EVERSOURCE ENERGY

Connecticut Siting Council Application

Connecticut General Statutes Section 16-50/(e)

For a Certificate of Environmental Compatibility and Public Need

Greenwich Substation and Line Project

Greenwich, Connecticut

June 2015

Submitted by:

The Connecticut Light and Power Company doing business as Eversource Energy

56 Prospect Street

Hartford, CT 06103

Table of Contents

APPENDICES

APPENDIX A PHOTOLOG OF VICINITY

APPENDIX B GREENWICH SUBSTATION SITE PLAN DRAWINGS

APPENDIX C COS COB SUBSTATION SITE PLAN DRAWINGS

APPENDIX D PREFERRED ROUTE SEGMENT MAPS

APPENDIX E AGENCY CORRESPONDENCE

APPENDIX F CULTURAL RESOURCES REVIEW OF THE PROJECT REGION ASSOCIATED WITH THE PROPOSED SUBSTATION AND TRANSMISSION LINE PROJECT IN GREENWICH, CONNECTICUT

APPENDIX G.1 CONNECTICUT SITING COUNCIL ELECTRIC AND MAGNETIC FIELDS BEST MANAGEMENT PRACTICES FOR THE CONSTRUCTION OF ELECTRIC TRANSMISSION LINES IN CONNECTICUT

APPENDIX G.2 MF CALCULATION TABLES

APPENDIX G.3 REVIEW OF RELEVANT SCIENTIFIC LITERATURE

APPENDIX H FORMAL REQUIREMENTS

BULK FILING OF MUNICIPAL DOCUMENTS – PROVIDED UNDER SEPARATE COVER

A. ABUTTER INFORMATION (NOTICE AND LIST)
B. TOWN OF GREENWICH INLAND WETLANDS AND WATERCOURSES REGULATIONS
C. TOWN OF GREENWICH ZONING REGULATIONS AND AMENDMENTS
D. TOWN OF GREENWICH ZONING MAP
E. 2006-2015 REGIONAL PLAN OF CONSERVATION AND DEVELOPMENT
F. GREENWICH SUBSTATION LOCATION REVIEW FILING
G. GREENWICH SUBSTATION AND LINE PROJECT MUNICIPAL CONSULTATION FILING
H. GREENWICH PLAN OF CONSERVATION AND DEVELOPMENT

LIST OF FIGURES

LIST OF TABLES

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CONNECTICUT SITING COUNCIL APPLICATION GUIDE FOR AN ELECTRIC SUBSTATION FACILITY April 2010

This application guide is designed to assist applicants in filing for a Certificate of Environmental Compatibility and Public Need (Certificate) from the Connecticut Siting Council (Council) for the construction of an electric substation facility. Such facilities are defined in the Connecticut General Statutes **§** 16-50i (a) (4).

Applicants should consult Connecticut General Statutes **§§** 16-50g through 16-50aa, §16a-7c, and Sections 16-50j-1 through 16-50z-4 of the Regulations of Connecticut State Agencies to assure complete compliance with the requirements of those sections. Where appropriate, statutory and regulatory references are noted below.

I. Pre-Application Process

A. Municipal Consultation (Conn. Gen. Stat. § 16-50*l* (e)) Refer to Bulk Filing

"….at least 60 days prior to the filing of any application with the Council, the applicant shall consult with the municipality in which the facility may be located and with any other municipality required to be served with a copy of the application under subdivision (1) of subsection (b) of this section [any adjoining municipality having a boundary not more than 2500 feet from such facility] concerning the proposed and alternative sites of the facility…..Such consultation with the municipality shall include, but not be limited to, good faith efforts to meet with the chief elected official of the municipality. At the time of the consultation, the applicant shall provide the chief elected official with any technical reports concerning the public need, the site selection process and the environmental effects of the proposed facility. The municipality may conduct public hearings and meetings as it deems necessary for it to advise the applicant of its recommendations concerning the proposed facility. Within 60 days of the initial consultation, the municipality shall issue its recommendations to the applicant. No later than 15 days after submitting the application to the Council, the applicant shall provide to the Council all materials provided to the municipality and a summary of the consultations with the municipality including all recommendations issued by the municipality."

"…the applicant shall submit to the Connecticut Energy Advisory Board (CEAB) the same information that it provides to a municipality … on the same day of the consultation with the municipality."

B. Application to Municipal Agencies (Conn. Gen. Stat. § 16-50x (d)) Refer Bulk Filing

Municipal zoning and inland wetland agencies may regulate and restrict the location of an electric substation facility. Such action must be taken within 30 days of application filed with the Council. Orders made by the municipal zoning and inland wetland agencies may be appealed within thirty days by any party or municipality required to be served with a copy of the application.

II. Form of Application (Regs. Conn. State Agencies §16-50*l*-2)

All applications shall include the following components:

A. The purpose for which the application is being made; **Refer to Section A**

B. The statutory authority for such application; **Refer to Section B**

C. The exact legal name of each person seeking the authorization or relief and the address or principal place of business of each such person. If any applicant is a corporation, trust association, or other organized group, it shall also give the state under the laws of which it was created or organized; **Refer to Section C**

D. The name, title, address, and telephone number of the attorney or other person to whom correspondence or communications in regard to the application are to be addressed. Notice, orders, and other papers may be served upon the person so named, and such service shall be deemed to be service to the applicant; **Refer to Section D**

E. Such information as may be required under the applicable provisions of Section 16-50*l* of the Connecticut General Statutes; **Refer to this Document and Bulk Filing**

F. Such information as any department or agency of the state exercising environmental controls may, by regulation, require; and **Refer to this Document and Bulk Filing**

G. Such information as the applicant may consider relevant. **Refer to this Document and Bulk Filing**

III. Filing Requirements (Regs. Conn. State Agencies §16-50j-12)

A. Except as may be otherwise required, at the time applications are filed with the Council, there shall be furnished to the Council an original and 20 copies. All filings from the applicant, parties, or intervenors must consist of an original and 20 copies, labeled with the docket number, properly collated and paginated, and bound. An electronic version of all filings, as appropriate, should be provided.

Per the Council's recent request, we are providing one (1) original and 15 copies of this Application

B. Bulk filing should be provided of not less than four (4) copies of the applicable town zoning and Inland wetlands regulations (including a map showing the location of inland wetlands if relevant) and plan of development and any other publicly available material in support of the application. These documents shall include effective dates, revision dates, or dates of adoption. If no such dates are available, the document shall include the date the document was obtained. **Refer to Bulk Filing**

C. Applications filed for the purpose of any proceeding before the Council shall be printed or typewritten on paper cut or folded to letter size, 8 1/2 by 11 inches. Width of margins shall be not less than one inch. The impression shall be on only one side of the papers, unless printed, and shall be double spaced, except that quotations in excess of five typewritten lines shall be single spaced and indented. Mimeographed, multigraphed,

photoduplicated, or the like copies will be accepted as typewritten, provided all copies are clear and permanently legible. In accordance with the State Solid Waste Management Plan, all filings should be submitted on recyclable paper, primarily regular weight white office paper. Applicants should avoid using heavy stock paper, colored paper, and metal or plastic binders and separators.

Refer to this Document and Bulk Filing

D. Every original shall be signed by the applicant or by one or more attorneys in their individual names on behalf of the applicant. All applications shall be filed at the office of the Council, Ten Franklin Square, New Britain, Connecticut 06051. Service of all documents and other papers filed as applications, briefs, and exhibits, but not limited to those categories, shall be by personal delivery or by first class mail to the Council and all parties and intervenors to the proceeding, unless service has been waived.

