong Road with a normally closed air break switch picking up the entire load from Trap Falls Circuit 3543.

New Circuit for Trap Falls Circuit 3546 and Trap Falls Substation Relief:
Start with 750 EPR underground cable in the ductline from the substation breaker to the new splicing chamber in front of substation (150 ft.). Continue the 750 EPR underground cable in the new ductline on Armstrong Road to Old Stratford Road (1,100 ft.). Use one of the laterals from the new splicing chambers on Old Stratford Road and Armstrong Road and rise to 500 AL EPR aerial cable (150 ft.). Run the 500 EPR AL aerial cable North on Old Stratford Road (500 ft.) and splice into the existing aerial cable from Trap Falls Circuit 3546 and pick up the entire load from this circuit.

The total length of the new ductline required for this site is approximately 9,850 ft. along with 19 new splicing chambers. The total combined cable required for these initial five feeders is approximately 17,150 ft. of 750 EPR underground cable, 2,350 of 500 EPR underground cable and 37,700 ft. of 500 AL EPR aerial cable. The total cost of interconnecting to these six initial distribution circuits is approximately $12.25 million.

Table 2, below summarizes the load to be transferred from Trap Falls and Indian Well Substations to the proposed Shelton Substation.

Table 2: Initial Load Relief to Trap Falls & Indian Well from Site #1

SUBSTATION TRANSFER FROM	CIRCUIT TRANSFER FROM	SUBSTATION TRANSFER TO	CIRCUIT TRANSFER TO	AMPS	MVA
Indian Well	501	Shelton	Shelton 1	315	7.5
Indian Well	503	Shelton	Shelton 2	79	1.9
Indian Well	510	Shelton	Shelton 2	262	6.3
Indian Well	516	Shelton	Shelton 3	221	5.3
Trap Falls	3543	Shelton	Shelton 4	347	8.3
Trap Falls	3546	Shelton	Shelton 5	405	9.7
Total					**39**

As described in Table 2 above, the initial load relief to Indian Well and Trap Falls Substations will be 21 MVA and 18 MVA respectively. This relief would reduce the 2015 projected peak load at Indian Well to approximately 38.66 MVA or 79% of its rating and to approximately 54.18 MVA at Trap Falls or 71% of its rating. Additional circuits can be transferred from Trap Falls and/or Indian Well Substation to Shelton Substation in the future as required.

Figure 2, below shows the feeder cable one-line layout of the six feeders to be picked up by Shelton Substation from this site as described in the analysis above.

Distribution Feeder One-Line

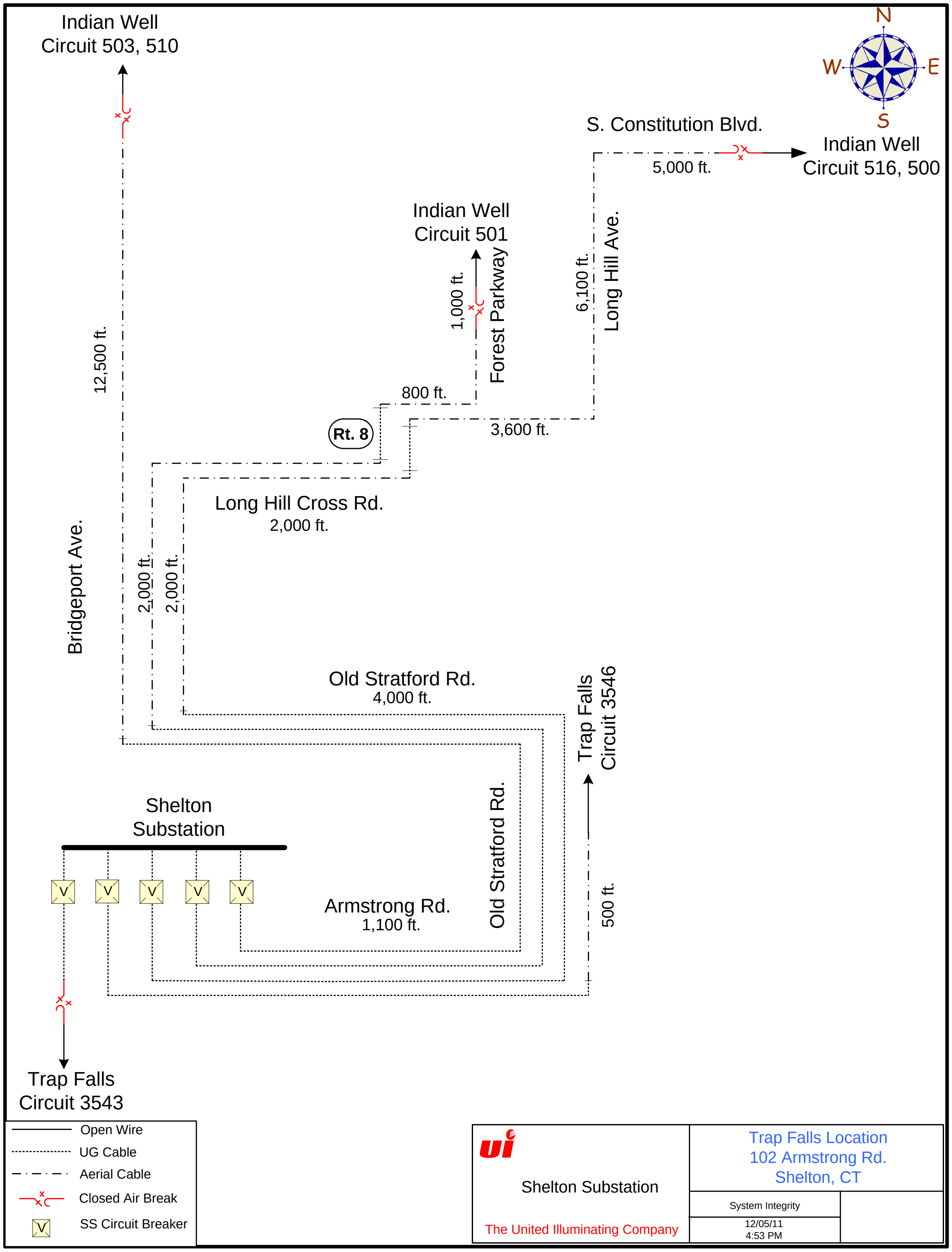


Figure 2: Site 1 - Trap Falls Distribution Feeder One-Line for Site 1-Trap Falls

B. T&S Engineering Analysis of Site #1 – Trap Falls

General Description

The Trap Falls site is located immediately adjacent to UI's existing Trap Falls Substation at 102 Armstrong Road. The site is a 3.6 acre parcel on Armstrong Road which currently contains the existing Trap Falls Substation. The entire parcel is owned by UI. The site is also adjacent to the Devon – Stevenson Transmission Line Corridor. The usable area for the new substation is approximately 2.5 acres. This site has sufficient space to accommodate a distribution substation; however it cannot accommodate future expansion to address transmission needs identified by the South West Connecticut (SWCT) Study Group. It is located directly adjacent to the existing transmission line corridor and the interconnection would be overhead to the existing line. Figure 3 below shows an aerial image of the existing Trap Falls Substation and the adjacent site for the proposed new substation. The Devon – Stevenson Transmission Lines can also be seen as dashed lines below.

Figure 3: Site 1 Trap Falls Aerial Photography

Transmission & Substation Scope of Work

The scope of work for the transmission portion of the new Shelton Substation includes the following:

- The reconfiguration of the transmission line junction at Trap Falls Substation including overhead to connect the new substation to the transmission system creating a 115 kV line loop through the new substation.

- The installation of a single breaker (expandable to three), two-line, two transformer position (AIS) arrangement at 115 kV with a 115 kV mobile transformer position.

The scope of work for the distribution portion of the new Shelton Substation includes the following:

- The installation of (2) 115/13.8 kV 30/40/50 MVA Load Tap Changer (LTC) transformers with a 115 kV mobile transformer position

- The installation of (2) power distribution centers with metalclad switchgear including (2) main breakers, (2) tie breakers and (10) feeder positions.

Figure 4 below shows the proposed Shelton Substation Layout & Plot Plan at this site.

Substation Layout and Plot Plan

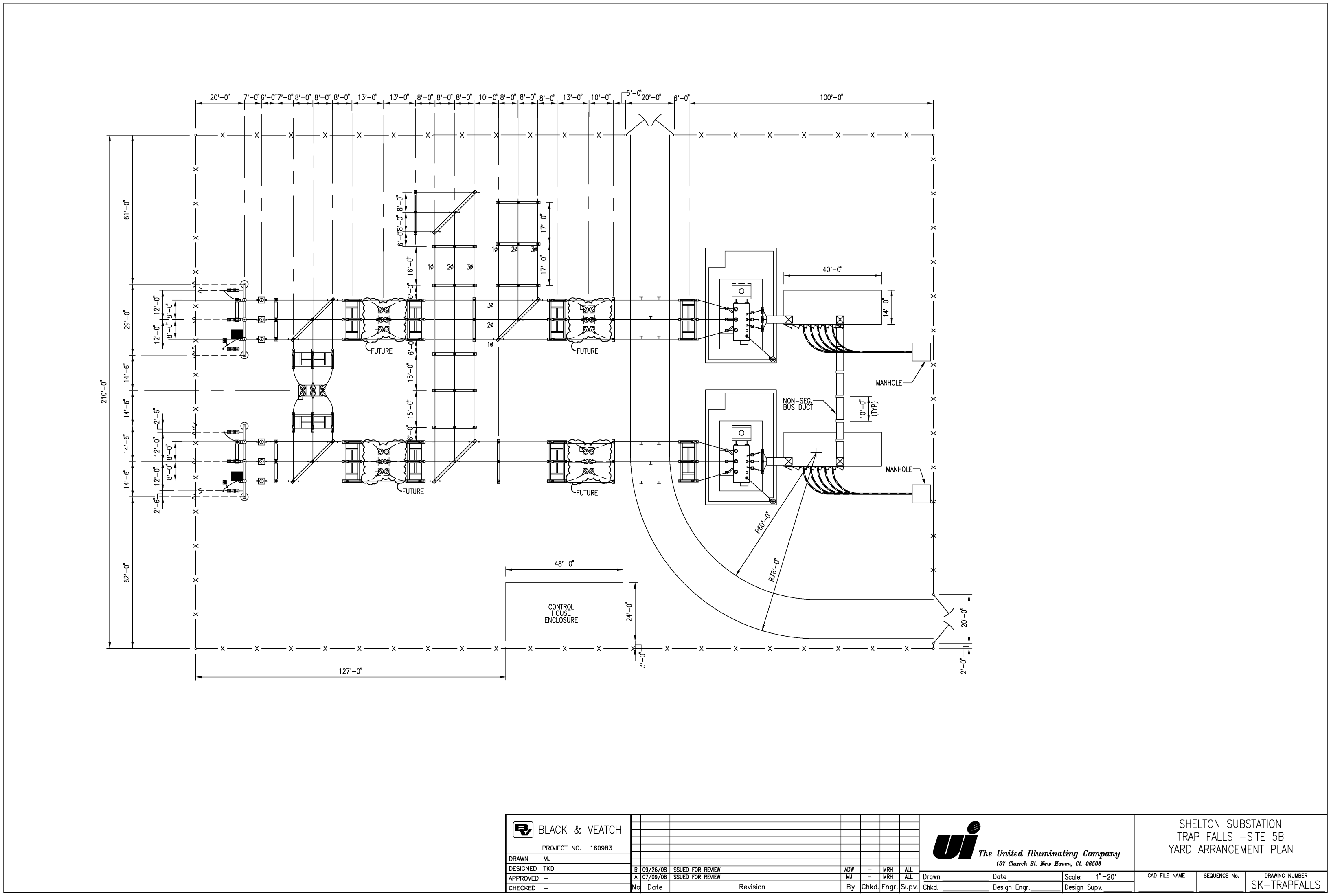


Figure 4: Proposed Substation Layout & Plot Plan at Site 1 - Trap Falls

Transmission and Substation Engineering Cost Estimate

The project cost summary below is a high level estimate for the Pooled Transmission Facility (PTF) and Non-Pooled Transmission Facility (Non-PTF) as well as distribution substation costs at this site.

Item	Estimated Capital Cost
PTF – Shelton Substation	$ 29.1 million
Non-PTF – Shelton Substation	$ 0.7 million
Distribution – Shelton Substation	$ 9.9 million
Total Substation Engineering Estimate	$ 39.7 million

C. Engineering Evaluation Summary of Site 1 - Trap Falls

The Trap Falls Site has a number of important, favorable characteristics. The Site's current use as a UI-owned substation, its location next to the Devon – Stevenson Corridor and the availability of sufficient space, make it a prime candidate for the location of the proposed Shelton Substation. The size and location of the property provide for the ability of the site to accommodate an air insulated substation design and a cost effective transmission interconnection because of its proximity to the adjacent transmission lines. However, it cannot accommodate future expansion to address transmission needs identified by the South West Connecticut (SWCT) Study Group. The Armstrong Road Ductline Review feasibility study concluded that a second ductline can be installed on Armstrong Road toward Old Stratford Road, which would allow the new initial capacity of a new two transformer substation to exit the site. However, in order to get the capacity out from this site with a three transformer substation would require routing a new ductline towards the back of the station either towards Daybreak Lane or Partridge Lane and acquiring the necessary land or rights of way to accomplish this, since it would not be feasible to install a third ductline on an already congested Armstrong Road. Since this is a UI owned site, the land cost would be $0 dollars. The Trap Falls site provides relatively easy access to existing distribution infrastructure in front of the proposed location as well as along Old Stratford Road and Bridgeport Avenue. This site is also in relative close proximity to the assumed load center, 7,000 ft. Table 3 below gives the total combined Distribution Planning and T&S Engineering cost estimate for this site.

Table 3: Site #1 - Trap Falls Total Cost

COMPONENT	COST (IN MILLIONS)
Distribution Get-away	$12.25
Pooled Transmission Facility	$29.1
Non - Pooled Transmission Facility	$0.7
Distribution Substation	$9.9
Total Cost	**$51.95**

5. Engineering Assessment of Site #2 – 14 Old Stratford Road

A. Distribution Planning Analysis of Site #2 – 14 Old Stratford Road

General Description

14 Old Stratford Road is UI owned and adjacent to Route 8. The full lot is 6 acres, level, and is currently a vacant lot at the site of a former manufacturing facility. The usable area for the new substation is approximately 3.0 acres which is sufficient for and air insulated distribution substation and can also support future transmission expansion to accommodate potential proposed projects identified by the South West Connecticut Study Group. The new substation is proposed to have an initial capacity of 72 MVA with the potential to be expanded to 144 MVA with the addition of a third transformer in the future. However, to fully utilize this potentially available capacity requires the availability of the distribution infrastructure (underground and overhead) to support the load. This location provides favorable routes for installing distribution infrastructure along city streets. The evaluation assumes utilization of these routes. Currently there is no UI ductline and splicing chamber system installed on Old Stratford Road. The approximate distance from this site to the assumed distribution load center is 3,000 ft.

Distribution Get-Away

The distribution get-away from the substation at this site is assumed to be two new ductlines from the substation property exiting directly to two new splicing chambers located on Old Stratford Road directly in front of the new substation. The new ductlines would then extend northwest on Old Stratford Road approximately 1,150 ft. to Bridgeport Avenue. The ductlines would also extend southeast on Old Stratford Road approximately 3,000 ft. to the intersection of Old Stratford Road and Armstrong Road. Underground laterals would be installed from the new splicing chambers in front of the substation. This would enable the underground get-away cables to directly supply the existing 13.8 kV open wire distribution in front of the substation or to rise to aerial cable and splice into the existing aerial cables feeding in either a northwest or southeast direction in front of the substation.

In addition to the new ductline installation, approximately 11 new splicing chambers would be required in total in the roadway on Old Stratford Road, eight splicing chambers from the first splicing chamber in front of the substation to the intersection of Old Stratford Road and Armstrong Road and three splicing chambers from the splicing chamber in front of the substation to the intersection of Old Stratford Road and Bridgeport Avenue. Underground laterals would be installed from the new splicing chambers at the intersections of Armstrong Road and Old Stratford Road and Old Stratford Road and Bridgeport Avenue. These laterals will enable circuits to rise to open wire or aerial cable from these locations and supply overhead distribution circuits or splice into existing aerial cables on Armstrong Road and Warner Hill Road and on Bridgeport Avenue in the northeast and southwest directions.

Initial Distribution Circuit Routing

<u>New Circuit for Indian Well Circuit 501 and Indian Well Substation Relief:</u>

Start with 750 EPR underground cable in the ductline from the substation breaker to the new splicing chamber in front of the substation (150 ft.). Continue the 750 EPR underground cable in the new ductline on Old Stratford Road to Bridgeport Avenue (1,150 ft.). Rise to 500 AL EPR aerial cable on Bridgeport Avenue and run the aerial cable on Bridgeport Avenue to Long Hill Cross Road (2,000 ft.). Continue the 500 AL EPR aerial cable on Long Hill Cross Road to the Route 8 overpass (2,000 ft.). Transition from 500 AL EPR aerial cable to 500 EPR underground cable on Long Hill Cross Road for the Route 8 bridge crossing (500 ft.) and back to 500 AL EPR aerial cable to Forest Parkway (800 ft.). Run the 500 AL EPR aerial cable north along Forest Parkway (1,200 ft.) and rise to the existing 397 AL open wire with a new normally closed Air Break Switch (ABS) and pick up the entire load from Indian Well Circuit 501.

Note: The Forest Parkway load needs to be transferred from Trap Falls Circuit 3546 back to Indian well Circuit 501 by closing the ABS on P.842 and opening the ABS on P.846 Long Hill Avenue. Also, currently there is no pole line on Forest Parkway north of Long Hill Cross Road. The existing pole line on Forest Parkway will be extended north of Long Hill Cross Road.

<u>New Circuit for Indian Well Circuit 503 and 510 and Indian Well Substation Relief:</u>
Start with 750 EPR underground cable in the ductline from the substation breaker to the new splicing chamber in front of substation (150 ft.). Continue the 750 EPR underground cable in the new ductline on Old Stratford Road to Bridgeport Avenue (1,150 ft.). Rise to 500 AL EPR aerial cable on Bridgeport Avenue and run the aerial cable on Bridgeport Avenue (12,500 ft.) north of Kneen St. and rise to the existing 397 AL open wire with a new normally closed air break switch and pick up the entire load from Indian Well Circuit 503 and Circuit 510.

Note: This requires picking up a portion of the load of Trap Falls Circuit 3551 on Bridgeport Avenue, but reduces the amount of aerial cable required. A portion of Trap Falls Circuit 3551 will be tied to Indian Well Circuit 503 by closing the ABS on P.6024 and Circuit 503 will be tied to Circuit 510 by closing the ABS on P.191 Bridgeport Avenue.

<u>New Circuit for Indian Well Circuit 516 and Indian Well Substation Relief:</u>
Start with 750 EPR underground cable in the ductline from the substation breaker to the new splicing chamber in front of substation (150 ft.). Continue the 750 EPR underground cable in the new ductline on Old Stratford Road to Bridgeport Avenue (1,150 ft.). Rise to 500 AL EPR aerial cable on Bridgeport Avenue and run the aerial cable on Bridgeport Avenue to Long Hill Cross Road (2,000 ft.). Continue the 500 AL EPR aerial cable on Long Hill Cross Road to the Route 8 overpass (2,000 ft.). Transition from 500 AL EPR aerial cable to 500 EPR underground cable on Long Hill Cross Road for the Route 8 bridge crossing (500 ft.) and back to 500 AL EPR aerial cable to Long Hill Avenue (3,600 ft.). Continue the 500 AL EPR aerial cable on Long Hill Avenue north of Long Hill Cross Road to the intersection of South Constitution Boulevard (6,100 ft.). Continue the 500 AL EPR aerial cable on South Constitution Boulevard southeast of Long Hill Avenue passed Waterview Drive (5,000 ft). Rise to the existing 397 AL open wire on South Constitution Boulevard with a new normally closed air break switch and pick up the entire load from Indian Well Circuit 516.

<u>New Circuit for Trap Falls Circuit 3548 and Trap Falls Substation Relief:</u>
Start with 750 EPR underground cable in the ductline from the substation breaker to the new splicing chamber in front of substation (150 ft.). Use one of the new laterals from the new splicing chamber in

front of the substation (150 ft.) and rise to the existing 397 AL open wire on Old Stratford Rd. with a normally closed air break switch picking up the entire load from Trap Falls Circuit 3548.

New Circuit for Trap Falls Circuit 3546 and Trap Falls Substation Relief:
Start with 750 EPR underground cable in the ductline from the substation breaker to the new splicing chamber in front of substation (150 ft.). Continue the 750 EPR underground cable in the new ductline on Old Stratford Road (300 ft.). Use one of the laterals on Old Stratford Road by Pootatuck Place and rise to 500 AL EPR aerial cable (150 ft.). Rise to the existing 397 AL open wire on Old Stratford Rd. and Pootatuck Place with a normally closed air break switch picking up the entire load from Trap Falls Circuit 3546.

The total length of new ductline required for this site is approximately 8,600 ft. along with 13 new splicing chambers. The total combined cable required for these initial five feeders is approximately 4,450 ft. of 750 EPR underground cable, 2,350 ft. of 500 EPR underground cable and 37,200 ft. of 500 AL EPR aerial cable. The total cost of interconnecting to these five initial distribution circuits is approximately $7.04 million

Table 4 below summarizes the load to be transferred from Trap Falls and Indian Well Substations to the proposed Shelton Substation at this site.

Table 4: Initial Load Relief to Trap Falls & Indian Well from Site 2-Old Stratford Road

SUBSTATION TRANSFER FROM	CIRCUIT TRANSFER FROM	SUBSTATION TRANSFER TO	CIRCUIT TRANSFER TO	AMPS	MVA
Indian Well	501	Shelton	Shelton 1	315	7.5
Indian Well	500	Shelton	Shelton 2	341	8.2
Indian Well	503	Shelton	Shelton 3	221	5.3
Trap Falls	3548	Shelton	Shelton 4	337	8.1
Trap Falls	3546	Shelton	Shelton 5	405	9.7
Total					**38.8**

As described in Table 4 above, the initial load relief to Indian Well and Trap Falls Substations will be 21 MVA and 17.8 MVA respectively. This relief would reduce the 2015 projected peak load at Indian Well to approximately 38.66 MVA or 79% of its rating and to approximately 54.38 MVA at Trap Falls or 71% of its rating. Additional circuits can be transferred from Trap Falls and/or Indian Well Substations to Shelton Substation in the future as required.

Figure 5, below shows the distribution feeder one-line layout of the six circuits to be picked up by Shelton Substation from this site as described in the analysis above.

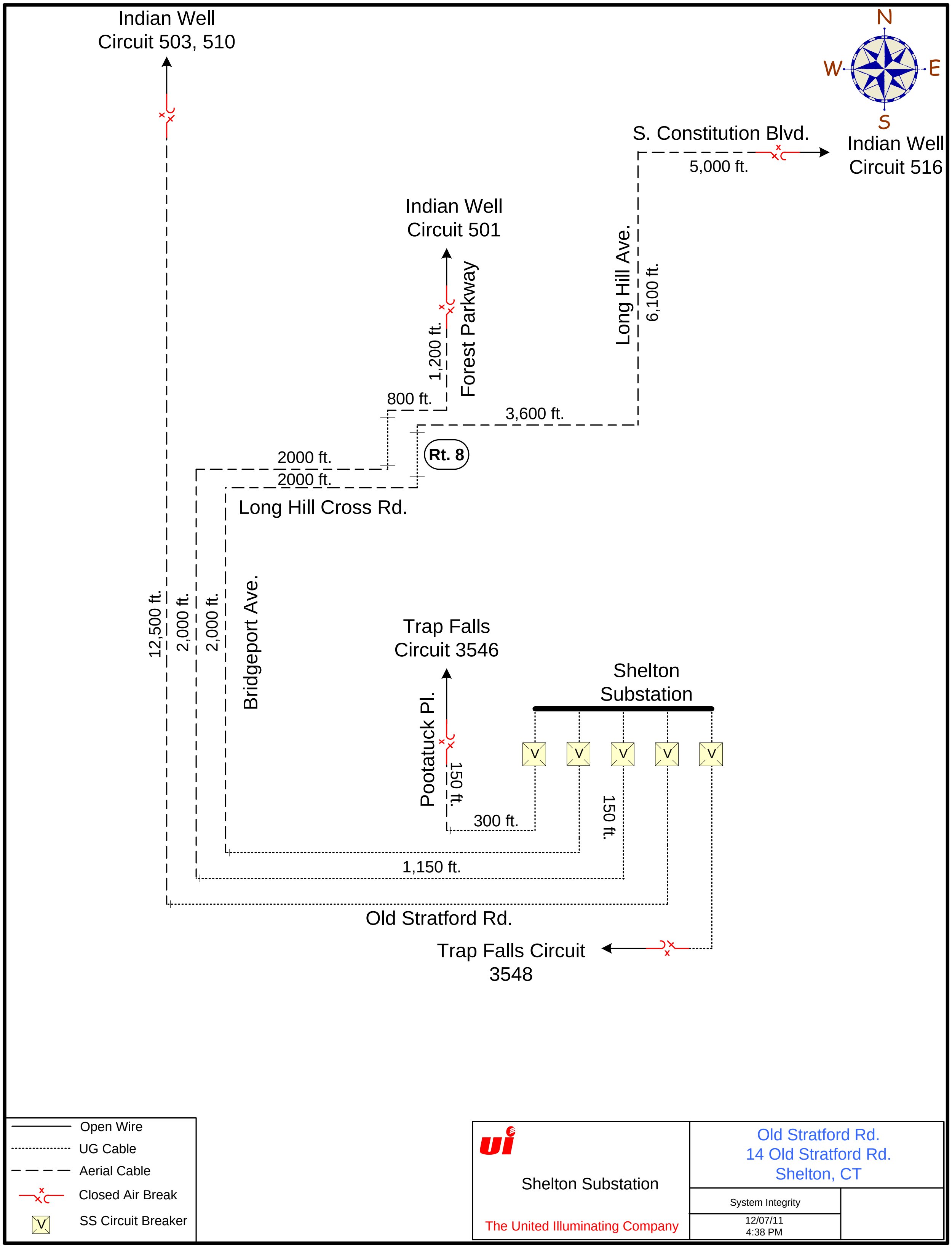


Figure 5: Distribution Feeder One-Line for Site 2 - Old Stratford Road

B. T&S Engineering Analysis of Site #2 – Old Stratford Rd.

The Old Stratford Road Site is located at 14 Old Stratford Road. The site is 6 acres, level, and located adjacent to the Devon – Stevenson Transmission Line Corridor on the northwest side of Route 8. The usable area for the new substation is approximately 3.0 acres. This former manufacturing facility currently stands as a vacant lot. It is located directly adjacent to the existing transmission line corridor and the interconnection would be overhead to the existing line. Due to the history of the site, unknown below grade obstructions can impact construction activities. Figure 6 below shows the site outlined in white line as well as the location of the Devon – Stevenson Transmission Lines represented with a dashed white line with arrow heads.

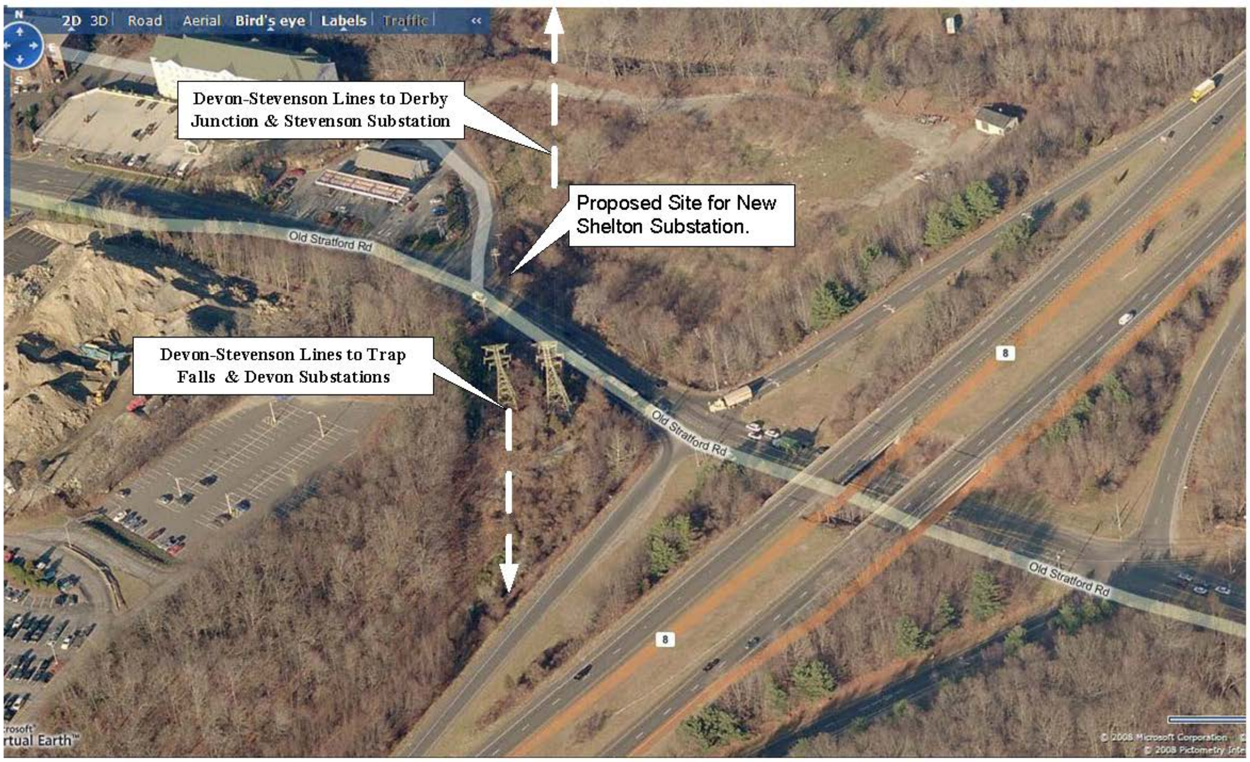


Figure 6: Aerial Photography of Site 2 - Old Stratford Road

\

Transmission & Substation Scope of Work

The scope of work for the transmission portion of the new Shelton Substation includes the following:

- The installation of four 115 kV monopole dead-end structures to connect the new substation to the transmission system creating a 115kV line loop through the new substation.

- The installation of a single breaker (expandable to three), two-line, two transformer position (AIS) arrangement at 115 kV with a 115 kV mobile transformer position.

The scope of work for the distribution portion of the new Shelton Substation includes the following:

- The installation of (2) 115/13.8kV 30/40/50 MVA LTC transformers with a 115 kV mobile transformer position

- The installation of (2) power distribution centers with metalclad switchgear including (2) main breakers, (2) tie breakers and (10) feeder positions.

Figure 7 below shows the proposed Shelton Substation Layout & Plot Plan at this site.

Substation Layout and Plot Plan

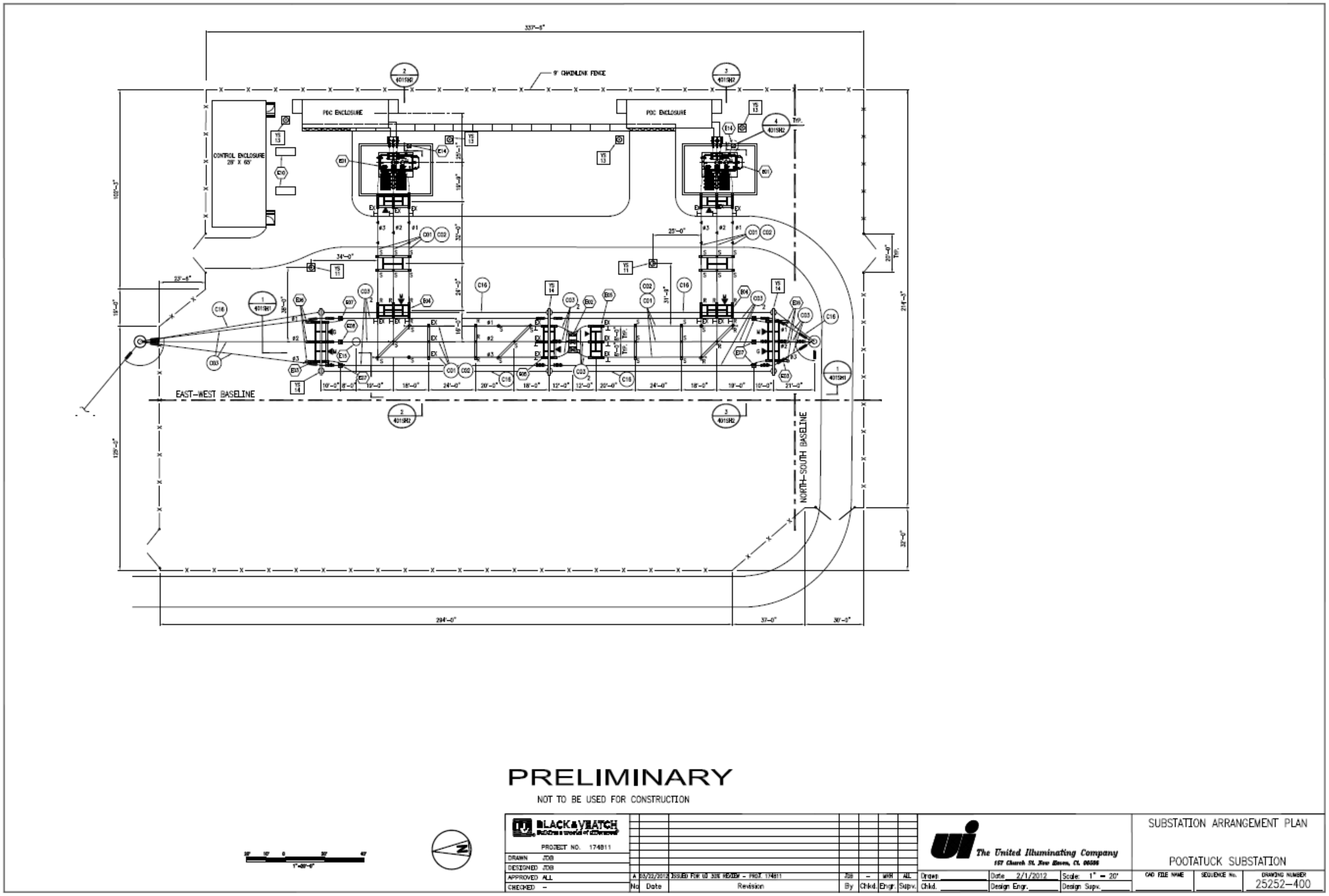


Figure 7: Proposed Substation Layout & Plot Plan at Site 2 - Old Stratford Road

Transmission & Substation Engineering Cost Estimate

The project cost summary below is a high level estimate for the Pooled Transmission Facility (PTF) and Non-Pooled Transmission Facility (Non-PTF) as well as distribution substation costs at this site.

Item	Estimated Capital Cost
PTF – Shelton Substation	$ 21.7 million
Non-PTF – Shelton Substation	$ 1.1 million
Distribution – Shelton Substation	$ 10.3 million
Total Substation Engineering Estimate	$ 33.1 million

C. Engineering Evaluation Summary of Site 2 – Old Stratford Road

The Old Stratford Road site is very favorable in many respects. It is a six acre parcel leveled and undeveloped and very close to the assumed load center. The size and location of the property provide for the ability of the site to accommodate an air insulated substation design and can also support future transmission expansion to accommodate potential proposed projects identified by the South West Connecticut Study Group. This site is also next to the Devon – Stevenson Line, which makes the transmission interconnection favorable and cost effective. From a distribution circuit get-away perspective, this site is also very favorable since there is currently no UI ductline on Old Stratford Road thus there are no underground congestion or thermal concerns. This site also provides easy access to the two main roads, Old Stratford Road and Bridgeport Avenue. Due to its close proximity to the load center, the amount of cable and total distribution get-away cost required to interconnect to the distribution feeders is significantly reduced. Overall, this site represents a very good candidate to supply the initial Trap Falls and Indian Well Substation load relief. Table 5 below gives the total combined Distribution Planning and T&S Engineering cost estimate for this site.

Table 5: Site #2 - Old Stratford Road Total Cost

COMPONENT	COST (IN MILLIONS)
Distribution Get-away	$7.04
Pooled Transmission Facility	$21.7
Non - Pooled Transmission Facility	$1.1
Distribution Substation	$10.3
Total Cost	**$40.14**

6. Conclusion

The load growth and projected capacity need in the Greater Shelton Area was documented in the Shelton Area Capacity Analysis Report dated May, 2012. The report concluded that there is a projected capacity deficiency in the Greater Shelton Area by the 2014 summer peak. As a result, UI's System Integrity and Transmission & Substation Engineering conducted a Distribution Solution Alternatives Study in order to determine viable solutions that can solve the capacity problem in a cost effective and reliable manner.

The study first considered nine potential distribution solution alternatives which were evaluated according to seven different criteria. As shown in the preceding analysis, with the exception of one, these alternatives do not address the load growth in the Greater Shelton Area to allow the substations in the area to remain below their firm ratings and/or they present a reliability risk to the system. The one alternative that does address the capacity problem in the area reliably, and is therefore a viable solution is a new 115/13.8 kV two transformer (expandable to three) substation in the Greater Shelton Area, preferably along the Route 8 corridor.

Two sites were identified and evaluated through a Site Selection Study as potential locations for a new substation from an engineering perspective (Distribution Planning and Transmission & Substation Engineering). These sites are:

- Trap Falls, located at 102 Armstrong Road.
- Old Stratford Road, located at 14 Old Stratford Rd.

Both of these sites can accommodate an open air substation design compliant with UI's Transmission and Substation Design and Rating Philosophy, which states that the UI Standard Area Distribution Substation will be a two transformer substation that is expandable to three transformers. The sites are large enough to accommodate initially two 115/13.8 kV initial transformers and an additional third transformer in the future as well as two PDC's. Both sites are also favorable to future expandability from a transmission perspective to support a three 115/13.8 kV transformer substation since these lots are large enough and are also adjacent to the Devon – Stevenson transmission lines. Only the Old Stratford Road site can support future transmission expansion to accommodate potential proposed projects identified by the South West Connecticut Study Group.

However, the future expandability of distribution infrastructure to support the utilization of a three transformer substation represents a challenge at the Trap Falls site. As mentioned previously, a second ductline can be constructed on Armstrong Road towards Old Stratford Road to accommodate the capacity of a two transformer substation after relocation of a water main and modification to the existing ductline. In order to get the capacity out from this site with a three transformer substation would require routing a new ductline towards the back of the station either towards Daybreak Lane or Partridge Lane and acquiring the necessary land or rights of way to accomplish this, since it would not be feasible to install a third ductline on an already congested Armstrong Road. Underground infrastructure congestion is not an issue at the Old Stratford Road site since there are currently no UI ductlines installed on this road. The total cost for the overall project, which includes the transmission structures, 115/13.8 kV transformers, PDCs switchgear and distribution get-away interconnection at the Trap Falls site is significantly higher (approximately 29 %) when compared to the cost from the

Old Stratford Road site Trap Falls is also further from the assumed load center than the Old Stratford Road site.

Therefore, based on the preceding analysis, the Old Stratford Road site located at 14 Old Stratford Road represents the best location for a new 115/13.8 kV Substation in the Greater Shelton Area since it provides future expandability of distribution infrastructure to support utilization of a three transformer substation, it is the least expensive site for the overall scope of the project and it is closer to the assumed load center. The Old Stratford Road site represents the most cost effective and reliable solution to address the Greater Shelton Area capacity need. This recommendation is based on an extensive review of distribution alternative solutions given above which used different criteria to evaluate the two candidate sites in order to ensure the safe, reliable and economic operation of the UI transmission and distribution system.

APPENDIX H

SITE SELECTION STUDY

The United Illuminating Company

Shelton Substation Site Selection Study

City of Shelton, Connecticut

June 2012

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

.

EXECUTIVE SUMMARY

In order to respond to the current and projected increased demands for electricity in the Greater Shelton Area, The United Illuminating Company (UI) proposes to construct and operate a new distribution substation in the City of Shelton (City), Connecticut. The Greater Shelton Area is defined as the service area supplied by Trap Falls, Indian Well, Ansonia, and Trumbull Substations. This area includes the entire municipalities of Shelton, Derby, Ansonia and parts of the municipalities of Trumbull, Stratford, and Orange. The planned substation will provide both a new interconnection to the existing 115-kilovolt (kV) electric transmission grid and a new location at which the high voltage power from the transmission system will be "stepped down" (i.e., the voltage will be decreased and current increased) for distribution to residential, commercial, and industrial customers.

The proposed substation will supplement UI's four existing substations that presently serve the Greater Shelton Area (i.e., the Indian Well and Ansonia Substations located in the Town of Derby and the Town of Ansonia respectively, east of the Housatonic River, and the Trap Falls and Trumbull Substations, located in the City of Shelton and the Town of Trumbull respectively, west of the Housatonic River). Based on the results of capacity analyses, UI determined that after 2014, these four substations will not be adequate to reliably meet the Greater Shelton Area's growing demands for electricity.

To select feasible alternative sites for the development of the new substation, and from among these to choose a proposed site, UI used an iterative process whereby potential locations were first identified and screened in accordance with UI's standard objectives for substation siting. These standard criteria, which are detailed in UI's *Transmission and Distribution Guideline for Substation Site Selection* (2007), include the following guiding principles:

- Minimize the need to acquire residences and viable commercial/industrial uses to accommodate substation development.
- Maintain consistency/compatibility with existing land uses and land use plans to the extent possible.
- Minimize adverse effects on sensitive environmental resources and the social environment.
- Maintain public health and safety.
- Demonstrate cost-effectiveness, while adhering to good engineering and sound environmental planning practices.
- Present the public with a clear and well documented methodology for the identification of the proposed and alternative sites.

Applying these siting criteria and then consulting with City officials and performing baseline field reconnaissance, UI initially identified 36 potential sites. UI then performed screening analyses of the sites, followed by more detailed evaluations of sites that appeared potentially feasible for the location of the proposed new distribution substation facilities.

Key considerations in the site evaluation process were the locations of the potential sites in relation to projected areas of electric load growth in Shelton and to the existing transmission lines that traverse Shelton and feed the Indian Well and Trap Falls substations, as well as the length of new transmission and distribution lines that would have to be developed to effectively interconnect the new substation to the transmission network and to UI's distribution system. The existing transmission lines that traverse Shelton include:

- Three Connecticut Light and Power Company (CL&P) 115-kilovolt (kV) transmission lines that extend from north to south through Shelton (including the lines from the Stevenson Substation in the Town of Monroe to the Devon Switching Station in the City of Milford) and are located adjacent to the Trap Falls Substation.

- Two UI 115-kV transmission lines that extend west from UI's Indian Well and Ansonia substations (referred to as the Derby – Ansonia Lines) to interconnect to the Stevenson – Devon Line at Derby Junction, which is located in central Shelton, north of North Constitution Boulevard.

This alternative evaluation process led to the selection of the proposed substation site as well as one primary alternative site[1], as follows:

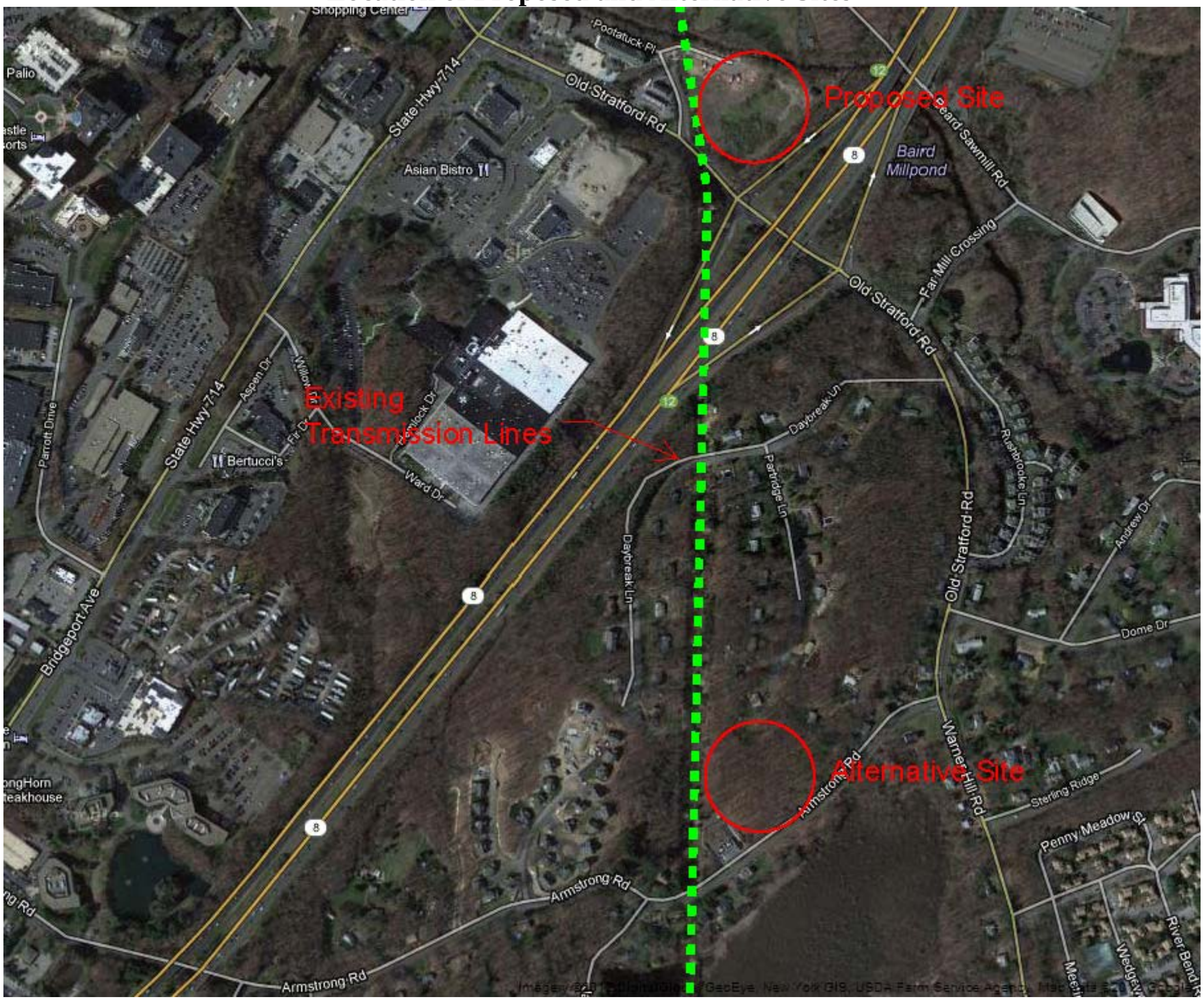
- **The proposed substation site**. This preferred site is located on land presently owned by UI that was formerly used for industrial purposes, on Old Stratford Road, adjacent to State Route 8 and Bridgeport Avenue. The site was purchased by UI in December 2009. It is preferred because of its proximity to both the 115-kV transmission corridor and distribution load center.