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E. Any exhibits, sworn written testimony, data, models, illustrations, and all other materials that the applicant deems necessary or desirable to support the granting of the application shall be attached to the application. In addition, annexed materials shall include such exhibits, sworn written testimony, and other data that any statute or regulations may require. The applicant may request that administrative notice be taken of and refer in the application to portions of other Council docket records and generic hearings or statements prepared by the Council as a result of generic hearings. All documents, including but not limited to maps, shall include effective dates, revision dates, or dates of adoption. If no such dates are available the document shall include the date the document was obtained. Maps must include a key table(s) and a matching source list/table, appropriately organized. **Refer to this Document and Bulk Filing**

F. Applicants may present material in a sequence and format most appropriate for the particular proposal. To allow timely Council review, include with the application a copy of this form with page references for each item required in Section VI below.

Included Herein

G. Potential applicants are urged to carefully review Connecticut General Statutes §§ 16-50*l*(e), 16-50i and 16a-7c to determine whether the proposed project falls within the Connecticut Energy Advisory Board (CEAB) "request-for-proposal" process.

No Longer Applicable

IV. Application Filing Fees (Conn. Gen. Stat. §16-50*l*(a); Conn. Gen. State. §4-189j; Regs., Conn. State Agencies § 16-50v-1a)

Conn. Gen. Stat. §16-50*l*(a) mandates a municipal participation fee of $25,000 to be deposited in the account established in accordance with Conn. Gen. Stat. §16-50bb.

The filing fee for an application is determined by the following schedule:

Estimated Construction Cost		Fee
Up to	$5,000,000	0.05% or $1,250.00, whichever is greater;
Above	$5,000,000	0.1% or $25,250.00, whichever is less.

All application fees shall be paid to the Council at the time an application is filed with the Council. Additional assessments may be made for expenses in excess of the filing fee. Fees in excess of the Council's actual costs will be refunded to the applicant.

Refer to Section Q - Filing Fees accompany CSC Application

V. Municipal Participation Account (Conn. Gen. Stat. §16-50bb)

Conn. Gen. Stat. §16-50bb requires that each application be accompanied by a payment in the amount of $25,000 to be deposited in a Municipal Participation Account within the General Fund to defray expenses incurred by each municipality entitled to receive a copy the application under Conn. Gen. Stat. § 16-50*l* that chooses to participate as a party to the certification proceeding. Any moneys remaining at the end of the proceeding shall be refunded to the applicant.

Refer to Section Q (Application Filing Fees) and Application Cover Letter

VI. Contents of Application (Conn. Gen. Stat. §16-50*l*(a)(1)(A))

An application for a Certificate for the construction of an electric substation or switchyard shall include the following:

A. An executive summary. A description and the location of the proposed facility, including an artist's rendering and/or narrative describing its appearance.

Refer to Executive Summary (ES)

B. A description of the technical specifications, including but not limited to:
   1. Itemized estimated costs;
   2. Comparative costs of alternatives considered;
   3. Facility service life;
   4. Bus design and specifications;
   5. Overhead take-off design, appearance, and heights, if any;
   6. Length of interconnections to transmission and distribution;
   7. Initial and design voltages and capacities;
   8. Rights-of-way and access-way acquisition;
   9. Transmission connections and distribution feeders; and
   10. Service area.

Refer to Sections G and H

C. 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 the 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;
5. If applicable, identification of the facility in the forecast of loads and resources pursuant to Connecticut General Statutes § 16-50r; and

Refer to Sections E and F (1-5 above)

6. An impact assessment of any electromagnetic fields to be produced by the proposed transmission line, pursuant to Conn. Gen. Stat. §16-50*l*(a)(1)(A).

Refer to Section M

D. A justification for overhead portions, if any, including life cycle cost studies comparing overhead alternatives with underground alternatives.

Refer to Section G.6

E. A schedule of dates showing the proposed program of right of way or property acquisition, construction, completion and operation. **Refer to Section P**

F. A description of the named sites, including: **Refer to Sections G, H and I**

1. The most recent U.S.G.S. topographic quadrangle map (scale 1 inch = 2,000 feet) marked to show the site of the facility and any significant changes within a one mile radius of the site.

2. A map (scale not less than 1 inch = 200 feet) of the lot or tract on which the facility is proposed to be located showing the acreage and dimensions of such site, the name and location of adjoining public roads or the nearest public road, and the names of abutting owners and the portions of their lands abutting the site and the proximity to the following:

    a. Settled areas;
    b. Schools and daycare centers;
    c. Hospitals;
    d. Group homes;
    e. Forests and parks;
    f. Recreational areas;
    g. Seismic areas;
    h. Scenic areas;
    i. Historic areas;
    j. Areas of geologic or archaeological interest;
    k. Areas regulated under the Inland Wetlands and Watercourses Act;
    l. Areas regulated under the Tidal Wetlands Act and Coastal Zone Management Act;
    m. Public water supplies;
    n. Hunting or wildlife management areas; and
    o. Existing transmission lines within one mile of the site.

3. A site plan (scale not less than 1 inch = 40 feet) showing the proposed facility, set back radius, existing and proposed contour elevations, 100 year flood zones, waterways, wetlands, and all associated equipment and structures on the site.

4. Where relevant, a terrain profile showing the proposed facility and access road with existing and proposed grades; and

5. The most recent aerial photograph (scale not less than 1 inch = 1,000 feet) showing the proposed site, access roads, and all abutting properties.

Refer to Section G

G. 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. **Refer to Section H**

H. Safety and reliability information, including:

1. Provisions for emergency operations and shutdowns; and
2. Fire suppression technology. **Refer to Section L**

I. A description of the effect that the proposed facility would have on the environment, ecology, and scenic, historic, and recreational values, including effects on:

Refer to Section J

1. Public health and safety;
2. Local, state, and federal land use plans;
3. Existing and future development;
4. Roads;
5. Wetlands;
6. Wildlife and vegetation, including rare and endangered species, and species of special concern, with documentation by the Department of Environmental Protection Natural Diversity Data Base;
7. Water supply areas;
8. Archaeological and historic resources, with documentation by the State Historic Preservation Officer; and
9. Other environmental concerns identified by the applicant, the Council, or any public agency, including but not limited to, where applicable:
    - Coastal Consistency Analysis (C.G.S. §22a-90)
    - Connecticut Heritage Areas (C.G.S. §16a-27)
    - Ridgeline Protection Zones (C.G.S. §8-1aa)
    - Aquifer Protection Zones (C.G.S. §22a-354b)
    - DOT Scenic Lands (C.G.S. §13a-85a)
    - State Parks and Forests (C.G.S. §23-5)
    - Agricultural Lands (C.G.S. §22-26aa)
    - Wild and Scenic Rivers (C.G.S. §25-199)
    - Protected Rivers (C.G.S. §25-200)
    - Endangered, Threatened and Special Concern Species (C.G.S. §26-303)

J. Sight line graphs to the named sites from visually impacted areas such as residential developments, recreational areas, and historic sites; **Refer to Section G.2**

K. A statement explaining mitigation measures for the proposed facility including:

1. Description of proposed site clearing for access road and compound including type of vegetation scheduled for removal and quantity of trees greater than six inches diameter at breast height and involvement with wetlands;
2. Construction techniques designed specifically to minimize adverse effects on natural areas and sensitive areas;
3. Special routing or design features made specifically to avoid or minimize adverse effects on natural areas and sensitive areas;
4. Establishment of vegetation proposed near residential, recreational, and scenic areas; and
5. Methods for preservation of vegetation for wildlife habitat and screening.

L. 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:

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 expected normal and peak normal line loading;
2. Calculations of expected EMF levels at the above-listed locations that would occur during normal and peak normal operation of the facility; and
3. A statement describing consistency with the Council's "Best Management Practices for Electric and Magnetic Fields," as amended; and
4. A description of siting security measures for the proposed facility, consistent with the Council's "White Paper on the Security of Siting Energy Facilities," as amended.

Refer to Section M

M. A schedule of the proposed program for right-of-way or property acquisition, construction, rehabilitation, testing, and operation. **Refer to Section P**

N. A statement of estimated costs for site acquisition, construction, and equipment for a facility at the various proposed sites of the facility, including all candidates referred to in the application;

O. Identification of each federal, state, regional, district, and municipal agency with which proposed route or site reviews have been undertaken or will be undertaken, including a copy of each written agency position on such route or site, and a schedule for obtaining approvals not yet received. **Refer to Section D**

P. Bulk filing of the most recent conservation, inland wetland, zoning, and plan of development documents of the municipality, including a description of the zoning classification of the site and surrounding areas, and a narrative summary of the consistency of the project with the Town's regulations and plans. **Refer to Section J and Bulk Filing**

Please note that all documents, including but not limited to maps, must be dated. If the document date is unavailable, the date the document was obtained shall be provided. Maps must include a key table(s) and a matching source list/table, appropriately organized. **Included Herein**

VII. Proof of Service (Conn. Gen. Stat. § 16-50*l* (b))

Refer to Section Q

Each application shall be accompanied by proof of service of such application on:

A. The chief elected official, the zoning commission, planning commission, the planning and zoning commissions, and the conservation and wetlands commissions of the site municipality and any adjoining municipality having a boundary not more than 2500 feet from the facility;

B. The regional planning agency that encompasses the site municipality;

C. The State Attorney General;

D. Each member of the Legislature whose district is in or is within 2500 feet from the municipality where the facility is proposed;

E. Any federal agency, department, commission or instrumentality which has jurisdiction over the proposed facility; and

F. The state Departments of Environmental Protection, Public Health, Public Utility Control, Economic and Community Development, Agriculture and Transportation; the Council on Environmental Quality; and the Office of Policy and Management.

G. Any such other state and municipal bodies as the Council may by regulation designate, including but not limited to, the State Historic Preservation Officer of the Commission on Culture and Tourism and the Department of Emergency Management and Homeland Security.

VIII. Notice to Community Organizations

The applicant shall use reasonable efforts to provide notice of the application on the following:

A. Affected community groups including Chambers of Commerce, land trusts, environmental groups, trail organizations, historic preservation groups, advocacy groups for the protection of Long Island Sound and river protection organizations within the watershed affected by 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

B. Any affected water company that would provide water to, or be within the watershed affected by, the proposed facility.

Refer to Section Q

IX. Public Notice (Conn. Gen. Stat. § 16-50*l* (b))

Notice shall be made in accordance with all relevant sections of Conn. Gen. Stat. §16-50*l*(b). The Council's regulations should also be consulted when determining appropriate notice. Notice of the application shall be published at least twice prior to the filing of the application in a newspaper having general circulation in the site municipality or municipalities. The notice shall state the name of the applicant, the date of filing, and a summary of the application. The notice must be published in not less than ten point type.

The Council also advises each applicant that at least ten business days prior to the public hearing such applicant should erect and maintain in a legible condition a sign not less than six feet by four feet upon the site at the entrance to the property from a public road where such facility is to be located. The sign shall set forth the name of the applicant, the type of facility, the public hearing date, and contact information for the Council (Web site and phone number).

Example:

PUBLIC NOTICE:

CL&P has filed an application with the Connecticut Siting Council (Council) for construction of an electric substation facility on this site. The Council will hold a public hearing on March 27, 2010 at the Newington Town Hall Auditorium at 3 and 7 p.m. A copy of the application can be reviewed at the town hall or at the Council offices in New Britain, CT. For more information, please contact the Council by telephone at 860-827-2935, electronically at www.ct.gov/csc, or by mail at 10 Franklin Square, New Britain, Connecticut 06051.

Refer to Section Q

X. Notice to Abutting Landowners (Conn. Gen. Stat. § 16-50*l* (b))

Notice of the application shall be sent by certified or registered mail to each person appearing of record as an owner of property which abuts the primary or alternative sites on which the proposed facility would be located. Notice shall be sent at the same time that notice of the application is given to the general public.

The application shall be accompanied by an affidavit of notice to all abutting landowners and an affidavit of publication each time notice of application is published.

Refer to Section Q

XI. Procedures

A. The Council will review and may reject the application within 30 days if it fails to comply with specific data or exhibit requirements or if the applicant fails to promptly correct deficiencies. (Regs., Conn. State Agencies §§ 16-50*l*-4 through 16-50*l*-5)

B. The Council and any party or intervenor to the proceeding may file exhibits and interrogatories requesting supplemental or explanatory materials. All filings will be subject to cross-examination and the Council's discretion for admission into the record. (Conn. Gen. Stat. § 16-50o)

C. A public hearing must be held at a location selected by the Council in the county in which the facility is proposed, with one session held after 6:30 p.m. for the convenience of the public. If the proposed facility is to be located in more than one county, the Council shall fix the location for at least one public hearing session in whichever county it deems appropriate, provided that the Council may hold hearing sessions in more than one county. The Council's record must remain open for 30 days after the close of the hearing. (Conn. Gen. Stat. § 16-50n (f))

D. The Council must render a decision within 180 days of receipt of an application, extendible by 180 days upon consent of applicant. (Conn. Gen. Stat. § 16-50p)

PLEASE NOTE THAT THIS GUIDE IS NO SUBSTITUTION FOR OBTAINING ADVICE FROM LEGAL COUNSEL. IN THE EVENT OF ANY CONFLICT BETWEEN THIS GUIDE AND THE ACTUAL STATUTES AND REGULATIONS, THE STATUTES AND REGULATIONS SHALL GOVERN.

CONNECTICUT SITING COUNCIL APPLICATION GUIDE FOR AN ELECTRIC AND FUEL TRANSMISSION LINE FACILITY April 2010

This application guide is intended to assist applicants in filing for a Certificate of Environmental Compatibility and Public Need (Certificate) from the Connecticut Siting Council (Council) for the construction of an electric or fuel transmission line. Such facilities are defined in Connecticut General Statutes § 16-50i (a) (1) and (2).

Applicants should consult Connecticut General Statutes §§ 16-50g through 16-50aa and § 16a-7c, and Sections 16-50j-1 through 16-50z-4 of the Regulations of Connecticut State Agencies to assure complete compliance with the requirements of those sections. Where appropriate, statutory and regulatory references are noted below.

I. Pre-Application Process

Municipal Consultation (Conn. Gen. Stat. § 16-50*l* (e))

"… at least sixty days prior to the filing of an application with the council, the applicant shall consult with the municipality in which the facility may be located and with any other municipality required to be served with a copy of the application under subdivision (1) of subsection (b) of this section [any adjoining municipality having a boundary not more than 2500 feet from such facility] concerning the proposed and alternative sites of the facility… Such consultation with the municipality shall include, but not be limited to good faith efforts to meet with the chief elected official of the municipality. At the time of the consultation, the applicant shall provide the chief elected official with any technical reports concerning the public need, the site selection process and the environmental effects of the proposed facility. The municipality may conduct public hearings and meetings as it deems necessary for it to advise the applicant of its recommendations concerning the proposed facility. Within 60 days of the initial consultation, the municipality shall issue its recommendations to the applicant. No later than 15 days after submitting an application to the Council, the applicant shall provide to the Council all materials provided to the municipality and a summary of the consultations with the municipality including all recommendations issued by the municipality." **Refer to Section M (Municipal and Community Outreach) and Municipal Consultation Filing in Bulk Filing**

"The applicant shall provide the Connecticut Energy Advisory Board (CEAB) the same information that it provides to a municipality… on the same day of the consultation with the municipality."