- **Alternative site**. The alternative site, which could be developed for the new substation, is the Trap Falls site adjacent to UI's existing Trap Falls Substation on Armstrong Road.

Both sites are located on property owned by UI. Figure ES-1 identifies the locations of the proposed and alternative substation site.

[1] A third potential site, Derby Junction, was considered in some detail but ultimately eliminated due to cost and other factors.

Figure ES-1
Location of Proposed and Alternative Sites



1. INTRODUCTION

SUMMARY OF PROJECT NEED

In recent years, electric demand in the Greater Shelton, Connecticut, has been growing, as a result of both increased power consumption by existing customers and new economic development. This upward trend in the demand for electricity is expected to continue, as new commercial and industrial customers, including new data centers, located in this area.

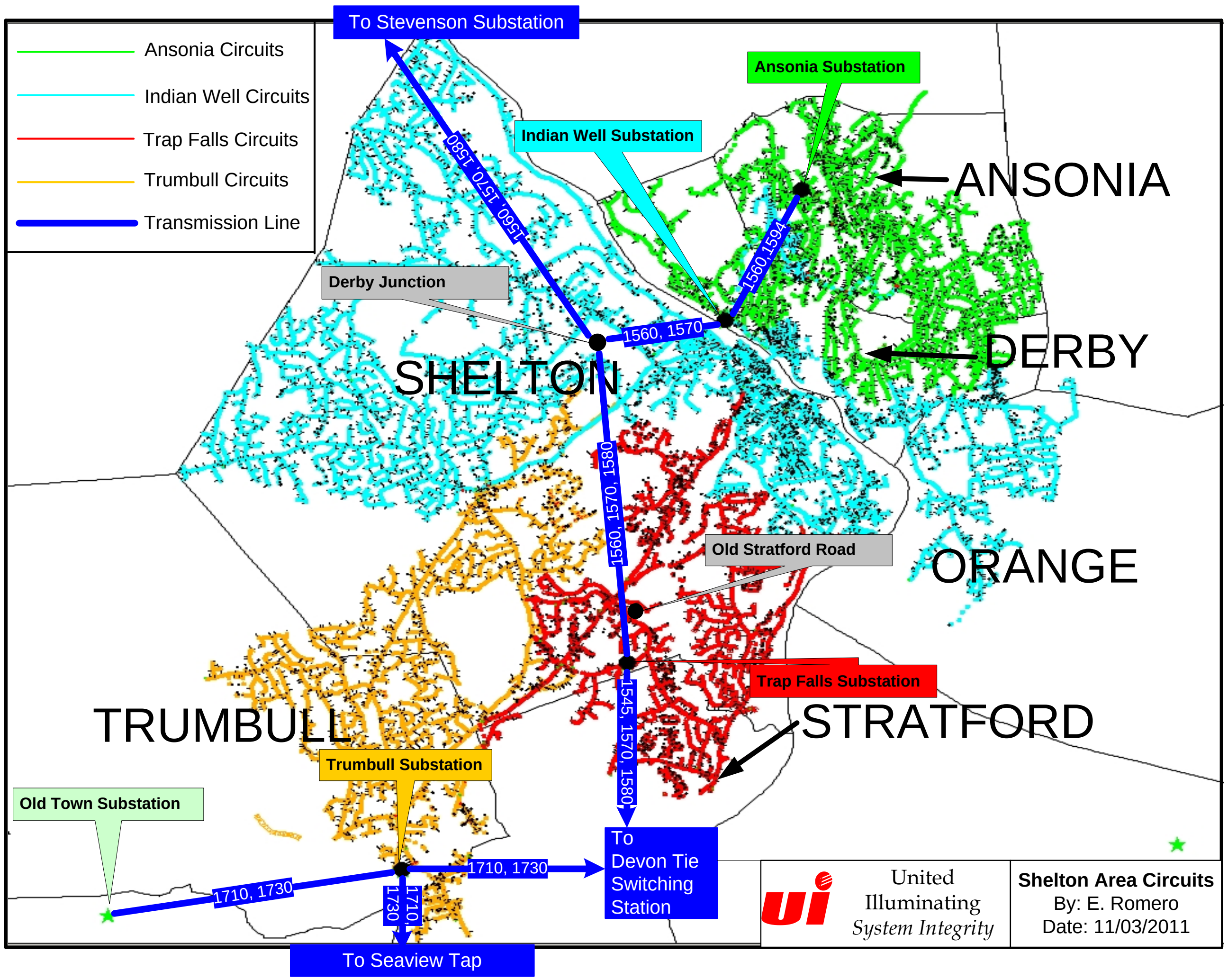
In response to the identification of the new customer load in the Greater Shelton Area and to relieve one of the area's four substations in order to eliminate a voltage collapse risk and possible rolling blackouts during contingency conditions, The United Illuminating Company (UI), which provides electric service to this area, analyzed the projected electric load growth in area, compared to the existing capacity of the area's substations and transmission grid to reliably meet such electric needs. UI's evaluation (*Shelton Area Capacity Analysis*, May 2008 – revised May, 2012) concluded that load growth in the Greater Shelton Area is expected to increase substantially over the next ten years, with particular new demands for electricity centered in the vicinity of the State Route 8 corridor, near where commercial and industrial uses are planned. Further, the results of the *Shelton Area Capacity Analysis* demonstrate that these demands cannot be reliably met by supplying the new loads from the existing substations in the Greater Shelton Area.

As Figure 1-1 illustrates, Shelton's electric supply is currently provided by distribution circuits that emanate from four existing UI distribution substations:

- The Indian Well Substation, located in the Town of Derby, east of the Housatonic River, distributes power to the northern portion of the City.
- The Trap Falls Substation, located in the southeastern portion of Shelton adjacent to Armstrong Road, distributes power to the southern portion of the City.
- The Ansonia Substation located in the west region of Ansonia and distributes power to the municipalities of Ansonia and Derby.

The Trumbull Substation, located in the southeast region of the Town of Trumbull and distributes power mainly to Trumbull and Shelton and part of the municipality of Stratford

Figure 1-1
Greater Shelton Area Electric Distribution System



All four distribution substations are interconnected to the transmission network by 115- kilovolt (kV) transmission lines. The existing transmission lines that traverse Shelton are:

- The Connecticut Light and Power Company's (CL&P's) 115-kV overhead transmission lines that extend from the Stevenson Substation in the Town of Monroe to the Devon Switching Station in the City of Milford. These Stevenson – Devon transmission lines traverse north-south through Shelton and are aligned directly west of and adjacent to the Trap Falls Substation.

- UI's 115-kV overhead transmission lines that extend west from UI's Ansonia Substation and Indian Well Substationand interconnect to the Stevenson – Devon Lines at Derby Junction. Derby Junction, which refers to the point at which these transmission lines interconnect, is located on undeveloped land in central Shelton, north of North Constitution Boulevard.

These area distribution substations, which are interconnected to these 115-kV transmission lines, step down the voltage to 13.8 kV via the substation transformers and then distribute the power to UI's local distribution network, which provides electricity to customers in the Greater Shelton Area. However, Indian Well Substation presently exceeds its firm load serving capability rating (firm rating) during periods of high electric demand. For example, the projected peak electric demand in the summer of 2015 is expected to be approximately 122% of Indian Well Substation's firm rating. For the same period, Trap Falls Substation is projected to be at approximately 94% of its firm rating, Trumbull Substation and Ansonia Substation are projected to be at 87% and 75% of their respective ratings for this same period. The overall Greater Shelton Area is projected to be at approximately 93% of the total area capacity by 2015.

To address the possible risk of overloading the Indian Well substation transformers and mitigate the voltage collapse risk at this substation during high load periods, UI implemented short term operational procedures as well as 13.8 kV distribution load transfers to neighboring substations. Trumbull Substation was energized in 2008 and its primary need was to provide load relief for Trap Falls Substation and Old Town Substation[2]. At the time of the Trumbull Substation site selection and siting process, the recently identified load growth for the Greater Shelton Area were not known.

[2] (considered outside of the Greater Shelton Area)

However, based on the results of the *Capacity Analysis,* UI determined that, even with other electric distribution system improvements, the existing substations in the Greater Shelton Area will not be adequate to meet reliably area's growing demands for electricity.

As a result, UI determined that a new distribution substation would be needed to meet current and projected electric demands in the Greater Shelton Area. Such a new distribution substation would preferably be located to optimize interconnections to both the existing transmission line infrastructure and the existing electric distribution system, thereby allowing the additional power to be provided to customers efficiently and cost-effectively, while minimizing environmental and social impacts.

1.2 OBJECTIVES OF THE SUBSTATION SITE SELECTION STUDY

After determining that a new substation would be required to meet current and projected electric demands in the Greater Shelton Area, UI identified and evaluated alternative substation configurations and sites that would meet distribution system needs and provide a cost-effective solution for interconnecting to the existing transmission network. The primary objectives of the alternatives evaluation which was performed in accordance with the requirements of the Connecticut Siting Council's *Application Guide: Electric Substation Facility* (April 2010), were to:

a) Identify and assess potential substation sites that would meet distribution system needs, including distribution substation requirements (size, design), as well as the new or upgraded distribution lines that would be required to interconnect any new substation site to the projected load centers in Shelton.

b) Evaluate potential substation sites based on engineering, constructability, environmental, social, and cost considerations, applying in particular the criteria contained in UI's *Transmission and Distribution Guideline for Substation Site Selection* (TDG 002; June 2007).

c) Select from among the locations identified in (a) and (b), potential sites that could be feasibly developed for a distribution substation to meet the overall demands for electricity in Shelton, taking into consideration UI's site selection guidelines.

This *Site Selection Report* describes the approach that was used to apply the site selection guidelines in order to:

- Identify potential candidate sites for the new substations;
- Conduct screening level analyses to review the sites, based on engineering and environmental factors, to identify locations that would address the distribution requirements; and

- Identify a proposed site for the new substation, as well as an alternative site, that would address the distribution capacity issues in Shelton.

2. SUBSTATION SITE IDENTIFICATION AND SELECTION CRITERIA

2.1 STANDARDS AND GUIDELINES

To identify and evaluate alternative sites for a new substation, UI followed its *Transmission and Distribution Guideline for Substation Site Selection (Guideline).* This *Guideline* describes the standard procedures and criteria to be used in the substation site selection process. Key factors considered in the site selection process include:

- Distance to load centers and to existing electric transmission lines.
- Site size requirements.
- Site terrain.
- Environmental and land use compatibility.
- Substation construction issues.
- Transmission and distribution line construction requirements.
- Accessibility.
- Cost.

To conduct the alternative siting analyses, UI assembled a multi-disciplinary team comprised of personnel with expertise in electrical distribution and transmission system planning, design, and construction; environmental science; and real estate. The team followed a step-by-step process, whereby potential distribution substation locations were first identified and screened in accordance with UI's standard objectives for substation siting. In addition to the factors listed above, the team took into consideration the following guiding principles, as detailed in the *Guideline*:

- Minimize the need to acquire residences and viable commercial/industrial uses to accommodate substation development.
- Maintain consistency/compatibility with existing land uses and land use plans to the extent possible.

- Minimize adverse effects on sensitive environmental resources and the social environment.
- Maintain public health and safety.
- Demonstrate cost-effectiveness, while adhering to good engineering and sound environmental planning practices.
- Present the public with a clear and well documented methodology for the identification of the proposed and alternative sites.

2.2 DISTRIBUTION SYSTEM CONSIDERATIONS IN THE GREATER SHELTON AREA

In order to meet the distribution capacity need in the Greater Shelton Area, UI determined that any new substation should be sited to facilitate interconnections to the existing electric transmission and distribution systems, and particularly to allow cost-effective interconnections to existing and projected load areas. The following primary factors were considered when identifying and assessing potential substation sites:

- Location of potential sites in relation to load growth centers. The *Shelton Area Capacity Analysis* determined that the primary areas of load growth in the Greater Shelton Area are in the southern portion of the City of Shelton and the southeastern portion of the Town of Trumbull, generally in the vicinity of State Route 8 and along the Bridgeport Avenue corridor.
- Location of potential sites in relation to the existing electric distribution network. For distribution interconnections, sites are typically preferred that are near existing distribution lines or in areas where new distribution lines could be economically developed to reach load centers. In certain areas, the development of new distribution lines is constrained by land uses, physical encumbrances or by the presence of other utilities (which can limit options for the routing of either overhead or underground distribution lines).
- Availability of land for development of a distribution substation. The minimum required area for a “distribution only” open air substation, meaning a substation supplied by two transmission lines with one transmission tie circuit breaker, no expansion capability on the transmission side and appropriate buffers and setbacks, is 2 acres.

3. GEOGRAPHICAL SITING REGION AND INITIAL SITE IDENTIFICATION

3.1 GEOGRAPHIC SITING AREA BOUNDARIES

Taking into consideration the overall substation siting *Guidelines*, the locations of the major load growth centers in Shelton, proximity to transmission corridors, and distribution system needs, UI defined the preferred geographic location area for the substation as within an approximately 1-mile-wide corridor along the existing Devon – Stevenson transmission line corridor between Derby Junction and the Trap Falls Substation.

This siting region was selected because the majority of the load growth is expected to be located around this portion of the area. Further, the loads in the Greater Shelton Area diminish rapidly north of Derby Junction and the majority of the load relief is needed at Indian Well Substation and Trap Falls Substation.

3.2 IDENTIFICATION AND SCREENING OF POTENTIAL SITES

Within the geographic siting region, UI conducted map and baseline research, performed field reconnaissance, and consulted with municipal officials to identify a range of potential sites for initial consideration for the development of the new substation. These sites were identified based on the UI *Guidelines* and the distribution capacity need and transmission considerations specific to the Greater Shelton Area, including:

- Greater than or equal to 2 acres of developable land (the estimated minimum size for the development of an open air distribution substation)
- Sites with at least one of the following characteristics:
  - ✓ Land adjacent to the Devon-Stevenson transmission line corridor between Derby Junction and the Trap Falls Substation.
  - ✓ Land owned by UI.

- ✓ Land that is vacant, available for sale, under-developed (e.g., formerly developed properties that are available for reuse), or otherwise undeveloped.

To aid in the identification of potential sites, UI compiled information on properties within a 1-mile corridor of the Derby Junction – Trap Falls Substation transmission line corridor and conducted preliminary field reconnaissance of potential sites. As a result of these initial analyses, UI identified 36 parcels that appeared to meet some of the siting criteria for the development of a new substation, and therefore warranted review. These sites are identified on the Siting Map in the Map Pocket and listed in the tables in Appendix B.

UI then qualitatively evaluated this set of potential sites in order to narrow the number of potentially viable candidate sites by taking into further consideration the following factors:

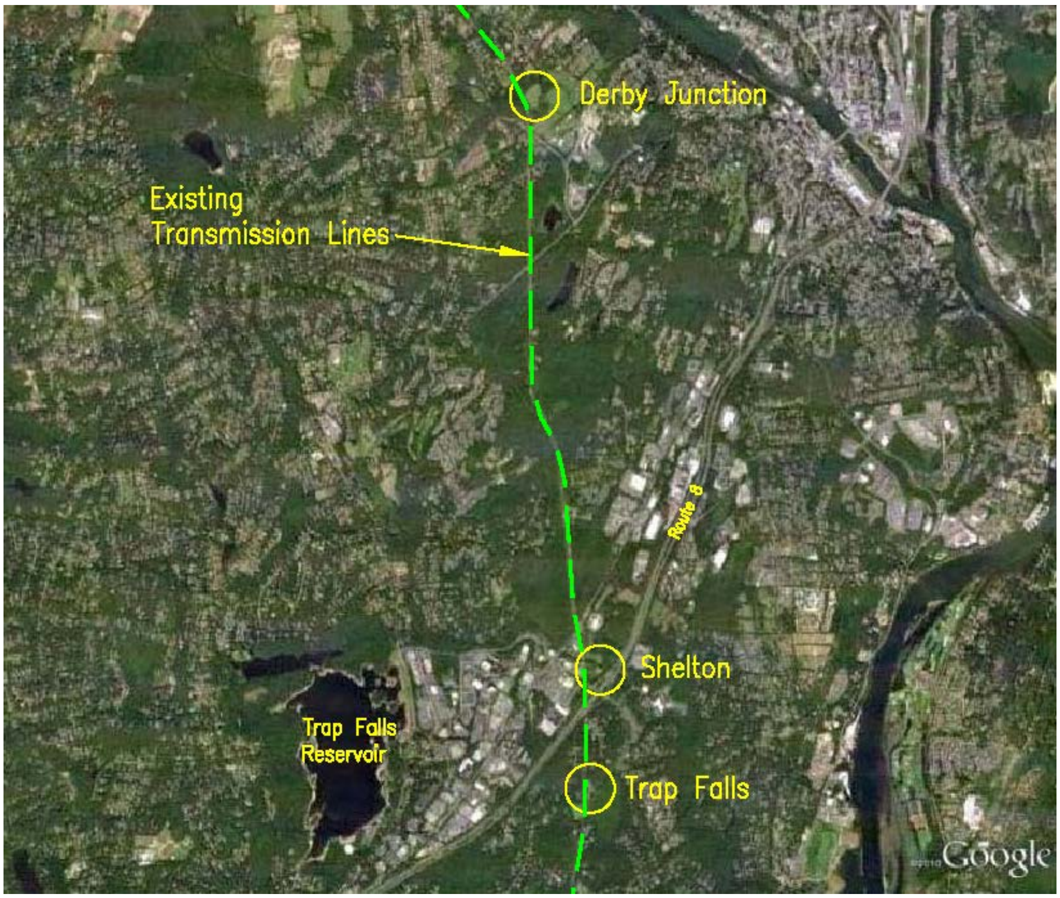
- Environmental – Environmental issues, including site character, present and past land uses of the property, cultural resources, threatened and endangered species, tidal or inland wetlands, ponds, aquifers, watercourses, public watersheds and floodplains, potential need for environmental remediation (for previously developed sites), encumbrances.
- Surroundings – Zoning and description of surrounding area, including proximity to statutory facilities (schools, playgrounds, daycares, nursery schools, day camps, and residential neighborhoods).
- Transmission and Distribution System – System transmission and distribution interconnection costs and other considerations including system impacts, accessibility and right-of-way requirements.
- Construction **–** Substation construction and vehicular access costs and other related considerations, including the effects of site size, shape, and subsurface/topographical conditions.
- Acreage available **–** Property availability, additional land for buffer or expansion, expected cost, and availability of easements.
- Permitability – Anticipated ability to obtain all the required siting, land use, environmental and construction permits.

Using this process, most of the initially identified sites were eliminated from further consideration. The reasons for eliminating a particular site varied, and ranged from environmental issues (e.g., presence of wetlands, rock, and insufficient developable area) to the identification of new information regarding alternative development plans for vacant property, etc.

Based on the results of the qualitative screening, the initial set of 36 sites was reduced to a list of three properties.[3] These three properties, which are illustrated on Figure 3-1, were evaluated in greater detail:

- Derby Junction 1, Lot 137-116
- Shelton Substation, 14 Old Stratford Rd, Lot 29-8 (UI property)
- Trap Falls Substation Lot 19-9 (UI property)

Figure 3-1
Location of Three Alternative Sites
Source: Google Earth, April 2012



3 A fourth site, located at 801 Bridgeport Avenue, was initially evaluated in more detail as a potential location for the new substation. This site, which occupies approximately 16.8 acres, is owned by UI and is presently occupied by UI's Electric System Work Center (ESWC). However, UI is in the process of selling the property and moving the ESWC. The sale of the site is pending and the anticipated new use of the property is expected to include commercial / retail development. As a result, 801 Bridgeport Avenue was eliminated as a potentially viable site for the new distribution substation.

4. DETAILED EVALUATION OF ALTERNATIVE SUBSTATION SITES

4.1 DETAILED SITE EVALUATION CRITERIA

For each of the three alternative sites, UI conducted more detailed evaluations, considering substation layouts and estimated costs and assessing each site based on more of the following, more specific siting criteria:

- Property / land issues (e.g., available useable and buffer acreage, site acquisition costs, existing and former land uses).

- Environmental and social/cultural resource factors (e.g., proximity to wetlands and watercourses, vegetative communities, wildlife resources, species of concern, visual resources, archaeological and historic resources, recreational and public resources, among others).

- Surrounding land uses (e.g., distance to the nearest residence and abutting property line, potential visibility of the substation, effect on public health and safety, consistency with local, state, and regional land use plans and future development, effects on transportation and access).

Electric transmission and distribution system considerations (e.g., length of distribution and / or transmission system interconnections that would be required, consistency with long-range plan for the expansion of UI's electric power system

- Construction costs.

- Permitability (e.g., identification of any issues that could affect the ability to obtain approvals for substation site development).

UI determined that the development of the new substation at the Old Stratford Road site would best meet the project objectives, based on environmental, technical, and economic considerations. The Trap Falls Substation site, although less preferable based on cost and environmental consideration, offers a second siting option. In contrast, the Derby Junction site was found to be impractical for the development of the new distribution substation.

4.2 DERBY JUNCTION SITE: ELIMINATED FROM CONSIDERATION

This undeveloped 5.2-acre site (Lot 137-116) is located at the north of the end of North Constitution Boulevard, at the intersection of CL&P's 115-kV overhead Stevenson – Devon transmission line and UI's 115-kV Derby – Ansonia overhead transmission lines (refer to Figure 4-1). As a result of its location at the intersection of these major transmission lines, the development of a distribution substation at this site would provide the opportunity to connect to and, in the future, sectionalize multiple transmission lines, and thereby substantially increase UI's customer reliability in the Shelton, Ansonia, Derby and Orange areas. Further, the site is set back from roads and houses and could be screened to minimize or avoid visual and noise effects. New distribution circuits would have to be constructed along North Constitution Boulevard and Shelton Road.

However, the site is within a 40.3-acre property owned by the City of Shelton and identified as conserved open space. The site is presently characterized by old field vegetation, bordered by forest lands and wetlands. In addition, the site is just to the east of the Summerfield Gardens residential area (townhouses) and is located approximately 0.2 mile to the northwest of Shelton High School. The site is separated from the high school by the City's open space, with associated wooded buffer areas, as well as the school playing fields (e.g., softball, track).