II. Form of Application (Regs. Conn. State Agencies §16-50*l*-2)

All applications shall include the following components:

a. The purpose for which the application is being made; **Refer to Section A**

b. The statutory authority for such application; **Refer to Section B**

c. The exact legal name of each person seeking the authorization or relief and the address or principal place of business of each such person. If any applicant is a corporation, trust association, or other organized group, it shall also give the state under the laws of which it was created or organized; **Refer to Section C**

d. The name, title, address, and telephone number of the attorney or other person to whom correspondence or communications in regard to the application are to be addressed. Notice, orders and other papers may be served upon the person so named, and such service shall be deemed to be service upon the applicant; **Refer to Section D**

e. Such information as may be required under the applicable provisions of Section 16-50*l* of the Connecticut General Statutes; **Refer to this Document and Bulk Filing**

f. Such information as any department or agency of the state exercising environmental controls may, by regulation, require; and **Refer to this Document and Bulk Filing**

g. Such information as the applicant may consider relevant.
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III. Filing Requirements (Regs., Conn. State Agencies § 16-50j-12)

A. Except as may be otherwise required, at the time applications are filed with the Council, there shall be furnished to the Council an original and 20 copies. All filings from the applicant, parties, or intervenors must consist of an original and 20 copies labeled with the docket number, properly collated and paginated, and bound. An electronic version of all filings, as appropriate, should be provided.
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G. Potential applicants are urged to carefully review Conn. Gen. Stat. §§16-50*l*(e), 16-50i and 16a-7c to determine whether the proposed project falls within the Connecticut Energy Advisory Board (CEAB) "request for proposal" process.

No Longer Applicable

IV. Application Filing Fees (Conn. Gen. Stat. § 16-50*l* (a); Conn. Gen. Stat. §4-189j; Regs., Conn. State Agencies § 16-50v-la)

Conn. Gen. Stat § 16-50*l* (a) mandates a municipal participation fee of $25,000, to be deposited in the account established in accordance with Conn. Gen. Stat. § 16-50bb.

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All application fees shall be paid to the Council at the time an application is filed with the Council. Additional assessments may be made for expenses in excess of the filing fee. Fees in excess of the Council's actual costs will be refunded to the applicant.

V. Municipal Participation Account (Conn. Gen. Stat. §16-50bb; Conn. Gen. Stat. §16-50*l*(a)(3))

Conn. Gen. Stat. §16-50bb requires that each application be accompanied by a payment in the amount of $25,000 to be deposited in a Municipal Participation Account within the General Fund to defray expenses incurred by each municipality entitled to receive a copy the application under Conn. Gen. Stat. § 16-50*l* that chooses to participate as a party to the certification proceeding. Any moneys remaining at the end of the proceeding shall be refunded to the applicant.

Refer to Section Q (Application Filing Fees) and Application Cover Letter

VI. Contents of Application (Conn. Gen. Stat. § 16-50*l* (a) (1) (A); Conn. Gen. Stat. §16-50p; Conn. Gen. Stat. §16-50o)

An application for a Certificate for the construction of a transmission line facility should include or be accompanied by the following:

A. An executive summary. A description of the proposed facility, including location relative to affected municipalities and location relative to adjacent streets.

Refer to Section ES (Executive Summary)

B. A description of the technical specifications, including but not limited to:

Refer to Sections G, H and I

1. Itemized estimated costs;
2. Conductor sizes and specifications;
3. Overhead tower design, appearance, and heights, if any;
4. Length of line;
5. Terminal points;
6. Initial and design voltages and capacities;
7. Rights-of-way and access way acquisition;
8. Substation connections;
9. Service area;

10. Construction methods; and
11. For an electric transmission line, a description of the life-cycle costs of the proposed transmission line and alternative facilities, including overhead and underground lines, including all capital and operating costs, and other associated effects that can be calculated for development and operation of the specified transmission line and alternative lines over their expected operational lives.

C. A statement and full explanation of why the proposed facility is needed and how the facility would conform to a long-range plan for expansion of utility service in 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 the 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;
5. If applicable, identification of the facility in the forecast of loads and resources pursuant to Conn. Gen. Stat. § 16-50r; and
6. An impact assessment of any electromagnetic fields to be produced by the proposed transmission line, pursuant to Conn. Gen. Stat. §16-50*l*(a)(1)(A)(ix).

Refer to Sections E, F and L

D. A justification for overhead portions, if any, including life cycle cost studies comparing overhead alternatives with underground alternatives.

E. A schedule of dates showing the proposed program of right of way or property acquisition, construction, completion and operation.

F. All applications shall include information for property within the proposed project area, including access roads and the proposed right-of-way. To the extent that the Applicant does not own, lease or otherwise have access to property within the proposed project areas, the applicant shall exert due diligence to seek permission to gain access. Due diligence shall be established by the submission of (1) Certified Mailing receipts for letters sent to the owner or owners of record requesting access to the property; and (2) an affidavit from the applicant stating that it was not provided access to the property. In the absence of permission to access, the applicant shall make visual inspections to document existing conditions from public rights-of-way, existing utility rights-of-way and/or from other accessible properties within or surrounding the proposed project area.

G. A proposed route map at a scale no smaller than one inch = 2,000 feet or a USGS topographic map and aerial photos of suitable scale showing details of the rights- of-way and the proximity to the following: **Refer to Sections H and I**

1. Settled residential areas;

2. Public and Private schools, licensed daycare centers, licensed youth camps and public playgrounds;
3. Hospitals;
4. Group homes;
5. Forests and parks
6. Recreational areas;
7. Scenic areas;
8. Historic areas;
9. Areas of archaeological interest;
10. Areas regulated under the Inland Wetlands and Watercourses Act and Coastal Zone Management Act;
11. Areas regulated under the Tidal Wetlands Act;
12. Public water supplies;
13. Hunting or wildlife management areas; and
14. Existing transmission lines within one mile of the route.

H. A narrative description of the proposed transmission line and transmission line alternatives, including:

Refer to Section I

1. Existing conditions:

    a. The ecological communities of the wetlands, watercourses and upland systems and their functional significance, including but not limited to,

        i. Floral associations;
        ii. Inventory of wildlife habitat with observed and expected wildlife users;
        iii. Endangered, threatened, special concern or rare species, including their habitats;
        iv. Inventory of breeding birds and their habitats;
        v. Riparian environments and buffer vegetation; and
        vi. Fishery habitat and cold water fisheries.

b. Existing infrastructure (where applicable)

i. Existing Right-of-Way boundaries;
ii. Components of existing transmission line; and
iii. Other improvements within existing and proposed right-of-way.

2. Proposed conditions:

Refer to Sections J and K

a. Areas of disturbance (temporary and permanent);
b. Proposed construction staging areas, conductor pulling sites, material marshaling yards and construction field offices;
c. Proposed access roads and opportunities for alternative access;
d. Proposed structure location envelopes; and
e. Proposed blasting, grading, and changes to drainage.

I. Proposed route plans at a scale no smaller than 1inch = 100 feet, except as otherwise required, can be provided in a stacked version and bulk filed, showing existing conditions and certain proposed transmission line changes, expanding upon the narrative descriptions in Section H. **Refer to Appendix D**

1. Existing conditions:

a. Identification of existing and proposed right-of-way boundaries;
b. Locations of any existing transmission line structures and accessways;
c. Contour mapping at two-foot intervals;
d. Inland and tidal wetlands boundaries, vernal pools, and intermittent and perennial watercourses, as determined in the field, unless existing mapping is adequate , with a 50 foot buffer shown for wetlands and a 100 foot buffer shown for vernal pools and watercourses.
e. Coastal Management Zone boundaries;
f. 100-year flood plain boundaries as identified by the Federal Emergency Management Agency;
g. Locations of protected and special concern species;
h. Areas susceptible to soil erosion;
i. Habitat for protected and special concern species, including those represented by the DEP Natural Diversity Data Base (confidential data provided in an appropriate manner);
j. Fishery habitat and cold water fisheries.

(All maps shall identify the location(s) of source information.)

2. Changes to existing conditions for the proposed transmission line:
    a. Additional Rights-of-way width required, if any;
    b. Anticipated transmission line structure location envelopes;
    c. Anticipated areas of disturbance (temporary and permanent);
    d. Anticipated area of disturbance to an inland wetland buffer boundary or inland wetland;
    e. Anticipated area of disturbance for material staging and conductor pulling sites;
    f. Anticipated access roads and opportunities for alternative access;
    g. Substation connections; and
    h. Other sensitive areas requiring special attention.

J. A justification for adoption of the route selected including a comparison with alternative routes which are environmentally, technically, and economically practicable. For electric transmission lines, provide a justification of overhead portions, if any, including comparative cost studies and a comparative analysis of effects described in Conn. Gen. Stat. § 16-50*l* (a)(1)(A) and section K below for undergrounding. Include enough information for a complete comparison between the proposed route and any alternative route contemplated. **Refer to Section L**

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: **Refer to Section I**

1. Public health and safety;
2. Local, state, and federal land use plans;
3. Existing and future development;
4. Road and waterway crossings;
5. Wetland crossings;
6. Wildlife and vegetation, including rare and endangered species, and species of special concern, with documentation by the Department of Environmental Protection Natural Diversity Data Base;
7. Water supply areas;
8. Archaeological and historic resources, with documentation by the State Historic Preservation Officer; and
9. Other environmental concerns identified by the applicant, the Council, or any public agency, including but not limited to, where applicable:
    - Coastal Consistency Analysis (C.G.S. §22a-90)
    - Connecticut Heritage Areas (C.G.S. §16a-27)
    - Ridgeline Protection Zones (C.G.S. §8-1aa)
    - Aquifer Protection Zones (C.G.S. §22a-354b)
    - DOT Scenic Lands (C.G.S. §13a-85a)
    - State Parks and Forests (C.G.S. §23-5)
    - Agricultural Lands (C.G.S. §22-26aa)
    - Wild and Scenic Rivers (C.G.S. §25-199)

- Protected Rivers (C.G.S. §25-200)
- Endangered, Threatened or Special Concern Species (C.G.S. §26-303)

L. A statement explaining mitigation measures for the proposed facility including:

1. Description of proposed site clearing for access including type of vegetation scheduled for removal and quantity of trees greater than six inches diameter at breast height and involvement with wetlands;
2. Construction techniques designed specifically to minimize adverse effects on natural areas and sensitive areas;
3. Special routing or design features made specifically to avoid or minimize adverse effects on natural areas and sensitive areas;
4. Justification for maintaining retired or unused facilities on the rights-of- way if removal is not planned;
5. Methods to prevent and discourage unauthorized use of the rights-of-way;
6. Establishment of vegetation proposed near residential, recreational, and scenic areas and at road crossings, waterways, ridgelines, and areas where the line would be exposed to view; and
7. Methods for preservation of vegetation for wildlife habitat and screening.

M. Safety and reliability information, including:

1. Provisions for emergency operations and shutdowns; and
2. Fire suppression technology.

Refer to Section L

N. Justification that the location of the proposed facility would not pose an undue safety or health hazard to persons or property along the area traversed by the proposed facility including:

Refer to Section M

1. Measurements of existing electric and magnetic fields (EMF) at the boundaries of adjacent schools, daycare facilities, playgrounds, and hospitals (and any other facilities described in Conn. Gen. Stat. § 16-50*l*), with extrapolated calculations of exposure levels during expected normal and peak normal line loading;

2. Calculations of expected EMF levels at the above listed locations that would occur during normal and peak normal operation of the transmission line;

3. A statement describing consistency with the Council's "Best Management Practices for Electric and Magnetic Fields," as amended; and buffer zone requirements; and

4. A description of siting security measures for the proposed facility, consistent with the Council's "White Paper on the Security of Siting Energy Facilities," as amended.

O. A schedule of the proposed program for right-of-way or property acquisition, construction, rehabilitation, testing, and operation. **Refer to Section P**

P. Identification of each federal, state, regional, district, and municipal agency with which proposed route or site reviews have been undertaken or will be undertaken, including a copy of each written agency position on such route or site, and a schedule for obtaining approvals not yet received. **Refer to Section O**

Q. Bulk filing of the most recent conservation, inland wetland, zoning, and plan of development documents of the municipality, including a description of the zoning classification of the site and surrounding areas, and a narrative summary of the consistency of the project with the Town's regulations and plans.
Refer to Section J and Bulk Filing

R. Such information any department or agency of the state exercising environmental controls may, by regulation, require. **Refer to Table O-1 and Appendix E (Agency Correspondence)**

S. Pursuant to Conn. Gen. Stat. §16-50o, the applicant shall submit into the record the full text of the terms of any agreement, and a statement of any consideration therefor, if not contained in such agreement, entered into by the applicant and any party to the certification proceeding, or any third party, in connection with the construction or operation of the facility. This provision shall not require the public disclosure of proprietary or trade secrets.

T. Such information the applicant may consider relevant.

Please note that all documents, including but not limited to maps, must be dated. If the document date is unavailable, the date the document was obtained shall be provided. Maps must include a key table(s) and a matching source list/table, appropriately organized.

VII. Proof of Service (Conn. Gen. Stat. § 16-50*l* (b))

Each application shall be accompanied by proof of service of such application on:

A. The chief elected official, the zoning commission, planning commission, the planning and zoning commissions, and the conservation and wetlands commissions of the site municipality and any adjoining municipality having a boundary not more than 2500 feet from the facility;

B. The regional planning agency that encompasses the route municipalities;

C. The State Attorney General;

D. Each member of the Legislature in whose district the facility is proposed;

E. Any federal agency which has jurisdiction over the proposed facility;

F. The state Departments of Environmental Protection, Public Health, Public Utility Control, Economic and Community Development, Agriculture and Transportation; the Council on Environmental Quality; and the Office of Policy and Management; and

G. Other state and municipal bodies as the Council may by regulation designate, including but not limited to, the State Historic Preservation Officer of the Commission on Culture and Tourism and the Department of Emergency Management and Homeland Security.

Refer to Section Q

VIII. Notice to Community Organizations

The applicant shall use reasonable efforts to provide notice of the application on the following:

A. Affected community groups including Chambers of Commerce, land trusts, environmental groups, trail organizations, historic preservation groups, advocacy groups for the protection of Long Island Sound, and river protection organizations within the watershed affected by the proposed facility that have been identified by a municipality where the facility is proposed to be located or that have registered with the Council to be provided notice; and

B. Any affected water company within the watershed affected by the proposed facility.

Refer to Section Q

IX. Public Notice (Conn. Gen. Stat. § 16-50*l* (b))

Notice shall be made in accordance with all relevant sections of Conn. Gen. Stat. §16-50*l*(b). The Council's regulations should also be consulted when determining appropriate notice. Notice of the application shall be published at least twice prior to the filing of the application in a newspaper having general circulation in the site municipality or municipalities. The notice shall state the name of the applicant, the date of filing, and a summary of the application. The notice must be published in not less than ten point type.

The Council also recommends to each applicant that at least ten business days prior to the public hearing such applicant should erect and maintain in a legible condition a sign not less than six feet by four feet at conspicuous locations along the route of the proposed line, especially close to populated areas. The signs should be erected in sufficient number to fairly notify most residents living in proximity to the route and set forth the name of the applicant, the type of facility, the public hearing date, and contact information for the Council (Web site and phone number).

Example:

PUBLIC NOTICE:

CL&P has filed an application with the Connecticut Siting Council (Council) for construction of an electric transmission line facility on this site. The Council will hold a public hearing on March 27, 2010 at the Newington Town Hall Auditorium at 3 and 7 p.m. A copy of the application can be reviewed at the town hall or at the Council offices in New Britain, CT. For more information, please contact the Council by telephone at 860-827-2935, electronically at www.ct.gov/csc, or by mail at 10 Franklin Square, New Britain, Connecticut 06051.

Refer to Section Q

X. Notice in Utility Bills (Conn. Gen. Stat. § 16-50*l* (b))

For electric transmission facilities, notice shall also be provided to each electric company customer in the municipality where the facility is proposed on a separate enclosure with each customer's monthly bill for one or more months, not earlier than 60 days prior to filing the application with the Council, but not later than the date the application is filed with the Council. Such notice shall include the following:

Refer to Section Q

A. A brief description of the project including:

1. Location relative to the affected municipality, and
2. Location relative to adjacent streets.

B. A brief technical description of the project including:

1. Proposed length;
2. Proposed voltage; and
3. Type and range of heights of support structures or underground configurations.