Although Derby Junction would offer benefits in terms of transmission system interconnections, the development of a substation on this municipal open space would not be consistent with UI's objectives for minimizing adverse environmental effects to the extent possible and would not necessarily be consistent with the City of Shelton's land use plans, especially in consideration of other apparent feasible sites that do not introduce these concerns. In addition, the distribution lines that would have to extend from the Derby Junction site would be difficult and costly to construct. While a substation at this site can supply relatively easily the residential load in the northern section of Shelton to relieve Indian Well Substation, the challenge is to deliver the available capacity to the Bridgeport Avenue area to relieve Trap Falls Substation in the southern part of the City. This is difficult since there are limited north-south roads with existing overhead mainline construction close to the Derby Junction site. These factors contributed to UI's determination that the use of Derby Junction for a new distribution substation would not be preferable. If the Derby Junction site is required for a future UI 115 kV transmission facility or a 115/13.8 kV substation, the site may be reconsidered pending the specific future need and construction costs associated with this location.

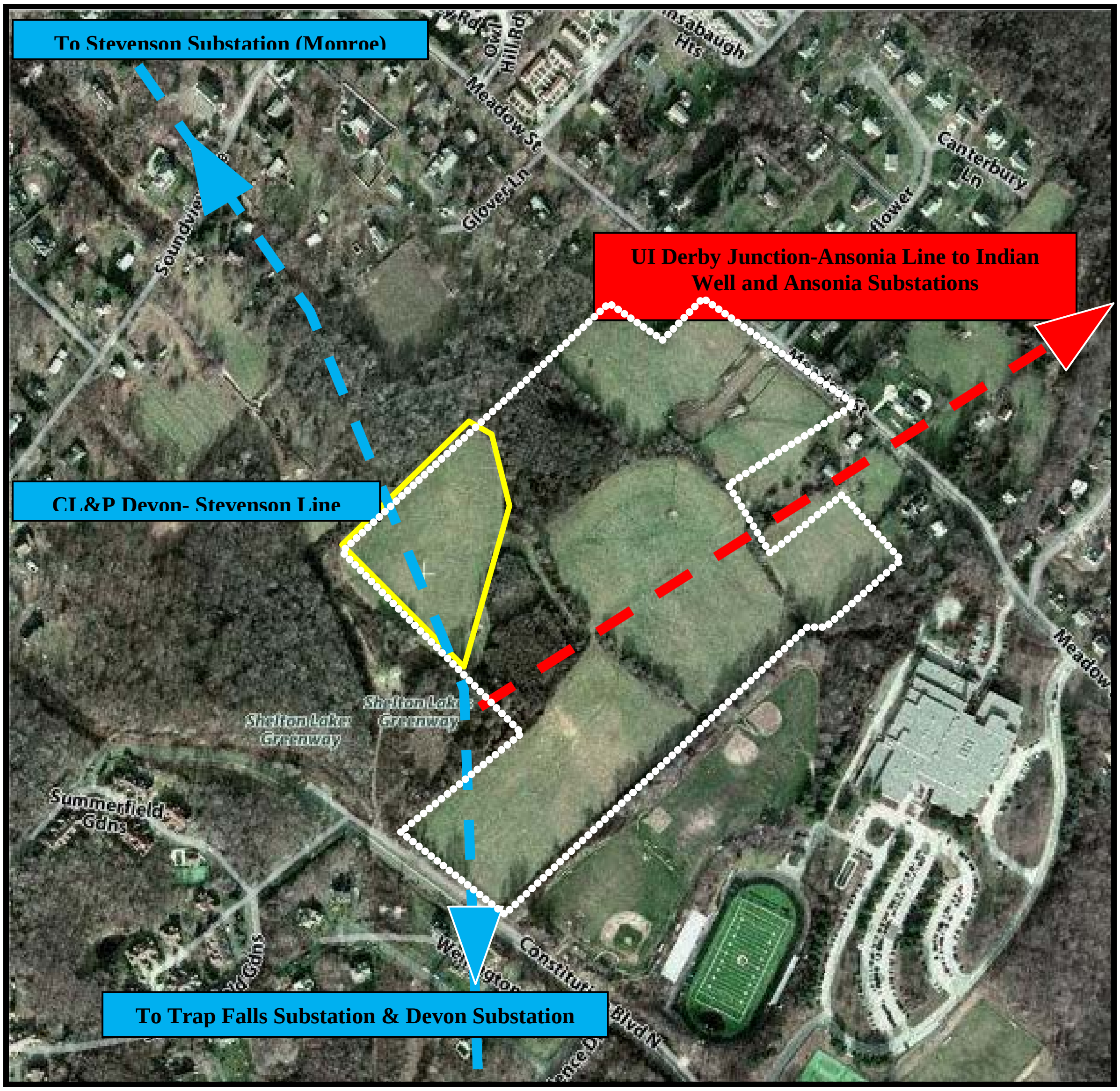


Figure 4-1
Derby Junction

4.3 TRAP FALLS SUBSTATION: SITE ALTERNATIVE

This site is located in the southern portion of the City of Shelton, near the Stratford boundary, and is immediately adjacent to UI's existing Trap Falls Substation at 102 Armstrong Road (refer to Figure 4-2). The Devon – Derby Junction transmission lines abut the site on the west. Forested vegetation screens the site from residential areas located to the north and east, whereas Armstrong Road forms the southern boundary of the site. A cranberry bog is located across Armstrong Road in Stratford.

In the general vicinity of the site, single-family residences border Armstrong Road and also characterize areas to the north of the substation (i.e., residential subdivisions along Daybreak Lane and Partridge Lane). Areas farther to the west along Armstrong Road, near the intersection with Bridgeport Avenue, are developed as office parks and for various commercial/retail uses.

Land for the development of new substation facilities adjacent to the Trap Falls Substation is constrained by the presence of the existing transmission line corridor, relatively steep topography (with rock outcrops), and the existing residential development. As a result, a new substation at this location would have to be developed within an approximately 2.5-acre site situated to the east of the existing substation (refer to Figure 4-2).

The development of the new substation at the Trap Falls site would have a number of attributes, including general proximity to the load centers in southern Shelton. Other benefits include the site's current UI ownership, existing use as a substation, location next to the Devon – Derby Junction transmission lines, and the availability of land.

Although the existing substation site is buffered from nearby land uses by the existing transmission line corridor and forest lands, several residential areas are located to the northwest and northeast of the substation, and residential areas also border Armstrong Road, principally to the east of the substation. In addition, a new ductline and splicing chamber system would have to be constructed from the substation to interconnect new electric distribution lines to existing lines. Such distribution infrastructure would likely have to be aligned underground along Armstrong Road toward Old Stratford Road. A new underground ductline can be constructed on Armstrong Road towards Old Stratford Road to accommodate the capacity of a two transformer substation after relocation of a water main and modification to the existing ductline. However, in order to get the capacity out from this site with a three transformer substation would require routing a new ductline towards the back of the station either towards Daybreak Lane or Partridge Lane and acquiring the necessary land or rights of way to accomplish this, since it would not be feasible to install a third ductline on an already congested Armstrong Road. Table 4-1 summarizes the characteristics of the Trap Falls Substation site.

This height elevation between the proposed site and the existing Trap Falls Substation site is approximately 10 feet. As a result, the proposed site would require extensive site preparation work including blasting and drilling in order to bring the level of the adjacent site down to the level of the existing Trap Falls Substation.[4]

UI's analyses determined that the new distribution substation could feasibly be developed at the Trap Falls Substation site. However, the need for extensive site preparation work at this site and the lack of space for additional underground infrastructure on Armstrong Road for future expandability of distribution lines from the substation, coupled with the constraints posed by the relatively small size of the site, make this site alternative less attractive than the preferred Old Stratford Road site.

[4] Approximately 10 feet of rock would have to be removed. A preliminary estimate performed by Black &Veatch in 2008 for the site preparation cost at this site was approximately $10.8 million.

Figure 4-2
Trap Falls Substation

Table 4-1
Trap Falls Site Evaluation Summary

CRITERIA	KEY CHARACTERISTICS
Costs, including Substation, Transmission and Distribution	**Estimated costs ($ millions)** • Substation with two transformers $39.7 • Overhead transmission lines $0.0 • Distribution circuits $12.25 • Total $51.95 .
Site layout	• Supports open air substation design. • Direct interconnection to Stevenson – Devon transmission line.
Environment	• No designated wetlands mapped on site. • No CTDEEP NDDB designated areas in vicinity.
Surroundings	• Adjacent residential uses. • Commercial uses farther to west, near Bridgeport Avenue. • Cranberry bog to south in Trumbull. • Stevenson-Devon transmission line along western boundary. • 60 feet south to nearest residence. • 216 feet to next nearest residence to the west. • Limited visual screening potential. • Road is narrow with a sharp blind corner near substation. • Limited available setback from Armstrong Road and residences.
Transmission system	• Adjacent to existing Stevenson – Devon 115-kV corridor • No transmission line required for interconnection
Distribution system	• Approximately 9,850 ft. of new ductline, 19 new splicing chambers, and 57,200 feet of distribution circuit cable is required for initial 39 MVA of capacity. Approximately 7,000 feet from load center. Existing utilities in Armstrong Road pose issues regarding underground distribution line locations for future capacity expandability at this site.
Land	• Approximately 2.5 acres provides ability for future distribution capacity additions, however is unable to accommodate future expansion of transmission infrastructure. • Owned by UI • Site zoned for __ use; this use would (or not?) allow substation development

4.4 PREFERRED SITE: 14 OLD STRATFORD ROAD

This UI-owned site, which encompasses approximately 6 acres, was formerly developed for industrial purposes (a metal finishing plant). The site is presently vacant.

The Devon – Derby Junction transmission lines traverse the western portion of the site, which is bordered to the east by the Far Mill River and agricultural areas, to the south by State Route 8, to the west by Old Stratford Road, and to the north by Pootatuck Place and commercial uses, including a gas station, convenience store, and hotel (refer to Figure 4-3).

The property has a long industrial history, and is undergoing environmental remediation. The previous site owner coordinated the remediation work with the Connecticut Department of Energy and Environmental Protection (DEEP). This remediation activity is confined to the treatment of ground water for chlorinated solvent pollution; groundwater monitoring wells associated with the remediation effort are located principally on the northeastern portion of the property.

The development of the distribution substation at this site would be consistent with the former use of the property for industrial purposes. The substation development is compatible with (and would not conflict with) the current remediation of groundwater contamination at the site. The site size and location adjacent to the Devon – Derby Junction transmission lines would allow the development of a cost-effective open air substation design. Further, the site is relatively close to the load growth pockets in the southern portion of the city, and thus distribution line interconnection costs and impacts would be minimized. Underground distribution infrastructure congestion is not an issue at the Old Stratford Road site since there are currently no UI underground distribution facilities installed on Old Stratford Road.

The site is located within the floodplain of the Farm Mill River. The floodplain boundaries (both 100- and 500-year) as designated by the Federal Emergency Management Agency, extend into the Old Stratford Road site and would be within areas that would be developed for the substation. No locations of state or federally listed threatened, endangered, or species of concern are located near the site, based on the review of CT NDDB data.

UI selected the 14 Old Stratford Road property as the preferred site for the new substation due primarily to the following factors:

- The site provides the lowest evaluated cost option.
- The site offers favorable set-back and visual screening potential, and is located adjacent to the State Route 8 corridor. Although located near the major distribution load centers and near commercial areas, the site is relatively isolated.
- The site is located directly along the existing 115-kV transmission ROW.
- The site is a former industrial property that is presently vacant and therefore underutilized. The development of this site for a substation would effectively re-adapt this brownfield site for productive use and therefore enhance its property value.

Table 4-2 summarizes the characteristics of the substation development at the Old Stratford Road Site.

Figure 4-3
14 Old Stratford Road

Table 4-2
Old Stratford Road Site Evaluation Summary

CRITERIA	KEY CHARACTERISTICS
Costs, including Substation, Transmission and Distribution	**Estimated costs ($ millions)** • Substation with two transformers $33.1 • Overhead transmission lines $0.0 • Distribution circuits $7.04 • Total $40.14
Site layout	• Supports open air substation design. • Direct interconnection to Stevenson – Devon transmission line. • Site north of existing transmission line interconnections.
Environment	• Former industrial site requiring remediation, currently under study. • Adaptive reuse potential. • Far Mill River along northern site boundary; FEMA designated 100- and 500-year floodplain boundaries extend into the property. • No CTDEEP NDDB designated areas in vicinity.
Surroundings	• Commercial land uses along Old Stratford Road; agricultural areas to north • Bordered and buffered by State Route 8 to the south / east. • Far Mill River and wooded riparian corridor to the north, bordered by agricultural land • Visual screening afforded by existing transmission line and forested buffers.
Transmission system	• Adjacent to existing Stevenson – Devon 115-kV corridor. • Good location for transmission interconnections and improved system reliability.
Distribution system	• Approximately 3,000 feet from load center • Approximately 8,600 ft. of new ductline, 13 new splicing chambers and 44,000 feet of distribution circuit cable is required for initial 38.8 MVA of capacity.
Land	• Approximately 6 acres provides ability to use site for future distribution capacity and transmission infrastructure additions. • Site zoned for IA-2 use.

5. CONCLUSIONS

UI conducted a comprehensive alternatives evaluation process first to identify potential sites for the new distribution substation in the project area and then to assess each site based on established site selection criteria. As a result of these alternatives analyses, 14 Old Stratford Road in Shelton was selected as the preferred site for the new 115/13.8 kV Substation in the Greater Shelton Area.

The Old Stratford Road site represents the least-cost option for the development of the new Shelton Substation. The UI-owned site is located near the Greater Shelton Area's major distribution load centers, and is optimally located directly along an existing NU 115-kV transmission line ROW. Further, the site is a brownfield property, which would be returned to productive economic use with the development of the new substation.

The Trap Falls Substation represents a feasible, but less preferable, alternative to the Old Stratford Road site. Although also owned by UI and adjacent to the 115-kV transmission line, the Trap Falls Substation site would be more costly to develop and would require longer new distribution lines to interconnect to UI's existing distribution line network since the site is also farther from the load center than the Old Stratford Road site. Furthermore, construction of additional underground distribution infrastructure on Armstrong Road to support future capacity expansion represents a challenge since this road is already congested.

APPENDIX A

Transmission and Distribution Guideline for Substation Site Selection (TDG 002)

APPENDIX B

REVIEW OF SUBSTATION SITES AND SITE SCREENING

Screening Criteria Summary

To evaluate the feasibility of developing the substation at each of the 36 sites initially identified (refer to list in Table B-1 and to the map in the Map Pocket that shows general site locations), UI performed a high-level, qualitative screening of each property. The high-level screening consisted of first assessing each site to determine whether any characteristics posed constraints that would immediately eliminate the location from consideration for the development of the substation. Such constraints included, among others:

- Lack of adequate developable land (e.g., due to the presence of steep slopes, rock outcrops, or wetlands, which limited the amount of land available for development within a parcel).
- Sale of the site for other uses during the course of the study
- Privately-owned land that could not be acquired.

The screening consisted of reviewing each site based on constructability (including land availability, lot size and shape, topography and access); ability to meet UI's transmission and distribution system objectives; and potential for minimizing adverse environmental and social effects related to the site and its surroundings. If the screening analyses revealed a fatal flaw, the site was eliminated from further consideration for the development of the substation.

Table B-1
List of Potential Substation Sites, by Name, Lot Address, and Initial Selection Criteria

Site No.*	Undeveloped Sites Adjacent to the Derby Junction –Trap Falls Substation Transmission Line	Sites Owned by UI	Sites Initially Identified as Available for Development; Not Adjacent to Derby Junction – Trap Falls Substation Transmission Line
1	Derby Junction 1, Lot 137-116		
2	Derby Junction 2, Lot 126-29		
3	Beard Sawmill Rd, Lot 29-3		
4	Bridgeport Ave, Lot 39-17		
5		14 Old Stratford Rd, Lot 29-8	
6		Trap Falls Substation Lot 19-9	
7	Bridgeport Ave Rd. Lot 50-9		
8	Kings Highway Lot 76-1		
9	John Dominick Dr, Lot 76-2		
10	Buddington Rd. Lot 75-2		
11	Buddington Rd. Lot 75-3		
12	Oak Valley Rd. extension Lot 89-20		
13	Oak Valley Rd. extension Lot 90-9		
14	Nells Rd. Rd, Lot 90-7		
15	234 Shelton Ave, Lot 115-1		
16	Shelton Ave. Lot 103-1		
17	Willoughby Rd. Lot 114-46		
18	Independence Dr, Lot 114-75		
19	279 Soundview Ave, Lot 136-23		
20		801 Bridgeport Ave.,18**	
21			Shelton Ave, Lot 102-38
22			71 Long Hill Cross Rd, Lot 51-7
23			Bridgeport Ave, Lot 50-15
24			8 Forest Parkway, Lot 51-18
25			15 Forest Parkway, Lot 63-35
26			28 Platt Rd, Lot 63-33
27			Waterview Dr, Lots 65-27 & 28
28			561 Bridgeport Ave, Lot 50-10
29			74 Todd Rd, Lot 63-22
30			Long Hill Cross Rd, Lot 51-29
31			Long Hill Cross Rd, Lot 51-13
32			Cots St, Lots 91-29, 104-25 & 28 to 31
33			Beard Sawmill Rd, Lots 29-3 & 39-17
34			6 Waterview Dr, Lot 79-9
35			Mountain View Dr, Site Lot 65-12
36			88 Long Hill Cross Rd, Lot 51-12

*Refers to site number assigned on map of sites initially reviewed (see map pocket). **Site owned by UI during initial screening study but now under contract for sale to others.

APPENDIX I

ELECTRIC AND MAGNETIC FIELD (EMF) ASSESSMENT

Exponent®

Electrical Engineering and Semiconductor Practice

[redacted]

Electric and Magnetic Field Assessment: The Shelton Substation

Electric and Magnetic Field Assessment: The Shelton Substation

Prepared for

The United Illuminating Company
157 Church Street
New Haven, CT 06506

Prepared by

Exponent
17000 Science Drive, Suite 200
Bowie, MD 20715

September 28, 2012

1200544.000 A0T4 0912 BC01

Contents

List of Figures

List of Tables

Limitations

At the request of the United Illuminating Company Exponent modeled the magnetic-field levels associated with the proposed Shelton Substation and electric and magnetic fields associated with the existing transmission lines in the vicinity of the project. This report summarizes work performed to date and presents the findings resulting from that work. In the analysis, we have relied on geometry, material data, usage conditions, specifications, and various other types of information provided by the client. We cannot verify the correctness of this input data, and rely on the client for the data's accuracy. Although Exponent has exercised usual and customary care in the conduct of this analysis, the responsibility for the design and operation of the project remains fully with the client.

The findings presented herein are made to a reasonable degree of engineering and scientific certainty. Exponent reserves the right to supplement this report and to expand or modify opinions based on review of additional material as it becomes available, through any additional work, or review of additional work performed by others.

The scope of services performed during this investigation may not adequately address the needs of other users of this report, and any re-use of this report or its findings, conclusions, or recommendations presented herein are at the sole risk of the user. The opinions and comments formulated during this assessment are based on observations and information available at the time of the investigation. No guarantee or warranty as to future life or performance of any reviewed condition is expressed or implied.

Executive Summary

The United Illuminating Company (UI) proposes to construct a new 115/13.8-kilovolt (kV) substation in the city of Shelton, Fairfield County, Connecticut to address the anticipated increased demand for electricity in the Greater Shelton Area. The substation will be interconnected to one of four adjacent 115-kV transmission lines and stepped down to 13.8 kV for delivery to the electric distribution system in the Greater Shelton region.

The highest calculated magnetic-field level at the perimeter of the Shelton Substation is less than 3% of that recommended by international health-based standards (the International Committee on Electromagnetic Safety and the International Commission on Non-Ionizing Radiation Protection) for the general public and is comparable to fields that may be found in homes near major appliances. The electric field from elements within the substation will likely be shielded by the substation fence and therefore were not modeled. Where the adjacent transmission lines are run overhead on double-circuit transmission line towers in the vicinity of the Shelton Substation, the electric-field levels approximately 1% or less of the recommended exposure limits and electric-field levels are less than10% of the recommended exposure limits.

The substation will occupy only 2 acres of the 6-acre UI property and EMF levels at the edge of the property will be still lower and in most locations on the property, will be comparable to magnetic field levels produced by existing transmission and distribution lines. The calculated magnetic fields produced by the proposed Shelton Substation therefore will be far below recommended guidelines for exposure of the general public and will likely have no effect whatsoever on the EMF levels at residences in the area..

Introduction

The United Illuminating Company (UI) proposes to construct a new substation in the city of Shelton, Fairfield County, Connecticut to address the anticipated increased demand for electricity in the Greater Shelton Area. The substation is proposed adjacent to an existing transmission line right-of-way (ROW) currently occupied by two double-circuit lattice towers each supporting two 115-kilovolt (kV) transmission lines. The proposed project will encompass:

- The construction of a new 115/13.8-kV substation adjacent to an existing transmission line ROW, including a 115-kV circuit breaker, disconnect switches, transformers, metal switchgear enclosures, and a control building.
- The adjacent 1560 115-kV transmission line (renamed 1241) will be routed into the substation and will be stepped down to 13.8 kV for delivery to the electric distribution system in the Greater Shelton region, and then routed back out and designated the 1560 transmission line.

In addition, UI plans to construct new 13.8-kV three-phase distribution circuits, which will exit the Shelton Substation in underground duct lines in two separate duct banks through the northern and western edges of the substation. These distribution circuits will consist of duct lines and splicing chambers which will be buried beneath local roads.

Measurements of electric and magnetic field (EMF) levels from existing sources at the proposed boundaries of the Shelton Substation were taken to assess pre-construction conditions. Magnetic-field measurements were performed on July 13, 2012 between the hours of 10AM and 2PM, and electric-field measurements were performed on July 27, 2012 between the hours of 11AM and 2PM. These measurements are summarized in the report "Electric and Magnetic Field Measurements: Shelton Substation Site in Shelton, Connecticut" in the Appendix to this report.

Post-construction levels of EMF are calculated using two separate models, one for assessing the EMF levels due to the existing and proposed transmission lines, and one to assess the magnetic-field levels due to sources within and nearby the proposed substation itself.