C. The reason for the project.

D. Address and a toll-free telephone number of the applicant by which additional information about the project can be obtained.

E. A statement in print no smaller than twenty-four point type size stating, "NOTICE OF PROPOSED CONSTRUCTION OF A HIGH VOLTAGE ELECTRIC TRANSMISSION LINE."

F. A description of how the project will meet the Council's "Best Management Practices for Electric and Magnetic Fields," as amended, including:

1. A brief statement of specific design elements planned to decrease magnetic fields;

2. How to obtain siting and magnetic field information specific to the project at the Council's website and at respective town halls;

3. How to obtain final post-construction structure and conductor specifications including calculated magnetic field levels specific to the project at the Council's website and at respective town halls; and

4. Phone numbers for follow up information including Department of Public Health and utility representatives.

XI. Procedures

A. The Council will review and may reject the application within 30 days if it fails to comply with specific data or exhibit requirements or if the applicant fails to promptly correct deficiencies. (Regs., Conn. State Agencies §§ 16-50*l*-4 through 16-50*l*-5)

B. The Council and any party or intervenor to the proceeding may file exhibits and interrogatories requesting supplemental or explanatory materials. All filings will be subject to cross-examination and the Council's discretion for admission into the record. (Conn. Gen. Stat. § 16-50o)

C. A public hearing must be held in the county within which the proposed facility is to be located, or in whichever county the Council deems appropriate for inter-county facilities, with one session held after 6:30 p.m. for the convenience of the public. The Council's record must remain open for 30 days after the close of the hearing. (Conn. Gen. Stat. § 16-50m)

D. The Council must render a decision not later than twelve months after the deadline for filing an application following the request-for-proposal process for a facility described in subdivision (1) or (2) of subsection (a) of Conn. Gen. Stat. § 16-50i or subdivision (4) of said subsection (a) if the application was incorporated in an application concerning a facility described in subdivision (1) of said subsection (a). (Conn. Gen. Stat. § 16-50p)

XII. CEAB Evaluation (Conn. Gen. Stat. §16a-7c)

No Longer Applicable

A. On or after December 1, 2004, not later than fifteen days after the filing of an application pursuant to subdivision (1) of subsection (a) of section 16-50i of the general statutes, as amended by this act, except for an application for a facility described in subdivision (5) or (6) of subsection (a) of section 16-50i of the general statutes, as amended by this act, the Connecticut Energy Advisory Board shall issue a request-for-proposal to seek alternative solutions to the need that will be addressed by the proposed facility in such application.

B. Not later than forty-five days after the deadline for submissions in response to a request-for-proposal, the board shall issue a report that evaluates each proposal received, including any proposal contained in an application to the council that initiated a request-for-proposal, based on the materials received pursuant to subsection (d) of this section, or information contained in the application, as required by section 16-50*l* of the General Statutes, as amended by this act, for conformance with the infrastructure criteria guidelines created pursuant to section 16a-7b of this act. The board shall forward the results of such evaluation process to the Connecticut Siting Council.

PLEASE NOTE THAT THIS GUIDE IS NO SUBSTITUTION FOR OBTAINING ADVICE FROM LEGAL COUNSEL. IN THE EVENT OF ANY CONFLICT BETWEEN THIS GUIDE AND THE ACTUAL STATUTES AND REGULATIONS, THE STATUTES AND REGULATIONS SHALL GOVERN.

Executive Summary

The Connecticut Light and Power Company doing business as Eversource Energy ("Eversource" or the "Company") seeks to construct the Greenwich Substation and Line Project (the "Project") in the Town of Greenwich, Connecticut ("Town") for the purpose of providing necessary upgrades to the electric distribution system in the Town. Siting of the Project is subject to the jurisdiction of the Connecticut Siting Council ("Council") pursuant to Title 16, Chapter 277a of the Connecticut General Statutes ("CGS"), known as the Public Utility Environmental Standards Act ("PUESA") (CGS §16-50g et seq.). Under PUESA, Eversource must apply for and obtain from the Council a Certificate of Environmental Compatibility and Public Need ("Certificate") for the Project.

ES.1 Project Description

The Project consists of a new 115-kilovolt ("kV") bulk substation and associated underground transmission supply lines (or "circuits") to add transformation capacity and relieve distribution overloads. The transmission supply lines would extend approximately 2.3 miles from the Cos Cob Substation on Sound Shore Drive to the new substation to be located at 290 Railroad Avenue in Greenwich. Modifications to the existing Cos Cob Substation are also required as part of the Project. Eversource is proposing the Project to provide immediate load relief to the electric distribution supply system in Greenwich by establishing the new bulk substation near the center of the customer electrical demand (or "load") to avoid overloads on both distribution lines and transformers.

ES.2 Project Need

This is a reliability project. Increased electrical demand in Greenwich currently exposes the distribution system to risk of overloads on transformers and distribution lines. The Southwest Connecticut region and Greenwich in particular, continues to experience economic growth and, as a result, load has increased at a faster pace than in other parts of Connecticut. Presently, the western part of Town is served primarily by one bulk substation, Cos Cob Substation, which is supplied by two overhead 115-kV transmission circuits and includes multiple step-down transformers. Cos Cob Substation, which is at capacity, was constructed in 1964 to serve an electrical load much lower than what exists today. Without the needed upgrades, certain contingency events could result in the overload of Cos Cob Substation transformers by as early as 2017. Those contingency events could also cause the overload of distribution lines to the distribution substations that are served from Cos Cob Substation. Additionally, the distribution

substation in the area of highest load concentration (Prospect Substation) would be exposed to overloads. If such overloads were to occur, widespread service interruptions and damage to Eversource's equipment may result, causing service disruptions to Greenwich homes and businesses. To avoid the overloads, controlled load shedding (targeted blackouts) would likely be required. It should also be noted that the 115-kV transmission lines serving Cos Cob Substation are at the western end of the existing Eversource transmission system.

A new bulk substation (the proposed "Greenwich Substation" or "Substation") located in the western part of Greenwich would share the load with Cos Cob Substation, and provide for continuity of service during many contingency events. The ability to transfer load during these contingency events is a typical design feature in most areas of the Eversource system with customer demand comparable to that of Greenwich. The proposed Greenwich Substation together with Cos Cob Substation is projected to meet the predicted demand over the next 30 years.

With the new capacity provided by a new bulk substation source and two new 115-kV transmission circuits, the risk of projected overloads on lines and equipment will be mitigated, thereby improving system reliability. The new Greenwich Substation will allow for the transfer of approximately one-half of the load currently served by Cos Cob Substation to the new facility. Additionally, bringing a transmission level power source to central Greenwich would provide a more reliable power supply than the existing multiple lengthy distribution feeders originating from Cos Cob Substation. By building two new transmission circuits, Eversource is providing a backup power source should one circuit be out of service.

ES.3 Greenwich Substation

The new Greenwich Substation is proposed to be a Gas Insulated Substation ("GIS") to be constructed on a commercially-zoned property at 290 Railroad Avenue in Greenwich (the "Property" or "Proposed Site"). In determining the best location for the new Substation, the Company evaluated several properties using its site selection criteria and determined that the Property is the most appropriate location. The Property best fulfills Eversource's electrical system objectives for locating a new source of supply in proximity to the customer load pocket and to existing distribution feeders. Moreover, it also meets Eversource's site selection criteria by supporting the installation of the Substation while minimizing potential adverse effects on the community and the environment.

The new Substation would be developed within the confines of the 0.81-acre Property, which is situated at the intersection of Railroad Avenue and Field Point Road. Based on consultations with Town officials and local boards, the Company engaged and architect and undertook substantial revisions to the design of the proposed Substation building (including its outer façade, structure and dimensions) and its location on the proposed Site. These design changes provided for a reduction in the height of the proposed building and an increase in the distance between the building and the property line along Railroad Avenue to make the building more compatible with the neighborhood. Gas insulated switchgear equipment would be housed in a building fronting Railroad Avenue measuring approximately 32-foot wide by 121-foot long; an angled façade paralleling Field Point Road would extend the southern footprint of the building approximately an additional 13 feet in length. The façade of the GIS building would include concrete panels with brick accents. The main roof of the GIS building would be 31 feet tall, with tower fascia on the east and west sides reaching heights of 36 feet above grade.[1] The GIS building would be outfitted with 115-kV circuit breakers, disconnect switches, protective relaying and control equipment as well as the battery and charger associated with transmission equipment. In addition, the exterior Substation yard would be outfitted with three 115-kV circuit switchers with integral disconnect switches and three 60-Megavolt-Ampere power transformers, which would step down the voltage from 115 kV to 13.2 kV. One metal switchgear enclosure would also be installed to house the switching equipment, relaying and control equipment for the 13.2-kV distribution feeders. A free-standing pump house (necessary to support the high pressure fluid filled transmission supply line cables) would be located in the southwest corner of the Proposed Site, adjacent to Field Point Road. The entire Substation yard would be surrounded by an eight-foot high, wrought iron-style fence for security.

The Project also requires a modest expansion of Cos Cob Substation for the installation of new equipment to support the underground transmission lines and provide for safe and proper operation. The Cos Cob Substation fence will be partially extended approximately 140 feet to the south to accommodate the new equipment. Since the Municipal Consultation Filing ("MCF") filing, the scope of work at Cos Cob Substation has been modified to eliminate an easement into Cos Cob Park.

[1] The GIS building has been reconfigured since the MCF in response to comments received from the Town. As a result, the structure has been angled on its west side by approximately 13 feet, and reduced in depth by 18 feet and the main roof in height by four feet, as well as being set back farther south off the property line abutting Railroad Avenue.

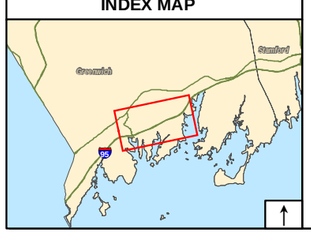
ES.4 Project Preferred Route

To the extent feasible, the new underground transmission supply lines would be located within existing public roadways and associated rights-of-way ("ROW") with the remainder on public and private properties. Upon evaluating various route options, and following consultation with Town officials, the Company identified a proposed route ("Preferred Route") that was presented in the MCF. The Company also identified a variation to a short segment of the Preferred Route (through Bruce Park) and two alternate route options ("Southern Alternative" and "Northern Alternative"). In response to comments received from the Town and members of the community, additional variations to the Preferred Route have been developed. The Preferred Route and its variations are shown in Figure ES-1.

As presented in the MCF, the Preferred Route (depicted in yellow on Figure ES-1) was described as follows: Beginning at Cos Cob Substation, the Preferred Route would exit this substation under the Metro-North Railroad ("MNRR"), turn west along Station Drive (beneath Interstate 95 ["I-95"]), and extend to Town-owned property west of Indian Field Road via open trench line installation construction. The route would turn southwest and extend beneath the MNRR and I-95 via an underground pathway created by horizontal directional drilling ("HDD") crossing to an area west of Kinsman Lane. The route would then travel a short distance via open trenching into Bruce Park to another HDD staging area. A second HDD crossing would extend west beneath the Park and its waterbodies. West of Bruce Park, the route would transition back to open trenching and generally follow Davis Avenue, Indian Harbor Drive and Museum Drive west before turning north on Arch Street and crossing again beneath I-95 and the MNRR to Railroad Avenue. The route would turn west and follow Railroad Avenue to the Proposed Site.

The Company also presented a variation of the Preferred Route through Bruce Park that would generally follow Kinsman Lane and Bruce Park Drive using open trench line installation

INDEX MAP



Legend

- Preferred Route
- Preferred Route HDD Crossing
- Preferred Route Open Trench Crossing
- Route Variation HDD Crossing
- Route Variation Open Trench Crossing
- Route Variation HDD Crossing
- Route Variation Open Trench Crossing
- Route Variation HDD Crossing
- Route Variation Open Trench Crossing

- Preferred Route Segment Point
- Route Variation Segment Point
- Route Variation Segment Point
- Route Variation Segment Point

- Proposed Greenwich Substation Site
- Existing Cos Cob Substation

Base Map: 2012 Aerial Photograph (CTECO)

1 inch = 625 feet

625 312.5 0 625 Feet

Figure ES-1
Preferred Route Map

Greenwich Substation and Line Project

EVERSOURCE ENERGY

ALL-POINTS TECHNOLOGY CORPORATION

June 2015

construction and eliminate a direct crossing of the park lands. This variation would require the installation of temporary coffer dams to trench through two of the Park's water bodies.

As a result of the MCF process, the Company evaluated an alternate routing of the HDD crossing beneath the MNRR corridor and I-95 (shown in green in Figure ES-1). The unimproved area of Station Drive to the east of Indian Field Road could be used for an HDD crossing southwestward to the Greenwich Department of Public Works ("DPW") maintenance facility or the terminus of Kinsman Lane. Eversource selected the Station Drive area as an alternate, and advantageous, staging location to avoid an open trench crossing of Indian Field Road, which is a very busy access road to I-95.

Comments received from the Town and members of the community encouraged Eversource to assess additional alternate crossings of Bruce Park. As a result, Eversource has proposed two additional variations that would originate at the DPW property or the end of Kinsman Lane and extend generally westward, via open trenching, to a point near the eastern-most waterbody in the Park (part of Indian Harbor) before transitioning to HDD to cross beneath the remainder of the Park. Both of these variations were developed to mitigate construction impacts along Kinsman Lane and to move the HDD staging area farther away from residences. These variations include:

1) A variation (depicted in blue on Figure ES-1) that would initially run southwest parallel to Kinsman Lane through a relatively open area of the park before turning north and west just outside of the existing trees. An HDD staging area would be located near the Park's eastern-most waterbody to accommodate an HDD crossing westward beneath the remainder of the Park, including Indian Harbor.

2) A variation (depicted in orange on Figure ES-1) that would head west through the northern portion of the Park, adjacent to I-95. An HDD staging area would be located near the Park's eastern-most waterbody to accommodate an HDD crossing westward beneath the remainder of the Park, including Indian Harbor.

ES.5 Route Alternatives

The Company analyzed a number of possible route options and selected the Preferred Route based on engineering, environmental, cultural, economic, and community considerations and

Project routing objectives.[2] These objectives include: ease of constructability; minimizing conflicts with existing utilities; meeting operations and maintenance requirements; limiting the need for right-of-way/easements as much as possible; and, minimizing surface disruption impacts, scheduling delays, length of the route, and costs.