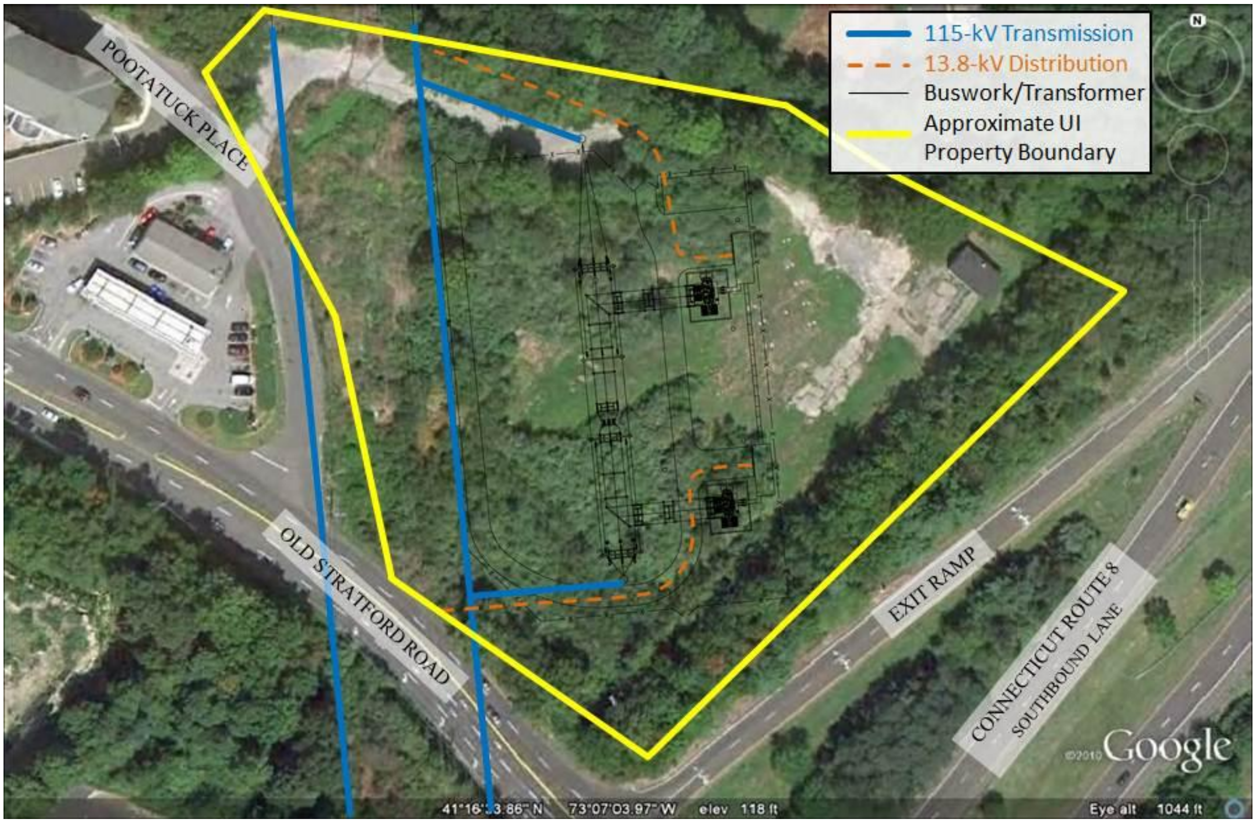


Figure 1. Site of the proposed Shelton Substation.

The figure shows the route of the two double-circuit 115-kV transmission line towers, the 115-kV taps into the substation, the 13.8-kV distribution duct banks from two proposed transformers, and associated buswork within the substation, as well as the approximate UI property boundary.

Magnetic Fields The current flowing in the conductors of a substation bus-line or an overhead transmission line generates a magnetic field near the conductor. The strength of project-related magnetic fields in this report is expressed as magnetic flux density in units of milligauss (mG), where 1 Gauss (G) = 1,000 mG. In the case of alternating current (AC) transmission lines, these currents (and thus magnetic fields) vary in direction and magnitude with a 60-Hertz (Hz) cycle. Since load current—expressed in units of amperes (A)—generates magnetic fields around the conductors, measurements or calculations of the magnetic field present a "snapshot" for the load conditions at only one moment in time. On a given day, throughout a week, or over the course of months and years, the magnetic-field level can change depending upon the patterns of power demand on the bulk transmission system.

Electric Fields The voltage on the conductors of transmission lines generates an electric field in the space between the conductors and to ground. Many objects are conductive—including fences, shrubbery, and buildings—and thus shield electric fields. Electric fields within the Shelton Substation therefore are not calculated since they are likely to be blocked by the substation fence. In addition, the buried distribution lines will not be a source of 60-Hz electric fields above ground, since electric fields are confined by the cables' conductive sheath and armor, as well as blocked by the surrounding soil and duct bank. In this report, electric-field levels are calculated beneath the transmission lines and are expressed in units of kilovolts per meter (kV/m), 1 kV/m is equal to 1,000 volts per meter (V/m).

.

Assessment Criteria

Neither the federal government nor Connecticut has enacted standards for magnetic fields or electric fields from power lines or other sources at power frequencies. Several other states have statutes or guidelines that apply to fields produced by new transmission lines, but these guidelines are not health based. For example, New York and Florida have limits on EMF that were designed to limit fields from new transmission lines to levels characteristic of the fields from existing transmission lines.

More relevant EMF assessment criteria include the exposure limits recommended by scientific organizations. These exposure limits are included in guidelines developed to protect health and safety and are based upon reviews and evaluations of relevant health research. These guidelines include exposure limits for the general public recommended by the International Committee on Electromagnetic Safety (ICES) and the International Commission on Non-Ionizing Radiation Protection (ICNIRP) to address health and safety issues (ICES, 2002; ICNIRP, 2010).

In a June 2007 Factsheet, the World Health Organization included recommendations that policy makers should adopt international exposure limit guidelines, such as those from ICNIRP or ICES (Table 1), for occupational and public exposure to EMF.

Table 1. ICNIRP and ICES guidelines for EMF exposure

	Exposure (60 Hz)	
	Electric Field	Magnetic Field
ICNIRP		
Occupational	8.3 kV/m	10 G (10,000 mG)
General Public	4.2 kV/m	2 G (2,000 mG)
ICES		
Occupational	20 kV/m	27.1 G (27,100 mG)
General Public	5 kV/m*	9.040 G (9,040 mG)

*Within power line rights-of-way, the guideline is 10 kV/m under normal load conditions.

Overhead Transmission Line Modeling

Four existing 115-kV transmission lines occupy the transmission line corridor adjacent to the proposed substation site. One set of double-circuit lattice towers supports the 1580 and 1590[1] circuits on the western side of the corridor and a second set of double-circuit lattice towers supports two additional circuits. In the existing configuration the second set of towers supports the 1570 and 1560 circuits. In the proposed configuration for interconnecting the new Shelton Substation, the 1560 circuit will be designated 1241 (south of the Shelton Substation) and 1560 (north of the Shelton Substation). The route of the proposed transmission lines and the two sections selected for EMF modeling are depicted in Figure 2.

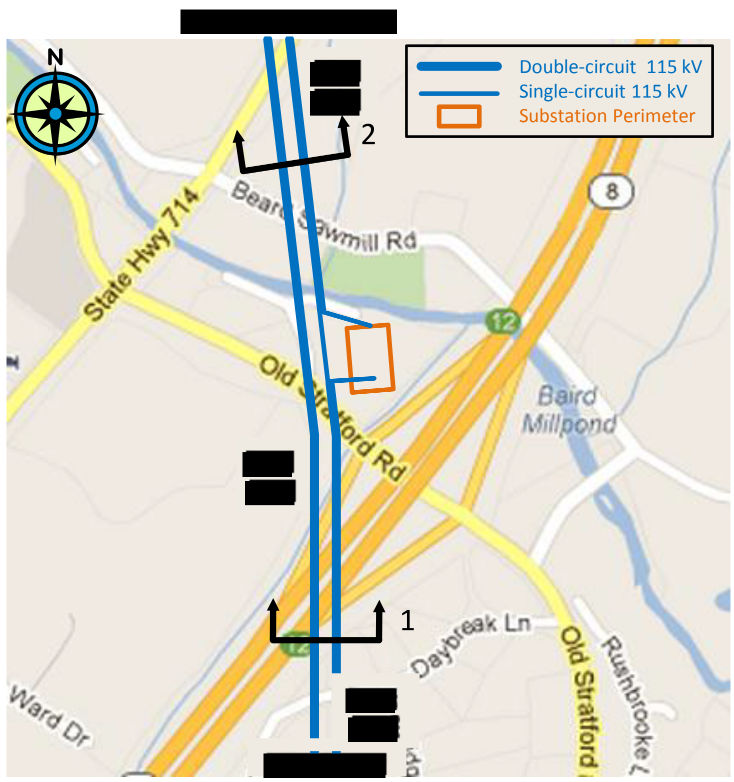


Figure 2. Overview of the proposed Shelton Substation site, showing the location and orientation of Sections 1 and 2.

[1] Circuit 1590 is currently de-energized.

As part of the project, the 1241 circuit will be routed into the substation and stepped down to 13.8 kV for delivery to the local distribution system. The three remaining circuits (including the de-energized 1590 circuit) will continue on the two double-circuit lattice towers northward toward Stevenson-Ansonia. A system diagram, including the circuits and direction of current flow, is shown in Figure 3.

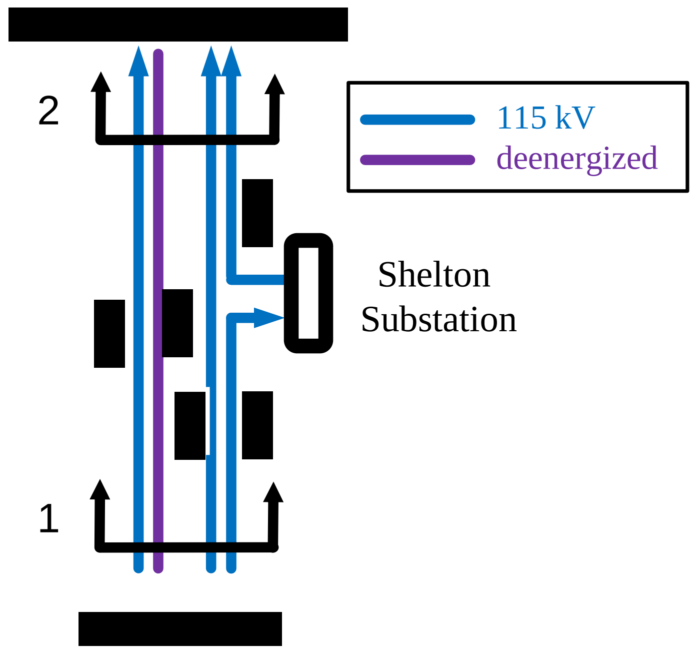


Figure 3. System diagram of the 115-kV lines entering and exiting the proposed Shelton Substation.

EMF profiles were calculated along transects perpendicular to the ROW for the two cross sections[2] of lines near the proposed substation as identified in Figure 2. Both cross sections are modeled with the same geometrical configuration and differ only in magnitude of power flow on the lines. The two double-circuit lattice towers are situated on a 110-foot ROW, each 30 feet from the respective edge of the ROW edge and separated by a distance of 50 feet. The 1560, 1241, and 1570 lines are strung with 795 MCM ACSR “Drake” conductors (1.108” diameter) and the 1580 and 1590 lines are strung with 4/0 copper conductors (0.46” diameter). The

[2] The portion of the transmission lines adjacent to the proposed Shelton Substation is included in the substation model discussed in the next section (western edge of the substation,).

typical configuration of the two transmission line towers, including phasing, is shown in Figure 4.

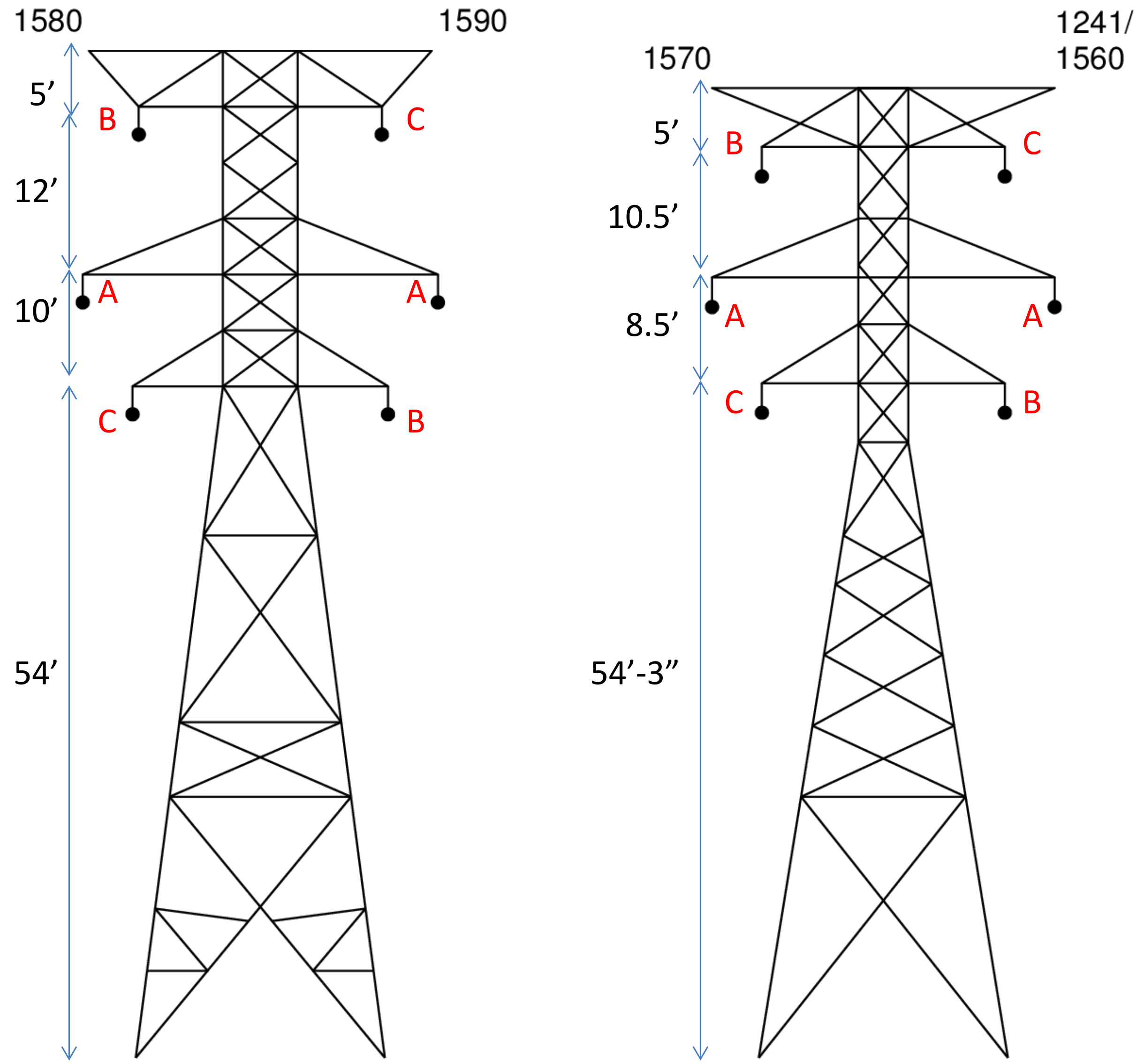


Figure 4. Lattice tower structures including dimensions and circuit phasing.

Methods

The EMF levels were calculated at 3.28 feet (1 meter) above ground, in accordance with Institute of Electrical and Electronics Engineers (IEEE) Std. C95.3.1-2010, and are reported as the root-mean-square (rms) value of the field ellipse at each location along a transect perpendicular to the transmission centerline. EMF levels based upon proposed construction were calculated using computer algorithms developed by the Bonneville Power Administration (BPA), an agency of the U.S. Department of Energy (BPA, 1991). These algorithms have been shown to accurately predict EMF levels measured near power lines. The electric fields and magnetic fields were calculated as the resultant of x, y, and z field vectors.

The inputs to the program are data regarding voltage, current flow, phasing of voltages and currents, and conductor configurations as provided by UI. These line loadings are summarized below in Table 2.

Table 2. Electrical Element loadings for the existing configuration of Sections 1-2 and within the Shelton Substation

		Existing Loads (A)		Proposed Load (A)	
Circuit	**Voltage (kV)**	**Average**	**Peak**	**Average**	**Peak**
1241	115	259	309	295	365
1560	115	259	309	247	279
1570	115	339	506	331	467
1580	115	117	118	117	118
1590	115	0	0	0	0
Transformer A	115/13.8	-	-	25	43
Transformer B	115/13.8	-	-	25	43
Breaker B	115	-	-	277	327
Distribution Circuits	13.8	-	-	184	335

Results and Discussion

Calculated magnetic-field profiles are depicted in Figure 5 and Figure 6 and the calculated electric-field profiles are depicted in Figure 7 and Figure 8. Table 3 and Table 4 summarize the calculated magnetic-field level in the vicinity of the circuits at average and peak loading, respectively. Table 5 summarizes the calculated electric field at the same locations.

The electric-field calculation in both sections and for existing and proposed conditions is the same because the two sections have the same voltage and transmission line geometry and because electric fields do not depend on line loading. The maximum calculated electric field on the ROW is 0.40 kV/m, at the edge of the ROW it is 0.31 kV/m or less, and at 100 feet from the edge of the ROW it is 0.01 kV/m or less. The magnetic-field levels in both sections are also very similar because the two sections have the same configuration and differ only slightly in terms of circuit loading. As shown in Table 3, the maximum calculated magnetic-field level at average loading in Section 1 increases by 0.2 mG to 17.1 mG. At the edge of the ROW the calculated magnetic-field level increases by 0.9 mG on the eastern edge of the ROW and decreases by 0.2 mG on the western edge. At a distance of 100 feet from the edge of the ROW the magnetic-field level decreases by 0.2 mG. The results in Section 2 are quite similar, but show even less variation, remaining the same as under existing conditions, or decreasing slightly. The change in calculated magnetic-field levels under peak loading are also small, with the maximum magnetic-field level decreasing by 1.3 mG in Section 1 and by 1.7 mG in Section 2. Elsewhere on the ROW the results are similar with changes of 0.8 mG or less at all locations, as shown in Table 4.The results presented in Table 3, Table 4, and Table 5 show that for both route segments the electric fields produced by the project at the edges of the ROW and beyond will not change at all and any changes in the magnetic field at the edge of the ROW and beyond are less than 1 mG. These values and the higher values under the existing lines are significantly below the ICNIRP and ICES guidelines for EMF exposure detailed in Table 1, above.

Table 3. Calculated magnetic-field values (mG) for overhead transmission lines for existing and proposed configurations at average load

Route Portion	Case	Location				
		–ROW –100 ft	–ROW	Maximum	+ROW	+ROW +100 ft
Section 1	Existing	1.4	7.2	16.9	8.0	0.5
	Proposed	1.2	7.0	17.1	8.9	0.3
Section 2	Existing	1.4	7.2	16.9	8.0	0.5
	Proposed	1.4	7.2	16.4	7.8	0.5

Table 4. Calculated magnetic-field values (mG) for overhead transmission lines for existing and proposed configurations at peak load

Route Portion	Case	Location				
		–ROW –100 ft	–ROW	Maximum	+ROW	+ROW +100 ft
Section 1	Existing	1.8	8.8	23.8	10.4	0.9
	Proposed	1.5	8.0	22.5	10.9	0.5
Section 2	Existing	1.8	8.8	23.8	10.4	0.9
	Proposed	1.8	8.5	22.1	9.6	0.9

Table 5. Calculated electric-field values (kV/m) for overhead transmission lines for both existing and proposed conditions

Route Portion	Location				
	–ROW –100 ft	–ROW	Maximum	+ROW	+ROW +100 ft
Section 1	0.00	0.29	0.40	0.31	0.01
Section 2	0.00	0.29	0.40	0.31	0.01

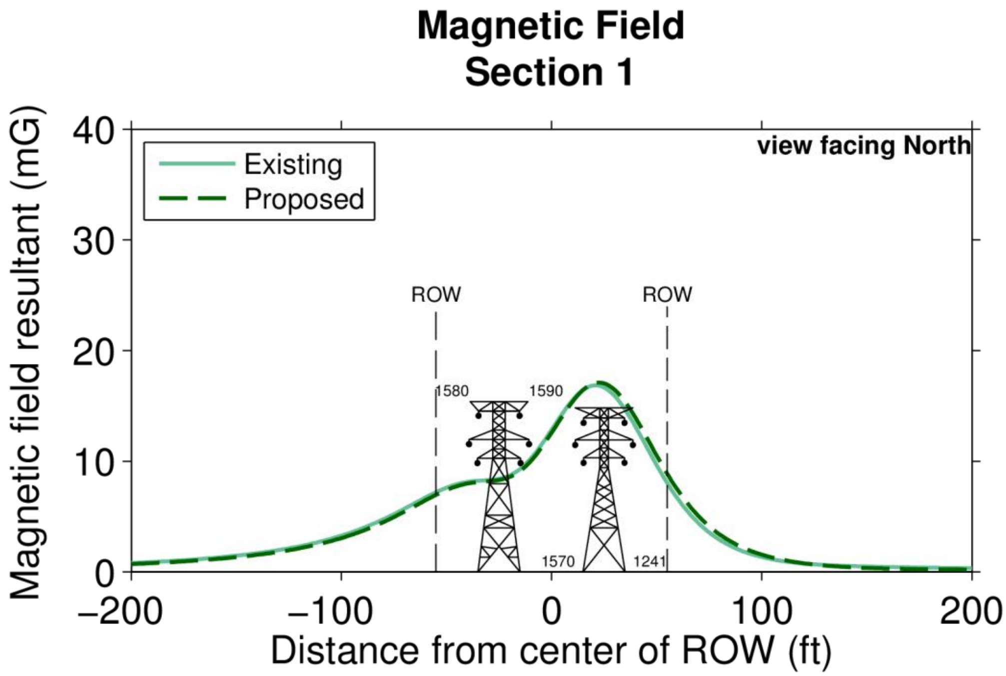


Figure 5. Calculated magnetic field at average loading for the overhead transmission lines south of the proposed Shelton Substation.

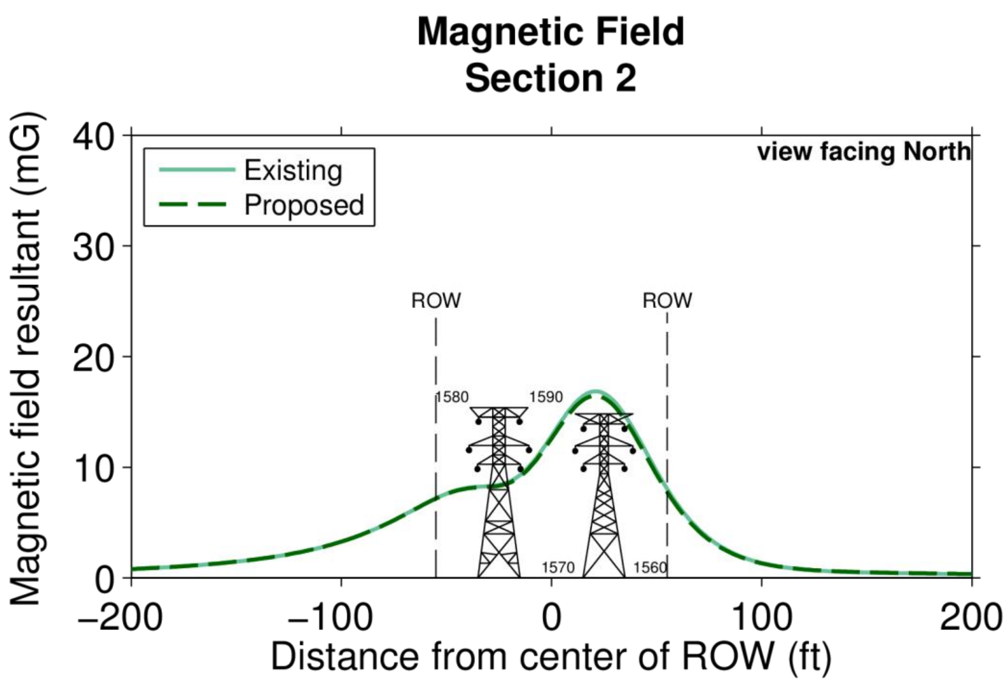


Figure 6. Calculated magnetic field at average loading for the overhead transmission lines north of the proposed Shelton Substation.

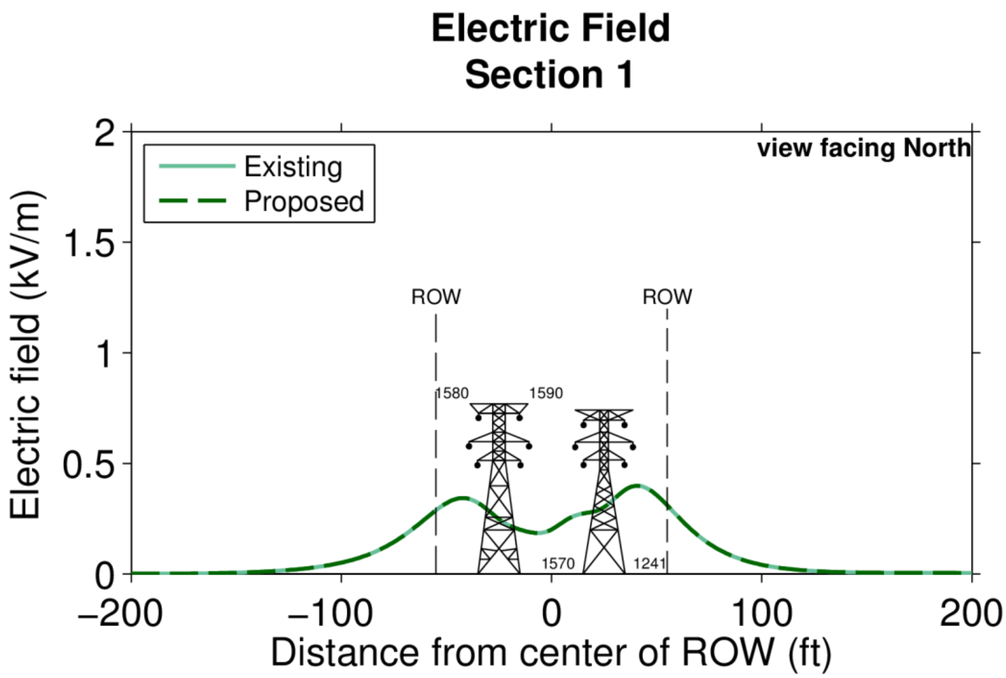


Figure 7. Calculated electric field for the overhead transmission lines south of the proposed Shelton Substation.

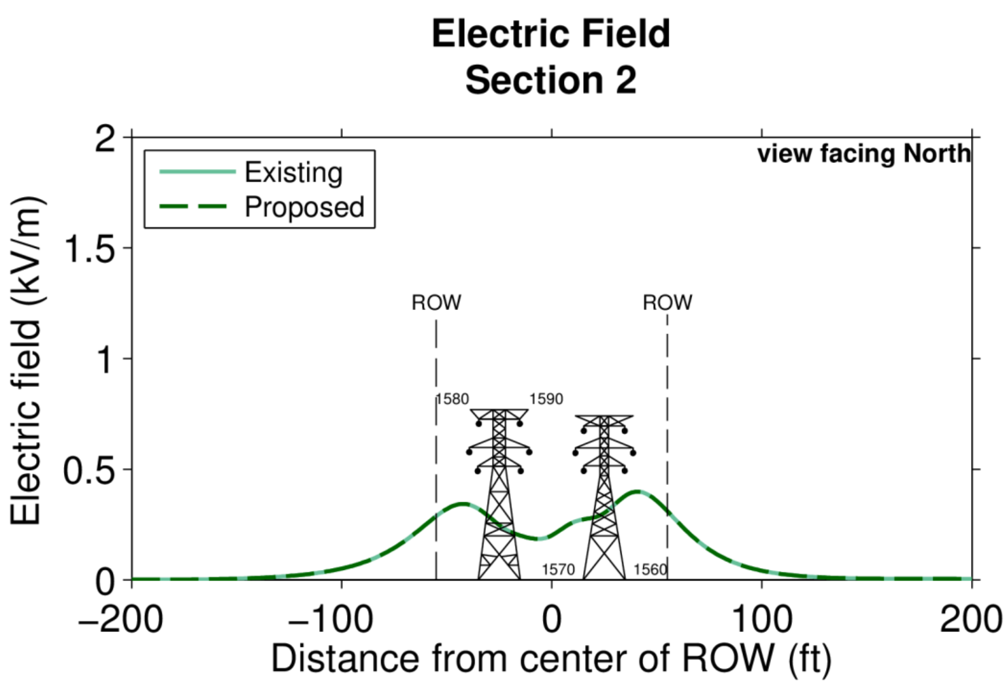


Figure 8. Calculated electric field for the overhead transmission lines north of the proposed Shelton Substation.

Shelton Substation

The proposed substation will be located on 2 acres in the western portion of a 6-acre UI-owned site, adjacent to the existing 115-kV transmission line ROW. As described above, the 1241 line will be routed into the station and stepped down to 13.8 kV for delivery to the electric distribution system in the Greater Shelton region as illustrated in Figure 9.

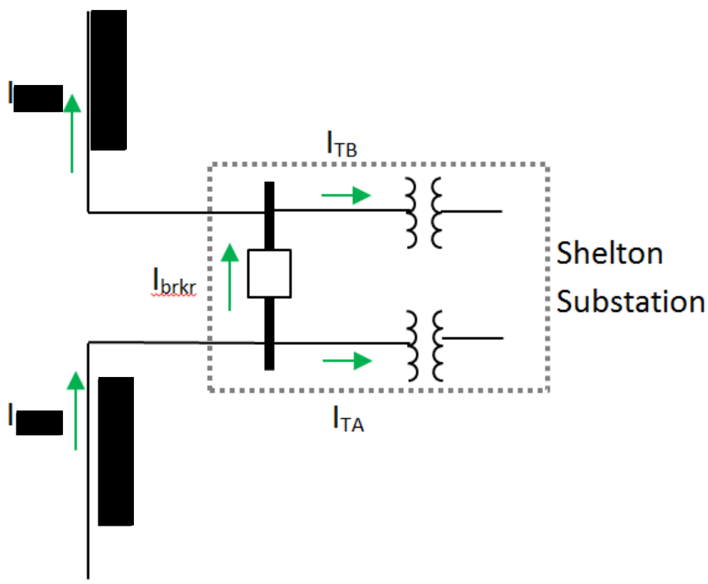


Figure 9. Conceptual description of the Shelton Substation.

The proposed substation facilities will include: a 115-kV circuit breaker; six 115-kV disconnect switches; two 50-MVA power transformers to step down the voltage from 115 kV to 13.8 kV; two metal switchgear enclosures; and a metal control enclosure (building for equipment protection). In addition, ten distribution circuits will exit the Shelton Substation in two PVC underground ductbanks (not shown in Figure 9). Each ductbank is buried to a typical depth of at least 30" below grade and has a total of 12 5" PVC conduits (4 across and 3 deep) each separated by 1.5". One ductbank will exit the site through the southern end of the substation, directly onto Old Stratford Road, while the other ductbank will exit the site to the west of the substation onto Pootatuck Place and continue to Old Stratford Road. From the splicing chambers on Old Stratford Road, new distribution duct lines will be aligned:

- For approximately 1,150 feet northwest beneath Old Stratford Road to an interconnection with UI's existing distribution system located beneath Bridgeport Avenue; and
- For approximately 800 feet southeast beneath Old Stratford Road to the east side of the State Route 8 bridge crossing on Old Stratford Road.

Magnetic-field levels were calculated around the perimeter of the proposed site of the Shelton Substation as well as along profiles perpendicular to the substation perimeter and across the 115-kV transmission lines. The perimeter profiles begin at the northwest corner of the substation fence line and proceed clockwise around the proposed substation as shown in Figure 10.

Perimeter Profiles

North Side	models the magnetic-field levels along the northern edge of the substation perimeter (from west to east) across the monopole connecting the substation to the 1560-N transmission line and the underground duct bank exiting the substation to the north.
East Side	continues the perimeter profile along the eastern edge of the substation (from north to south) past the control enclosure, two transformers, and the bus-bar between two PDC enclosures.
South Side	runs along the south side of the substation (from east to west), past one transformer and then roughly parallel to both the 1560-S tap entering the substation and the underground distribution circuit ductbank exiting the substation to the west.
West Side	continues the perimeter profile along the western edge of the substation (from south to north), across the 1560-S tap and underground distribution circuit ductbank, and then back to the northwest corner, completing the perimeter calculation.

Perpendicular Profiles

Profile 1	models the magnetic-field levels proceeding across the underground duct-bank and away from the substation to the north.
Profile 2	begins at the eastern edge of the substation near the bus-bar and proceeds away from the substation to the east.
Profile 3	begins near the southwest corner of the substation and proceeds away from the substation to the south.

Profile 4 begins near the transition tower for the 115-kV transmission lines and proceeds away from the substation to the west, across the 1570, 1580 and 1590 transmission lines.

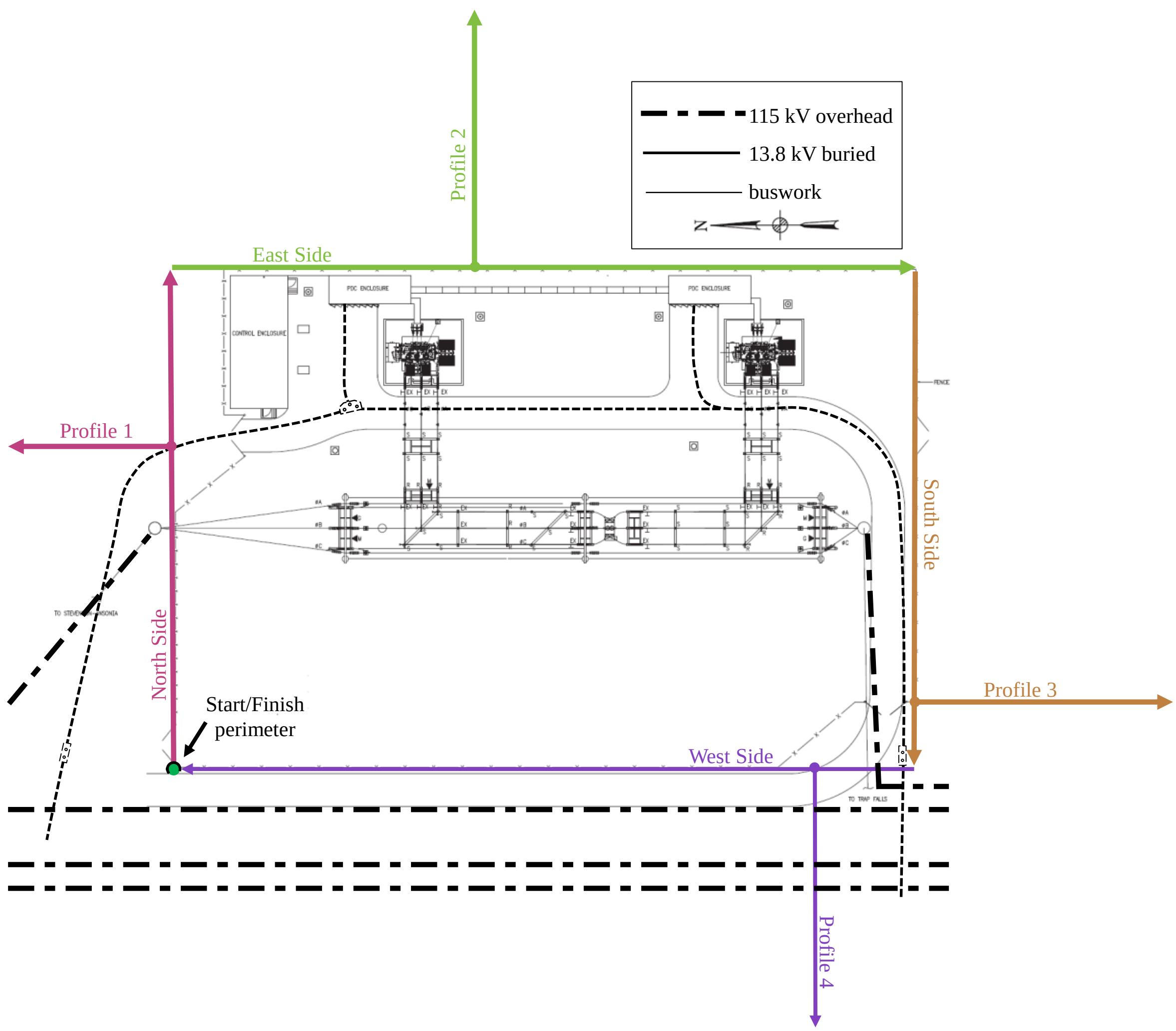


Figure 10. Overview of the proposed Shelton Substation,

Including the internal electrical components, transmission and distribution lines, as well as the location of perimeter profiles around the substation fence and perpendicular profiles 1-4.[3]

3 Note that the relative location of the transmission lines on the western edge of the substation are approximate and not to scale.

Methods

Magnetic fields around the perimeter of the substation and for perpendicular profiles 1-4 were modeled using SUBCALC, which is part of the Enertech EMF Workbench Suite. SUBCALC models the magnetic fields in and around substations, accounting for the breakers, disconnect switches, transformers, and the three-dimensional arrangement of buswork and interconnections (Figure 11). The SUBCALC model was built using a substation plan and profile data and did not account for grade on the proposed site. The inputs to the program include data regarding voltage, current flow, circuit phasing, and conductor configurations, which were provided by UI.

Along each profile, magnetic-field levels were calculated at 1 meter (3.28 feet) above ground, in accordance with IEEE Std. C95.3.1-2010. Calculated magnetic-field levels are reported as resultant quantities in units of mG.[4] Magnetic fields surrounding the proposed substation depend on current, which increases with increasing load. Loading for the proposed configuration of the substation are summarized in Table 2.

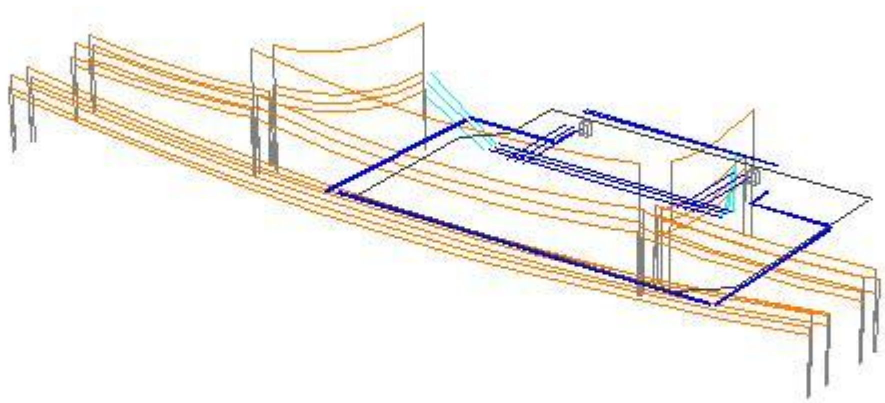


Figure 11. Overview of the three-dimensional SUBCALC model used to calculate perimeter and perpendicular magnetic-field profiles for average and peak loading cases.

[4] The resultant magnetic field is the Euclidian norm (square root of the sum of the squares) of the component magnetic-field vectors calculated along vertical, transverse, and longitudinal axes.

Results and Discussion

The calculated magnetic-field levels around the perimeter of the proposed substation are depicted in Figure 12 for average- and peak-load conditions and Table 6 summarizes the maximum, average, and minimum magnetic-field value along the four edges of the substation perimeter. The calculated magnetic fields for perpendicular profiles 1-4 are depicted for peak-load conditions in Figure 13 through Figure 16 and show the decrease in magnetic-field levels with distance away from the substation.

On the north side of the substation perimeter, the highest magnetic-field levels for average and peak loading are 25.8 and 44.7 mG, respectively, and they occur above the underground ductbank. Elsewhere on the northern edge of the substation perimeter, the magnetic-field levels for average and peak loading are dominated by the transmission lines, and are quite similar to one another. The mean magnetic-field levels on the north perimeter under average and peak loading are 7.5 and 9.2 mG, respectively, and the minimum levels are 1.2 and 1.1 mG, respectively.

On the eastern edge of the substation perimeter, the magnetic field is dominated by the bus-bar going between the two transformers. The magnetic-field level along this edge does not change significantly between average and peak loading (a change of 1 mG or less). At average loading the maximum, mean, and minimum magnetic-field level along the eastern edge of the substation are 14.9, 8.7, and 1.0 mG, respectively.

The underground ductbank which travels roughly parallel to the substation edge dominates magnetic-field levels along the southern edge of the substation. The maximum, mean, and minimum magnetic-field level for peak loading along the substation’s southern edge are 44.3, 32.6, and 1.0 mG, respectively. For average loading these values are 24.9, 15.8, and 1.0 mG, respectively.

At the southwest corner of the substation, the magnetic-field levels are dominated by the underground distribution circuit exiting the substation at that location. Elsewhere along the western edge, the magnetic-field levels are dominated by the adjacent transmission lines. Under peak loading conditions the maximum, mean, and minimum magnetic-field levels along this edge are 44.3, 15.1, and 8.9 mG, respectively, while for average loading these field levels are 22.8, 13.8, and 8.1 mG, respectively.

The profiles perpendicular to each substation edge are shown in Figure 13 through Figure 16 and describe the rate at which the magnetic field decreases with distance away from the substation. Calculated magnetic-field levels at distances of 25, 50, and 100 feet from the edge of the substation are shown in Table 7 for peak loading. Magnetic-field levels at average loading as a function of distance from the substation are similar to, or lower than, those presented in Table 7 at all locations.

On the northern edge of the substation the magnetic-field level decreases rapidly away from the underground ductbank to 2.7 mG at a distance of 25 feet, to 1.9 mG at 50 feet, and to 1.6 mG at 100 feet. Elsewhere on the northern edge of the substation, the magnetic-field level will be determined by proximity to transmission and distribution circuits and will decrease with distance as shown in Figure 5 and Figure 13, respectively.

The magnetic-field level on the eastern edge of the substation decreases rapidly with distance to 1.6, 0.5, and 0.3 mG at distances of 25, 50, and 100 feet from the edge of the substation as shown in Figure 14.

The magnetic-field level on the southern edge of the substation initially decreases rapidly away from the 1560-S transmission line tap into the substation and the distribution circuit ductbank as shown in Figure 15. Away from the local effects of these two elements, the perpendicular profile roughly parallels the transmission line ROW so that the magnetic-field levels do not decrease as rapidly with distance as on the northern or eastern edges of the substation. At distances of 25, 50, and 100 feet from the edge of the substation, the calculated magnetic-field levels are 20.7, 18.7, and 16.4 mG, respectively.

The perpendicular profile on the western edge of the substation crosses the adjacent transmission line ROW and decreases with distance as shown in Figure 16. At distances of 25, 50, and 100 feet from the substation fence, the magnetic-field levels along this profile are 20.2, 13.8, and 3.6 mG, respectively.

As shown in Figure 1, the 2-acre substation is situated on the 6-acre UI property such that only the corners are near to the property line. The minimum distance from the substation fence to the property line is approximately 30 feet (at the south-east corner) and is much greater at most other locations. On the north and south sides where the calculated perimeter magnetic fields are largest, the average distance from the substation fence to the UI property boundary is approximately 100 and 75 feet, respectively. The magnetic-field levels at the the boundary of UI property will therefore be far lower than shown in the perimeter. Furthermore, the nearest building to the substation fence is approximately 160 feet away and the nearest residence is at least 500 feet away so that the proposed substation will likely have no effect whatsoever on the EMF levels at residences in the area.

Table 6. Calculated magnetic-field levels (mG) around the perimeter of the Shelton Substation for both average and peak loading

	Average Loading			Peak Loading		
Profile	**Max**	**Mean**	**Min**	**Max**	**Mean**	**Min**
North Side	25.8	7.5	1.2	44.7	9.2	1.1
East Side	14.9	8.7	1.0	13.9	8.2	1.0
South Side	24.9	15.8	1.0	44.3	32.6	1.0
West Side	22.8	13.8	8.1	44.3	15.1	8.9

Table 7. Calculated magnetic-field levels (mG) at distances of 25, 50, and 100 feet from the edge of the Shelton Substation for peak loading

Perpendicular Profile	25 feet	50 feet	100 feet
1) North Side	2.7	1.9	1.6
2) East Side	1.6	0.5	0.3
3) South Side	20.7	18.7	16.4
4) West Side	20.2	13.8	3.6

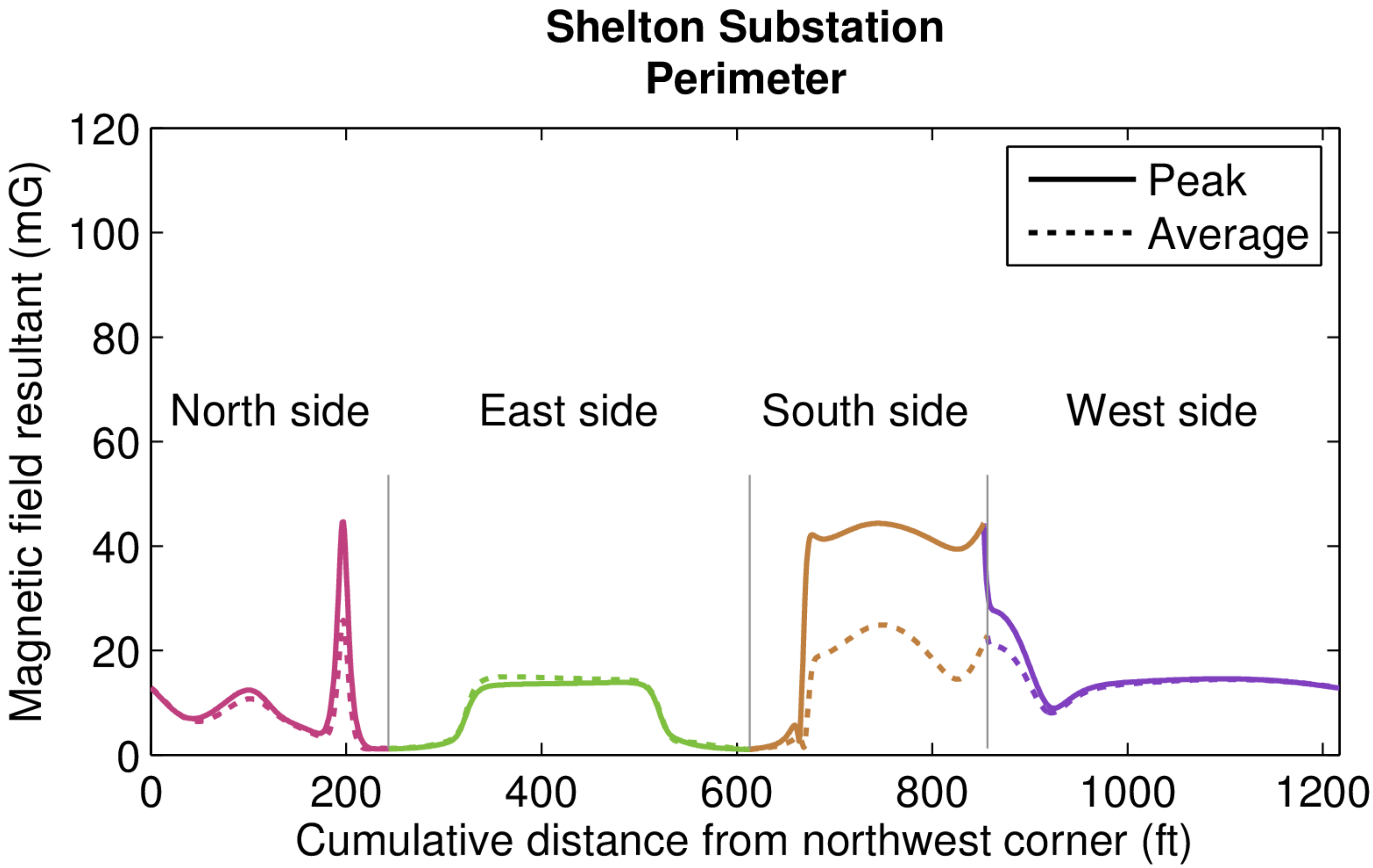


Figure 12. Calculated magnetic-field profile around the perimeter of the proposed substation for both average and peak loading.

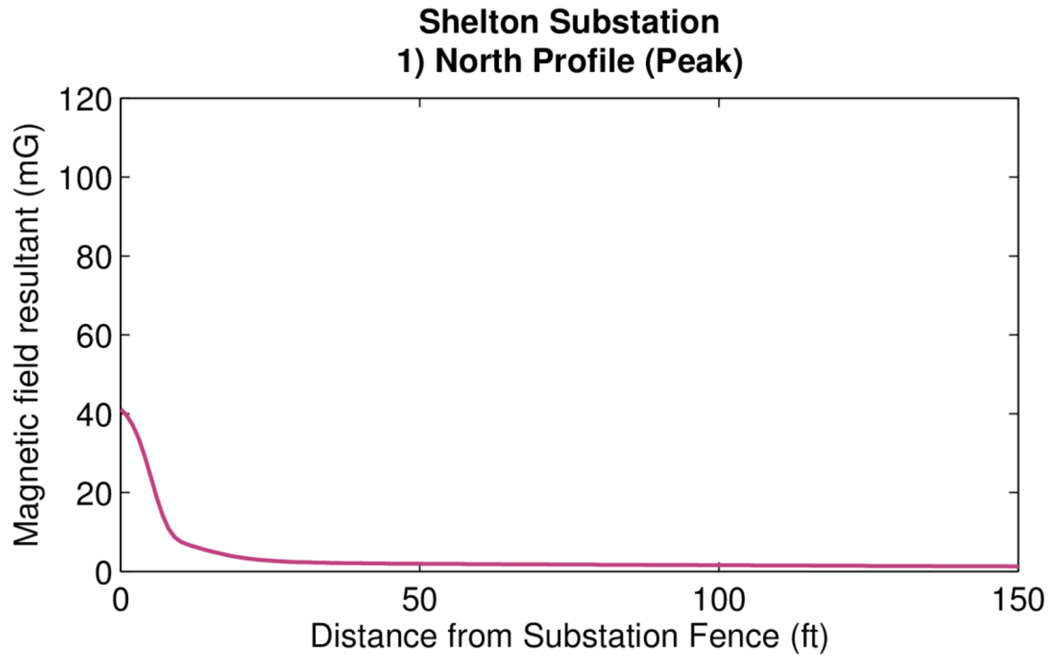


Figure 13. Calculated magnetic field for Profile 1, moving north, away from the substation for peak loading.

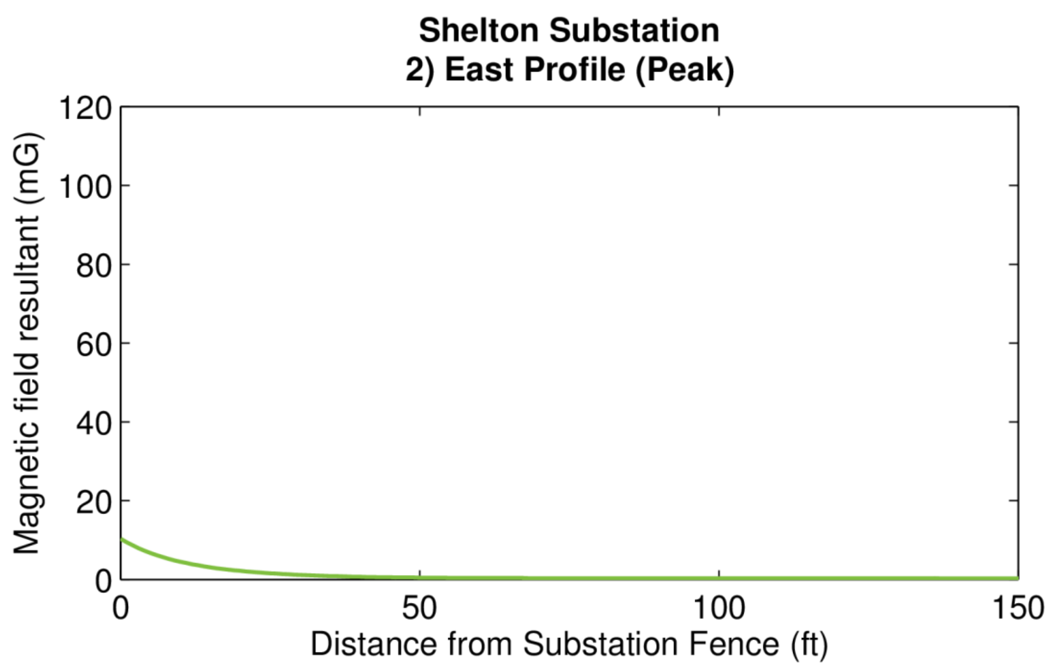


Figure 14. Calculated magnetic field for Profile 2, moving east, away from the substation for peak loading.

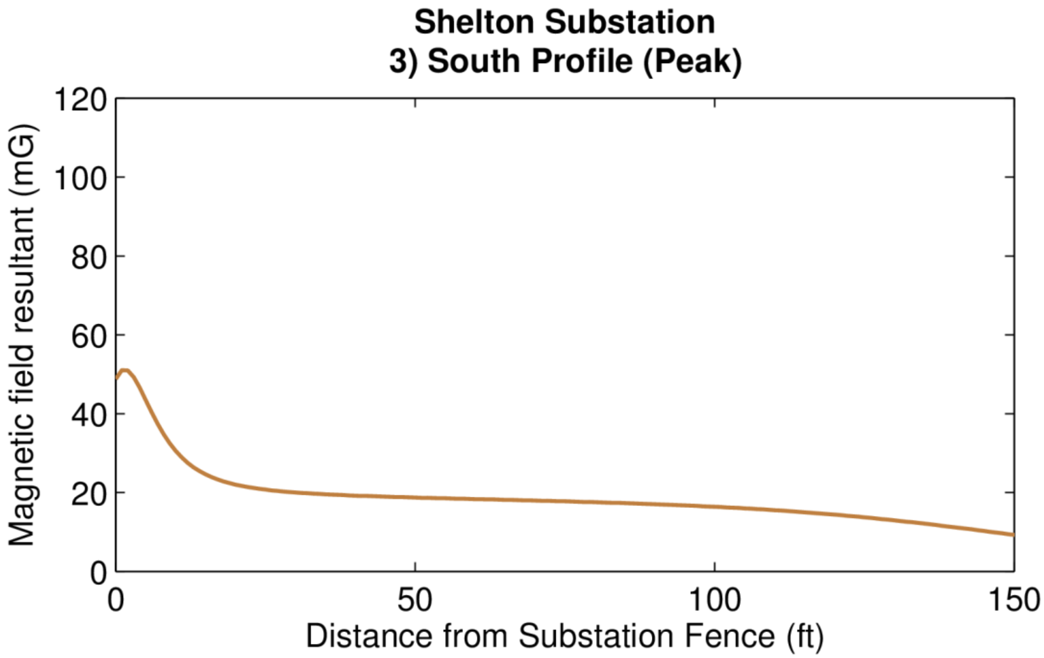


Figure 15. Calculated magnetic field for Profile 3, moving south, away from the substation for peak loading.

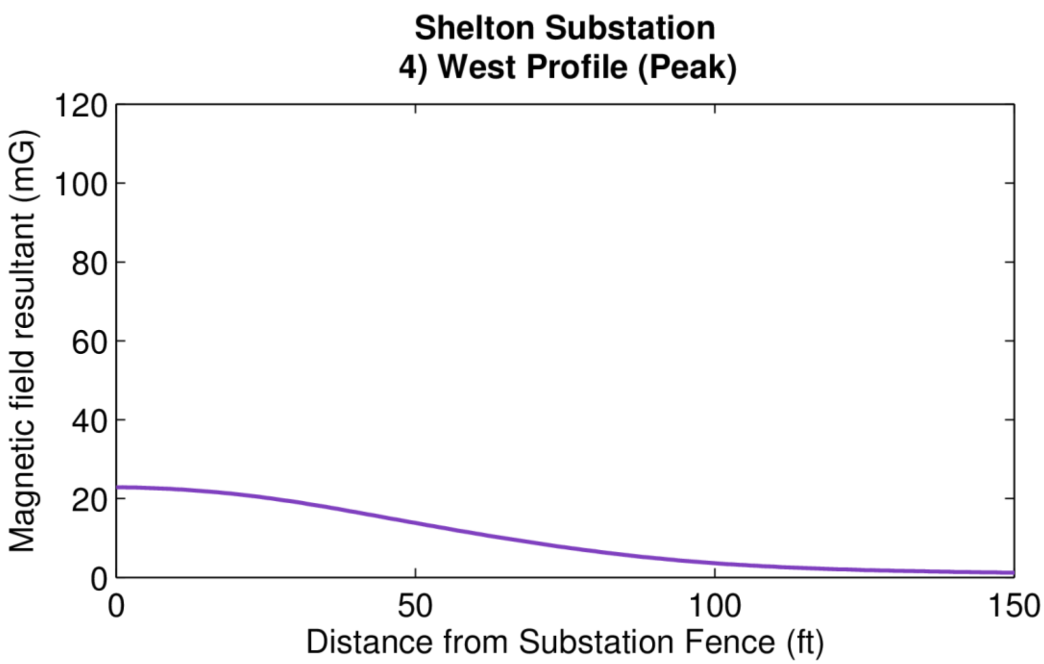


Figure 16. Calculated magnetic field for Profile 4, moving west, away from the substation for peak loading.

Conclusions

Electricity is an integral part of our infrastructure (e.g., transportation systems, homes, and businesses) and people living in modern communities are therefore surrounded by sources of EMF. Figure 17 depicts typical magnetic-field levels measured in residential and occupational environments, compared to levels measured on or at the edge of transmission line ROWs.

While magnetic levels decrease with distance from the source, any home, school, or office tends to have a "background" magnetic-field level as a result of the combined effect of numerous EMF sources. In general, the background magnetic-field level as estimated from the average of measurements throughout a house away from appliances is often between 1-2 mG, while levels can be hundreds of mG in close proximity to appliances. Comparing Figure 17 to the results discussed above, the calculated magnetic-field levels in the vicinity of the Shelton Substation are comparable in magnitude to the magnetic-field levels encountered in the vicinity of typical distribution lines and in homes and workplaces.

The highest calculated magnetic-field level at the perimeter of the Shelton Substation is less than 3% of that recommended for the general public by international health-based standards (ICES and ICNIRP) and is comparable to fields that may be found in homes near major appliances. Where the 1560, 1570, 1580, and 1590 transmission lines are run overhead on double-circuit transmission line towers in the vicinity of the Shelton Substation, the electric-field levels are less than 10% of recommended exposure limits and magnetic-field levels are approximately 1% or less of the recommended exposure limits. The nearest residence is at least 500 feet away so that the proposed substation will likely have no effect whatsoever on the levels of EMF at residences in the area.

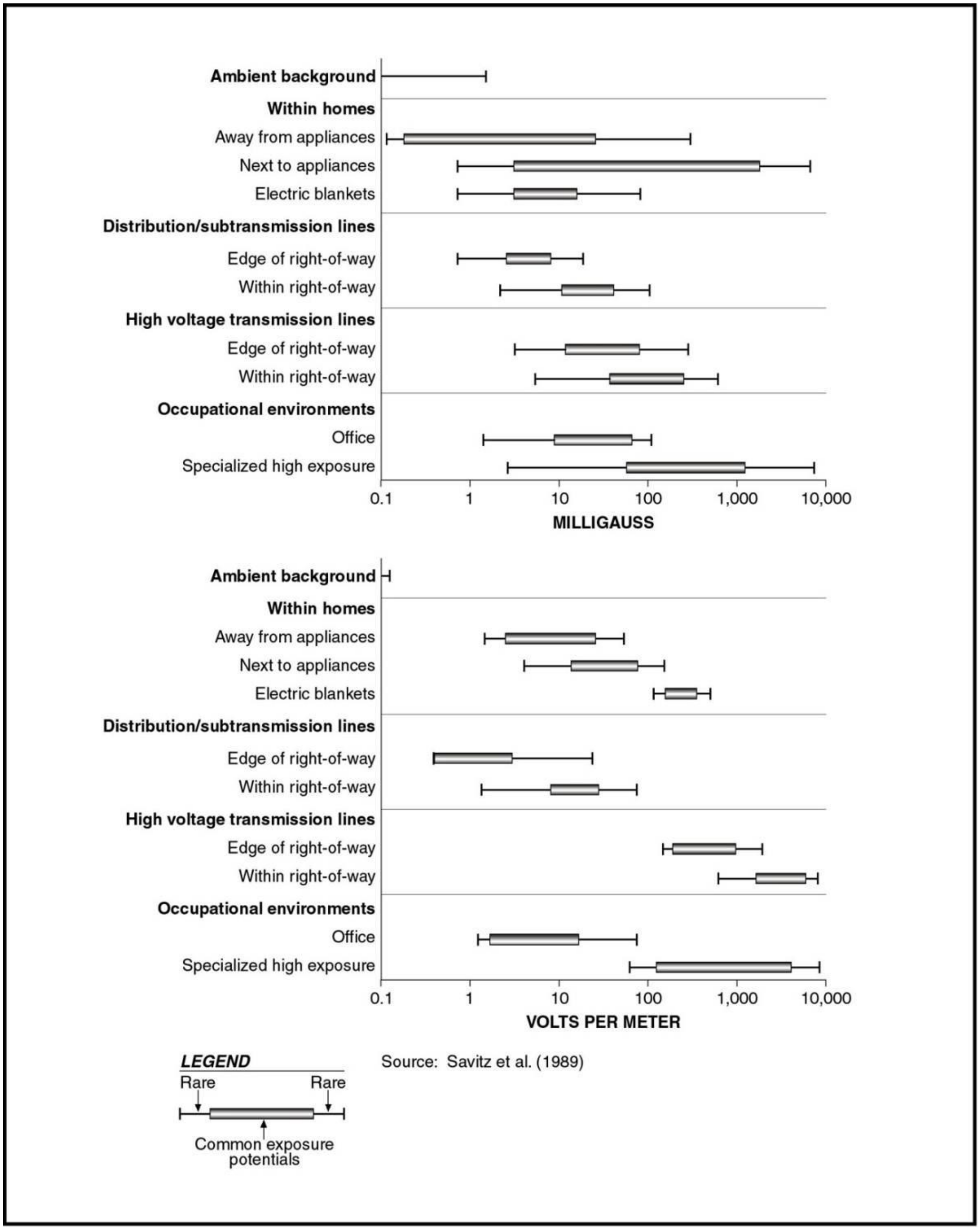


Figure 17. Electric and magnetic field levels in the environment.

References

Bonneville Power Administration (BPA). Corona and Field Effects Computer Program. Bonneville Power Administration, 1991.

Institute of Electrical and Electronics Engineers (IEEE). IEEE Recommended Practice for Measurements and Computations of Electric, Magnetic, and Electromagnetic fields with respect to Human Exposure to Such Fields, 0 Hz to 100 kHz. New York: IEEE. IEEE Std. C95.3.1™-2010.

International Commission on Non-ionizing Radiation Protection (ICNIRP). ICNIRP Statement—Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz to 100 KHz). Health Phys 99:819-816, 2010.

International Committee on Electromagnetic Safety (ICES). IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields 0 to 3 kHz C95. 6-2002. Piscataway, NJ: IEEE, 2002.

Savitz DA, Pearce NE, Poole C. Methodological issues in the epidemiology of electromagnetic fields and cancer. Epidemiol Rev 11: 59-78, 1989.

World Health Organization (WHO). Environmental Health Criteria 238: Extremely Low Frequency (ELF) Fields. Geneva, Switzerland: World Health Organization, 2007.

Appendix

Electric and Magnetic Field Measurements:

Shelton Substation Site in Shelton, Connecticut

Electrical Engineering and Semiconductor Practice

Exponent®

Electric and Magnetic Field Measurements:

Shelton Substation Site in Shelton, Connecticut

Electric and Magnetic Field Measurements:

Shelton Substation Site in Shelton, Connecticut

Prepared for

The United Illuminating Company
157 Church Street
New Haven, CT 06506

Prepared by

Exponent
17000 Science Drive, Suite 200
Bowie, MD 20715

July 31, 2012

1200544.000 A0T2 0712 BC02

Contents

List of Figures

List of Tables

Limitations

This report summarizes work performed to date and presents the findings resulting from that work. Although Exponent has exercised usual and customary care in the conduct of this analysis, the responsibility for the design and operation of the project remains fully with the client.

The findings presented herein are made to a reasonable degree of engineering and scientific certainty. Exponent reserves the right to supplement this report and to expand or modify opinions based on review of additional material as it becomes available, through any additional work, or review of additional work performed by others.

The scope of services performed during this investigation may not adequately address the needs of other users of this report, and any re-use of this report or its findings, conclusions, or recommendations presented herein are at the sole risk of the user. The opinions and comments formulated during this assessment are based on observations and information available at the time of the investigation. No guarantee or warranty as to future life or performance of any reviewed condition is expressed or implied.

Executive Summary

The United Illuminating Company proposes to construct a new 115/13.8-kV substation in Shelton Connecticut. To conform with the Connecticut Siting Council's guidelines for such a project, United Illuminating Company has requested that Exponent measure pre-construction levels of electric and magnetic fields from existing sources at the boundaries of the proposed Shelton Substation site. Magnetic-field measurements were performed on July 13, 2012 between the hours of 10AM and 2PM, and electric-field measurements were performed on July 27, 2012 between the hours of 11AM and 2PM.

The highest existing magnetic-field level at the proposed site is approximately 30 milligauss (mG) and occurs beneath the existing transmission line towers near the northwest corner of the proposed site. The highest existing electric-field level at the proposed site occurs in the same location and is approximately 1.97 kilovolts per meter (kV/m). Along the western edge of the proposed site, the measured magnetic-field level varied between approximately 20 and 27 mG beneath a local distribution circuit parallel to the edge of the proposed site. The electric field beneath the local distribution circuit is approximately 0.28 kV/m. On the eastern edge of the proposed site (along the exit ramp of Route 8), the magnetic-field level is 3 mG or less. The electric-field level at this location is that of the ambient background, less than 0.01 kV/m.

Measurements

At the request of the United Illuminating Company, Exponent measured electric- and magnetic-field levels in and around the site of the proposed Shelton Substation in the city of Shelton, Connecticut. A survey of magnetic-field levels throughout the community of Shelton was also performed.

Magnetic-field measurements were performed on July 13, 2012 between the hours of 10AM and 2PM and electric-field measurements were performed on July 27, 2012 between the hours of 11AM and 2PM in Shelton, Connecticut. The magnetic field measurements were recorded in units of magnetic flux density—milligauss (mG), where 1 Gauss = 1,000 mG. The electric field measurements were recorded kilovolts per meter (kV/m). Both measurements were taken using a data-logging EMDEX II, 3-axis electric- and magnetic-field meter with an electric-field sensor and a survey wheel. This meter recorded the total (resultant) root mean square (rms) magnetic field and the magnetic field along the x, y, and z-axes at a height of 1 meter (3.28 feet) above ground. The electric field was measured independently along each of the x, y, and z-axes, also at a height of 1 meter (3.28) feet above ground. This meter meets the instrumentation standard for obtaining accurate electric- and magnetic-field measurements at power-line frequencies (IEEE Std. C95.3.1-2010). As shown in Figure 1, magnetic-field measurements were taken along four paths in the vicinity of the substation. The magnetic-field measurement paths using the survey wheel are shown in Figure 1 and include:

(1) Survey along Old Stratford Road

(2) Survey along the Route 8 exit ramp

(3) Survey along Pootatuck Road

(4) Survey from the 1560 Line to the Hilton Garden Inn

Spot measurements were performed on the northern boundary of the substation site shown in Figure 1 as locations s1, s2, s3, and s4. Spot measurements were also performed throughout the community at various store locations and street intersections.

Electric-field measurements were performed at approximately 10-foot intervals between the western-most transmission line and the eastern corner of the hotel as shown in Figure 2.

The transmission line loading during the time of the measurements is shown in Table 1, indicating that the total loading of the three energized lines varied by as much as 40% over the course of measurements.

Table 1. Line loading in megavolt-amperes (MVA) during the time magnetic field measurements were conducted.

Measurement Time	Line 1560	Line 1570	Line 1580
13-Jul-12 10:00:00	18.4	49.2	17.2
13-Jul-12 10:15:00	20.9	51.0	18.2
13-Jul-12 10:30:00	20.5	52.2	18.3
13-Jul-12 10:45:00	20.9	52.8	18.2
13-Jul-12 11:00:00	23.3	53.9	18.7
13-Jul-12 11:15:00	25.1	55.5	19.8
13-Jul-12 11:30:00	24.9	56.3	19.7
13-Jul-12 11:45:00	25.1	57.2	20.2
13-Jul-12 12:00:00	24.2	57.1	20.2
13-Jul-12 12:15:00	23.8	57.1	20.3
13-Jul-12 12:30:00	25.8	58.5	21.1
13-Jul-12 12:45:00	25.3	58.6	20.8
13-Jul-12 13:00:00	25.5	59.6	21.3
13-Jul-12 13:15:00	29.7	62.7	22.8
13-Jul-12 13:30:00	31.9	63.8	23.4
13-Jul-12 13:45:00	30.2	63.5	23.4
13-Jul-12 14:00:00	30.9	64.1	23.6

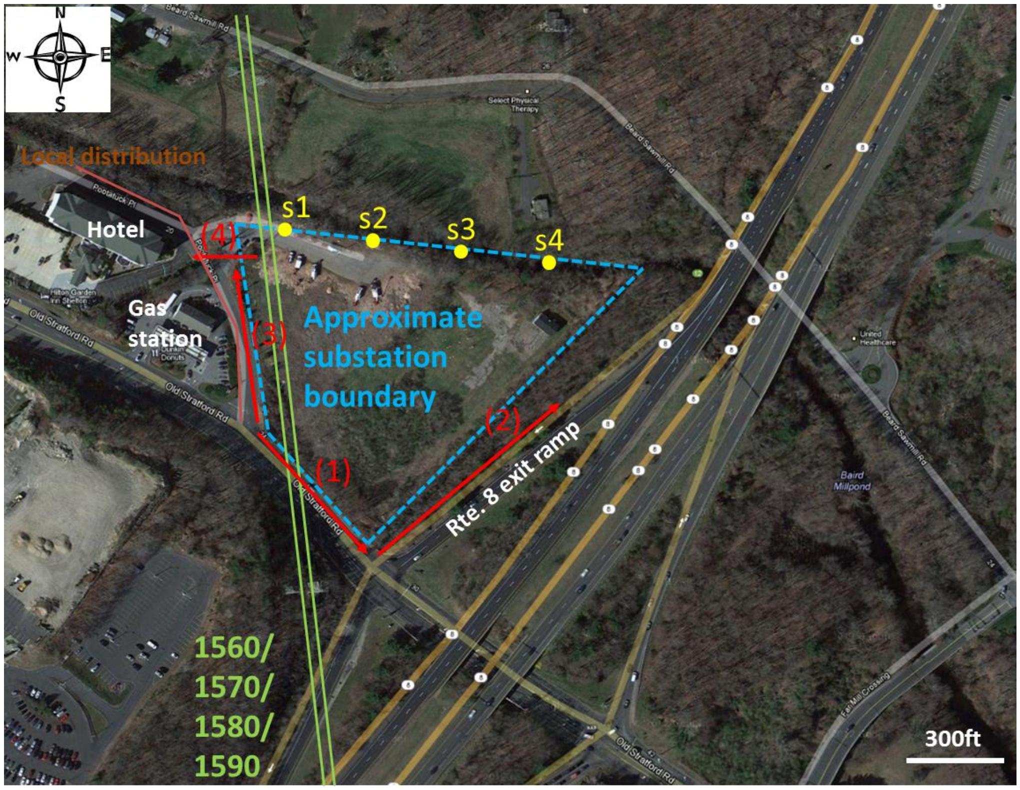


Figure 1. Map showing the locations of magnetic field measurements performed around the proposed Shelton Substation.

The paths along which measurements were taken are identified by the numbers in brackets. The blue hashed lines indicate the approximate boundary of the substation site, the green lines indicate the existing dual tower lines (circuits 1560, 1570, 1580, 1590), and the red arrows indicate the location and direction of magnetic-field measurements taken long Paths 1, 2, 3, and 4. The yellow dots indicate locations where spot measurements of the magnetic field were taken.

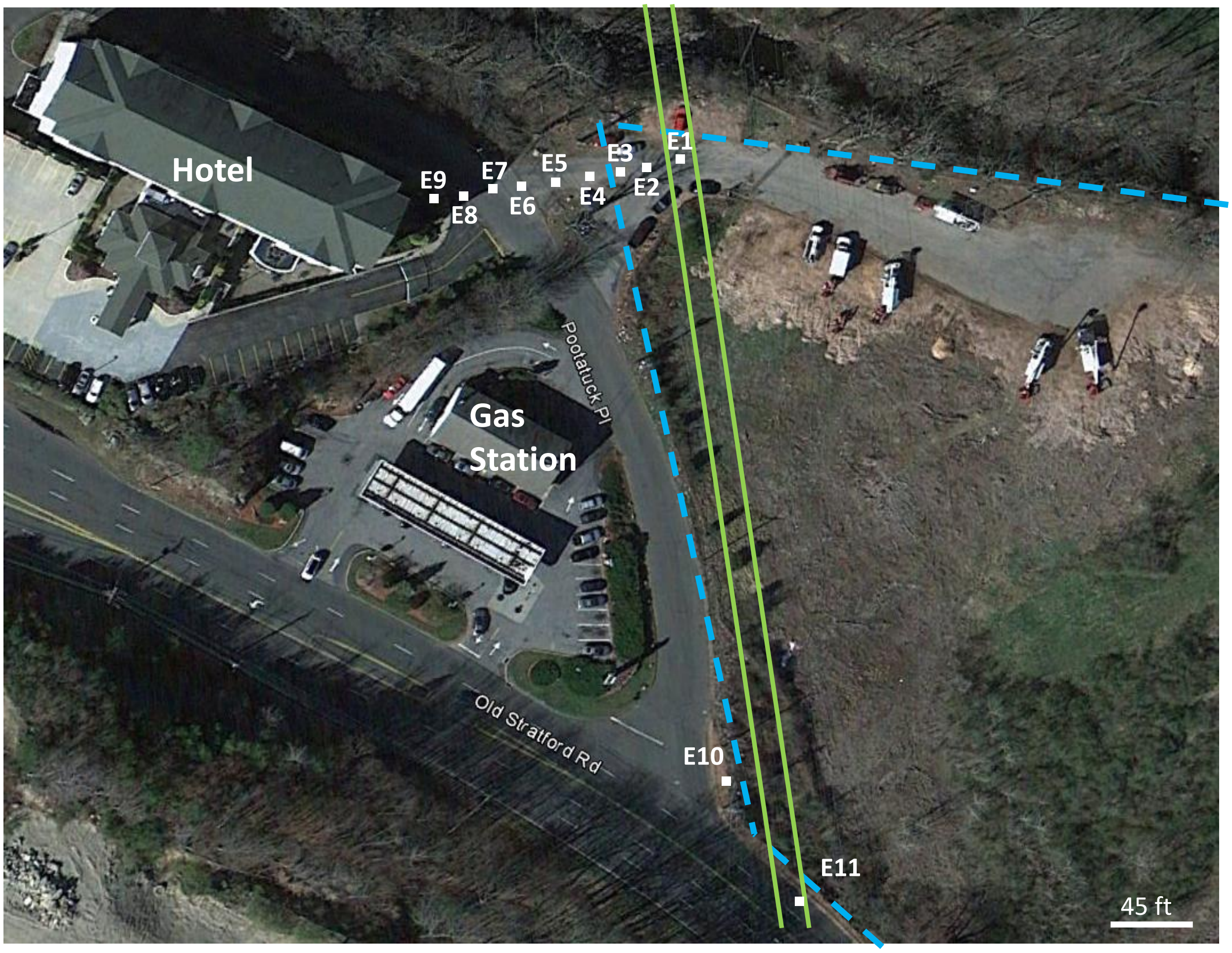


Figure 2. Map showing the locations of electric-field measurements performed around the proposed Shelton Substation site.

The paths along which measurements were taken are identified by the numbers in brackets. The blue hashed lines indicate the approximate boundary of the substation site, the green lines indicate the existing dual tower lines (circuits 1560, 1570, 1580, 1590), and the white squares indicate approximate locations where electric field measurements were taken.

Results and Discussion

Magnetic-Field Site Measurements

Surveys of the magnetic-field levels around the proposed substation site are described in Figures Figure 3 through Figure 6 below. The magnetic field along Old Stratford Road (Figure 3) along Path 1 was highest (22 mG) near the corner of Pootatuck Road, beneath an overhead distribution line. The field then dropped only to rise again (to 15 mG) when passing beneath the 1560/1570/1580/1590 transmission lines.

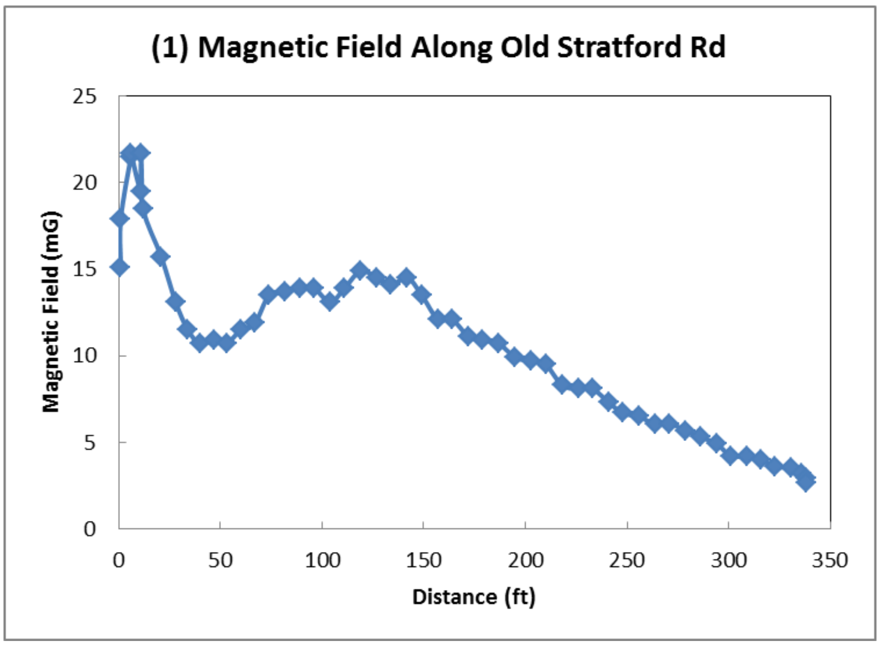


Figure 3. Resultant magnetic field measured along Old Stratford Road along Path 1 in Figure 1.

The magnetic field along the Route 8 off-ramp (Path 2), near the southeast boundary of the proposed site is shown in Figure 4. The maximum magnetic-field level along this path is 3 mG and occurs beneath a local distribution line near Old Stratford Road. The magnetic-field level decreases with distance away from the distribution line to below 1 mG at a distance of approximately 150 feet.

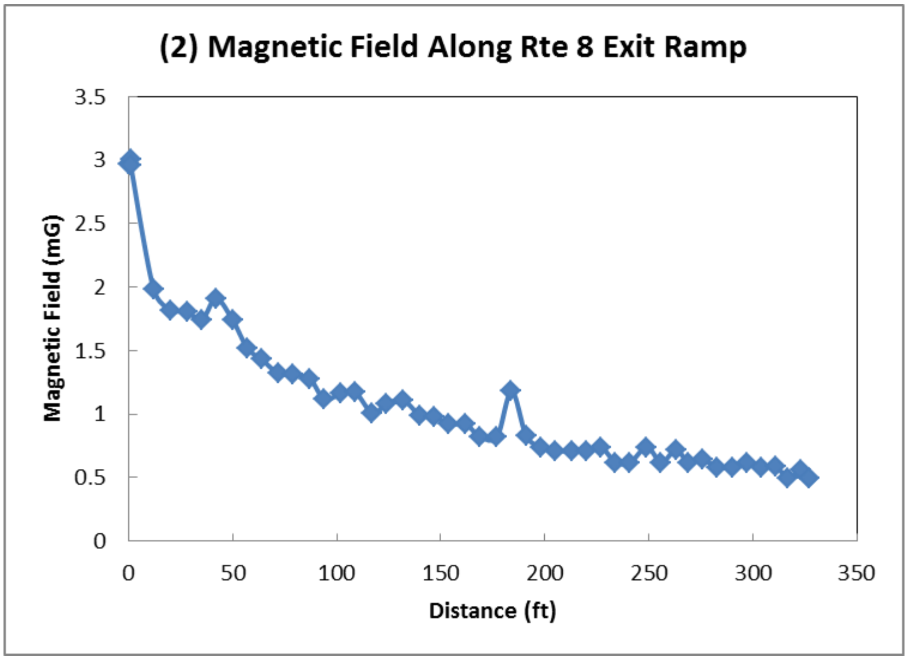


Figure 4. Resultant magnetic field measured along Path 2 along the Route 8 exit ramp in Figure 1.

As shown in Figure 5, the magnetic field along Pootatuck Road (Path 3) that is adjacent to the western boundary of the proposed site varies between 20 and 27 mG due to an overhead distribution line and the four transmission circuits which run parallel to the measurement direction.

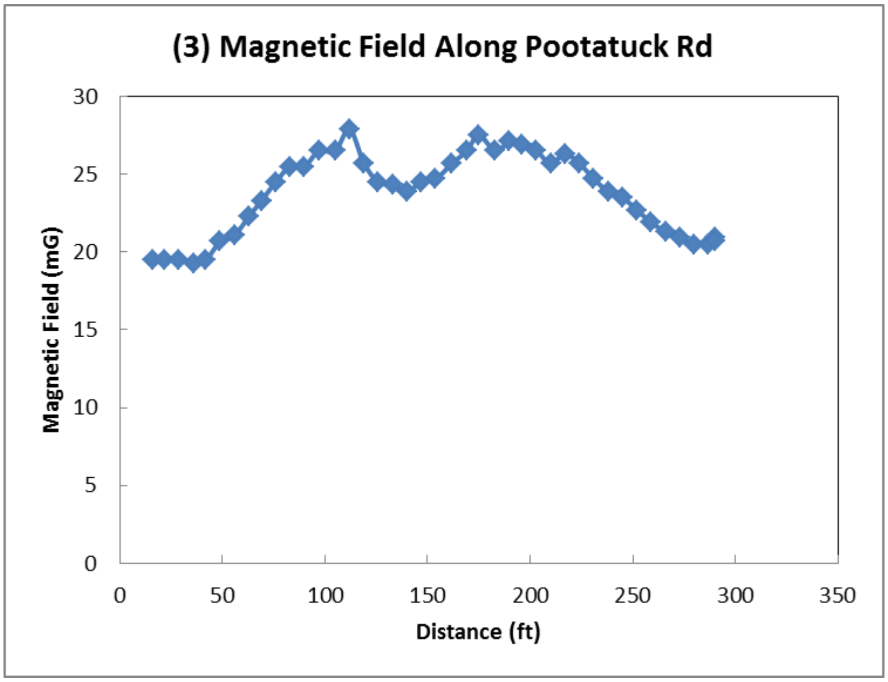


Figure 5. Resultant magnetic field measured along Pootatuck Road as shown by the red line in Figure 1

The measurements depicted in Figure 6 start beneath the 1560/1570/1580/1590 lines and continue towards the driveway of the Hilton Garden Inn located at 25 Old Stratford Road. The measurement was perpendicular to Pootatuck Road and peaks at about 27 mG then drops to 5 mG. When passing beneath the overhead distribution along Pootatuck Road, the field then rises back to 14 mG. The peak measured magnetic field along this profile is higher than the corresponding measurements of the same transmission lines shown in Figure 3 (profile 1, near 100 feet). This difference is likely due to a combination of slightly increased loading on the transmission line at this time as shown in Table 1[1] and because the measurement profile of Figure 3 was taken on a hill so that the height of the transmission lines were much higher above ground at this location than at the location of profile 4.

[1] Profile 1 was taken at approximately 11AM and profile 4 at approximately 12PM

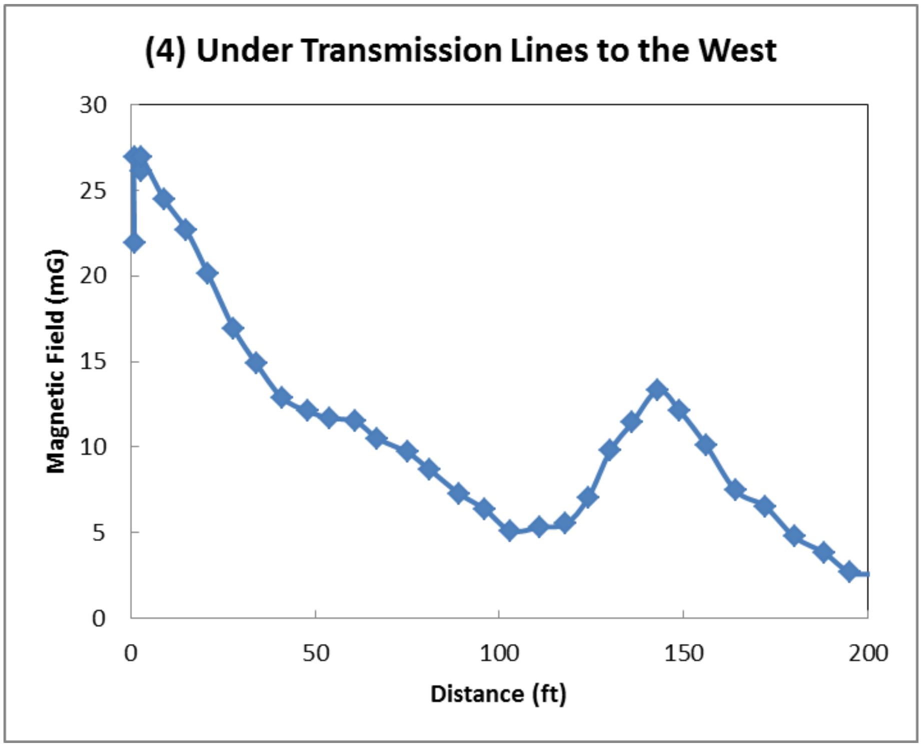


Figure 6. Resultant magnetic field measured along Path 4 from under the 1560/1570/1580/1590 lines towards a neighboring hotel identified by the red path to the west in Figure 1.

The spot measurements, as opposed to profiles of magnetic fields, were taken on the northern boundary of the substation site, as shown in Table 1. Profiles could not be taken due to the presence of dense grass and brush. As expected, the highest magnetic-field levels occur beneath the 1560/1570/1580/1590 lines then decrease with distance.

Table 2. Magnetic field measurements along the northern perimeter of the substation site corresponding to Figure 1.

Measurement Location	GPS Coordinates	Resultant Magnetic Field (mG)
s1	N41.27700, W073.11858	30.4
s2	N41.27699, W073.11843	14.8
s3	N41.27690, W073.11822	4.7
s4	N41.27669, W073.11685	2.5

Spot Magnetic-Field Measurements in the Area

The results of the spot measurements performed throughout the community are shown in Figure 7[2]. The highest magnetic-field levels occurred beneath overhead distribution lines either at roadway intersections or along sidewalks.

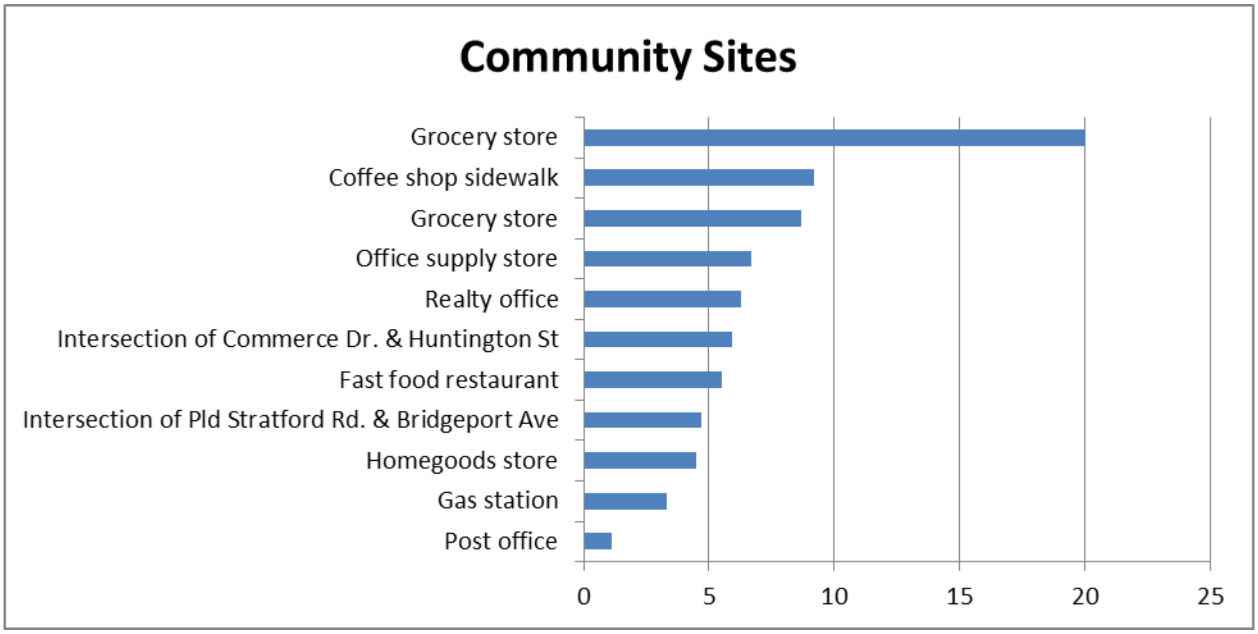


Figure 7. Maximum magnetic fields measured at various sites in the community.

Electric-Field Site Measurements

The three-axis electric-field measurements were taken approximately every 10 feet between the transmission line and the eastern corner of the hotel as shown in Figure 2. Electric-field measurements were also taken at the southwest corner of the proposed site beneath a local distribution circuit and the transmission lines. A summary of these electric-field levels, along with the GPS coordinates of the measurement locations are shown in Table 3. Additional measurements on the eastern and northern sides of the proposed substation site were <0.01

[2] Measurements at the coffee shop sidewalk, and at the two intersections were taken outside, all other measurements were made inside the referenced location

kV/m due to distance from electrical sources and because most conducting objects including trees, shrubs, fences, and walls effectively block electric fields.

Table 3. Electric field measurements at spot locations shown in Figure 2.

Measurement Location	GPS Coordinates	Resultant Electric Field (kV/m)
E1	N41.27689, W073.11873	1.97
E2	N41.27688, W073.11867	1.38
E3	N41.27687, W073.11877	1.07
E4	N41.27689, W073.11880	1.15
E5	N41.27682, W073.11899	0.72
E6	N41.27684, W073.11900	0.27
E7	N41.27686, W073.11898	0.07
E8	N41.27682, W073.11911	0.04
E9	N41.27677, W073.11926	0.01
E10	N41.27581, W073.11861	0.28
E11	N41.27560, W073.11845	0.83

Summary and Conclusion

Neither the federal government nor Connecticut have enacted standards for electric fields or magnetic fields from power lines or other sources at power frequencies. Several other states have statutes or guidelines that apply to fields produced by new transmission lines, but these guidelines are not health based. For example, New York and Florida have limits on electric and magnetic fields that were designed to limit field levels from new transmission lines to levels produced by existing transmission lines, i.e., to maintain the *status quo*.

More relevant are exposure limits recommended by scientific organizations that were developed to protect health and safety, which are based upon reviews and evaluations of relevant health research. These include exposure limits for the general public recommended by the International Committee on Electromagnetic Safety (ICES) in 2002 and by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) in 2010 to address health and safety issues.

The operation of the Shelton Substation is not expected to affect magnetic-field levels at any location outside the immediate vicinity of the substation itself. The construction of the proposed substation would be expected to mostly affect magnetic-field levels at the site boundaries because electric fields are largely shielded by buildings and fencing. In addition, as discussed by the IEEE Std 1127-1990[3] electric and magnetic fields attenuate rapidly with distance from the source and are often "…reduced to a general ambient level at the substation property lines." One exception is where transmission and distribution lines enter and exit the substation. The measurements provided in this report of the electric and magnetic fields surrounding the existing transmission and distribution lines, however, indicate that the present and future electric- and magnetic-field levels associated with the proposed substation will be well below the reference levels published by these two organizations, as summarized in Table 4.

[3] IEEE Guide for the Design, Construction, and Operation of Safe and Reliable Substations for Environmental Acceptance, New York, NY: IEEE, 1990

Table 4. Reference levels for whole body exposure to 60-Hz fields: general public.

Organization, recommended limit	Magnetic Fields	Electric Fields
ICNIRP[4], reference level	2,000 mG	4.2 kV/m
ICES[5], maximum permissible exposure (MPE)	9,040 mG	5 kV/m 10 kV/m[6]

4 International Commission on Non-Ionizing Radiation Protection (ICNIRP). Guidelines for limiting exposure to time-varying electric and magnetic fields (1 Hz – 100 kHz). Health Physics 99:818-826, 2010.

5 International Committee on Electromagnetic Safety (ICES). IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields 0 to 3 kHz C95. 6-2002. Piscataway, NJ: IEEE, 2002.

6 This is an exception within transmission line ROWs because people do not spend a substantial amount of time in ROWs, and very specific conditions are needed before a response is likely to occur (i.e., a person must be well insulated from ground and must contact a grounded conductor) (ICES, 2002, p. 27).