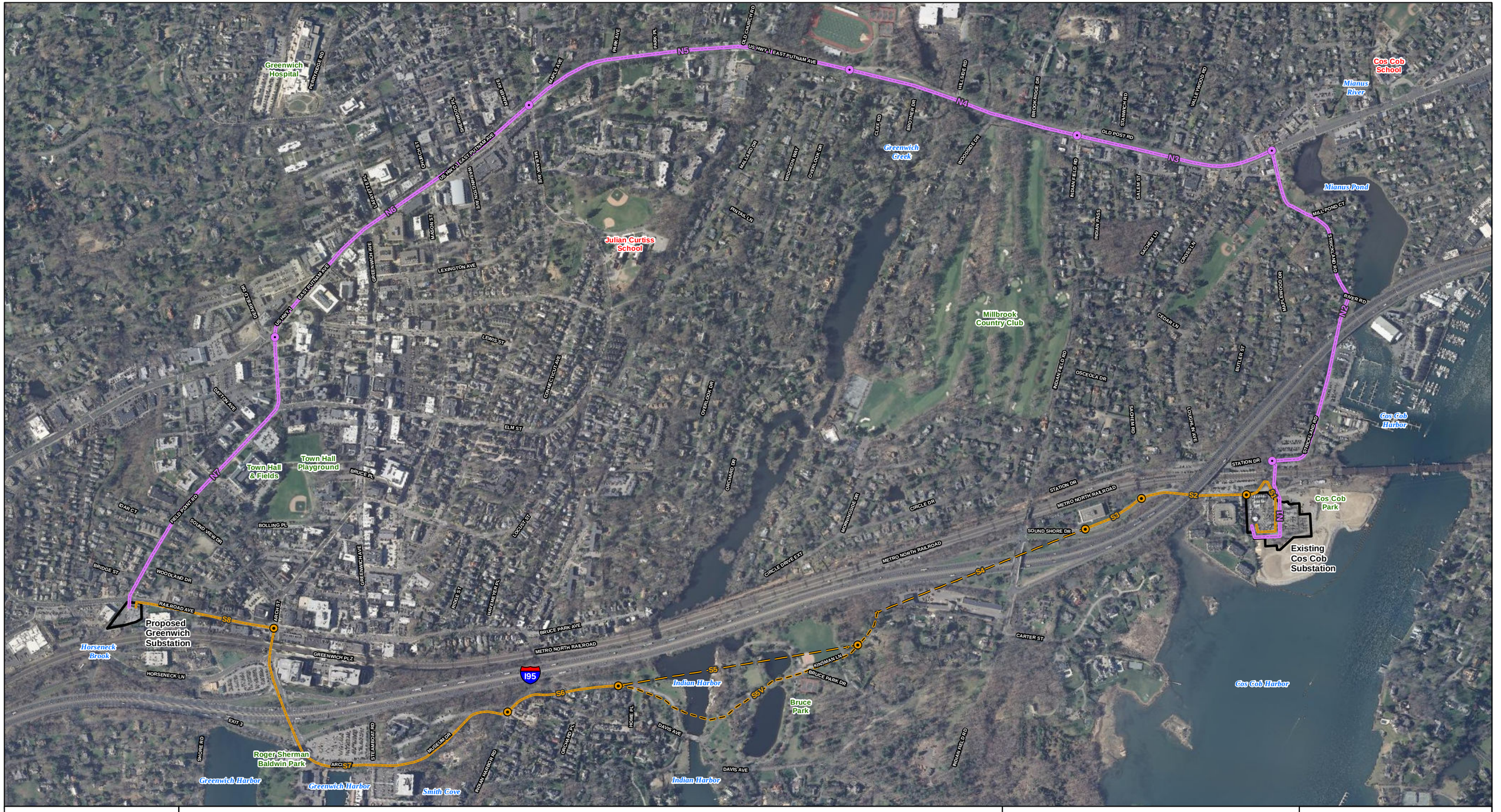
Key factors for selecting the Preferred Route over alternate routes were the route's length (which affects construction time and cost), construction complexities and desire to minimize environmental and community impacts. The Company identified two viable alternate routes ("Southern Alternative" and "Northern Alternative") as depicted in Figure ES-2.

The Southern Alternative would exit Cos Cob Substation south of the MNRR and extend west along Sound Shore Drive, passing under I-95. The route would extend southwesterly under I-95 a second time with an HDD crossing that would require staging locations for the duration of the Project along Sound Shore Drive near One Sound Shore Drive and a sending pit location near Kinsman Lane. Open trenching would continue in the road and into Bruce Park. Similar to the Preferred Route, HDD technology would be used to span Bruce Park and Indian Harbor. This route would then follow the same path as the Preferred Route along Davis Avenue, Indian Harbor Drive, Museum Drive, and Railroad Avenue. Similar to the Preferred Route, an open trench variation could generally follow Kinsman Lane and Bruce Park Drive to eliminate the direct crossing of the park lands.

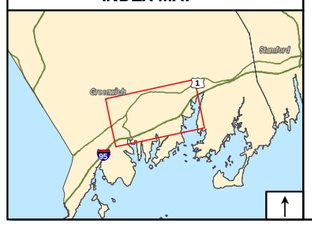
The Northern Alternative would primarily run along US Route 1, mainly within the public ROW. This route would exit north out of Cos Cob Substation under the MNRR before turning east and then north, following Strickland Avenue approximately 0.5 mile to Route 1. It would then head west along Route 1 for nearly two miles before turning southwest onto Field Point Road. The route would continue approximately 0.5 mile and terminate after crossing Railroad Avenue and entering the Greenwich Substation.

Neither alternative is as desirable as the Preferred Route due to physical constraints and increased community and environmental impacts.

[2] As discussed in Section ES-4, based on feedback received from Town officials and residents, the Project has also identified three variations to the Preferred Route.



INDEX MAP



Legend

- Northern Alternative Segment Point
- Northern Alternative
- Southern Alternative Segment Point
- Southern Alternative
- Southern Alternative HDD Crossing
- Southern Alternative Open Trench Crossing
- Proposed Greenwich Substation Site
- Existing Cos Cob Substation

Base Map: 2012 Aerial Photograph (CTECO)

1 inch = 750 feet

750 375 0 750 Feet

ES-2
Alternate Routes

Greenwich Substation and Line Project

EVERSOURCE ENERGY

ALL-POINTS TECHNOLOGY CORPORATION

June 2015

ES.6 Construction

The Project facilities would be constructed in accordance with established electric utility practices, industry best management practices, final engineering plans, Eversource's specifications and the conditions specified in the Certificate and permits obtained for the Project.

The proposed Greenwich Substation Site would require preparation work including removal of the existing building, grading and drainage improvements, constructing foundations, equipment installation, testing and interconnection to the transmission grid, establishing security facilities, and restoration and cleanup.

The transmission supply lines would be constructed underground and would use high-pressure fluid-filled ("HPFF") pipe type cables. Two HPFF circuits would provide for redundancy of supply and increased reliability to the Greenwich Substation. The Project's HPFF underground 115-kV line system would consist of three 8-inch steel pipes placed within a common trench. Two of the steel pipes would house the HPFF lines, while the third (fluid return) pipe would be dedicated for fluid circulation. The trench would also accommodate two 4-inch PVC conduits housing fiber optic cables and three 2-inch PVC conduits for distributed temperature sensing fibers. The system would be installed in a trench encased in low-strength concrete slurry, also known as fluidized thermal backfill and capped by a protective layer of high-strength concrete.

At a minimum, trenching for installing the transmission supply lines will require excavations measuring approximately 4.5 feet wide by 5.5 feet deep. The underground transmission supply line system also requires splice vaults, cable splices, grounding, insulating fluid reservoir, pump house, terminations (at the substations), and a cathodic protection system.

Concrete splice vaults would be installed along the route below ground for cable installation and splicing. Vaults are typically spaced up to 2,800 feet apart depending upon cable construction and route characteristics (i.e., community impacts and existing underground utilities). To install each concrete splice vault, an excavation area approximately 16 feet wide by 12 feet high and up to 24 feet long would be required.

ES.7 Environmental Effects and Mitigation

The Company evaluated the existing environment, including the scenic, historic and recreational values of the surrounding area. Based on that evaluation, Eversource does not expect the

construction and operation of the Project to have any significant permanent adverse effects on the existing environment and surrounding area. However, Eversource anticipates short-term construction effects including potential traffic congestion and access restrictions from the construction of the Project facilities; in particular, near the locations of the Greenwich Substation and splice vaults.

Eversource plans to mitigate these effects to the greatest extent feasible. Should the Project be approved, prior to the commencement of construction, Eversource will prepare and file with the Council a Development and Management Plan ("D&M Plan"). The D&M Plan will include specific procedures and detailed information on construction related aspects of the Project such as erosion and sedimentation control methods and placement (where necessary), dewatering, spill prevention and control, staffing and hours of work, traffic control and restoration activities.

ES.8 Municipal and Community Outreach

At numerous meetings over the past three-plus years, the Company has consulted with Town officials regarding the pressing need for improvements to the electrical system serving Greenwich and to solicit initial feedback on the Project. The focus of the meetings was primarily to communicate the Company's desire to upgrade the electric power distribution system in Greenwich and to establish a line of communication with Town officials.

Eversource submitted the MCF to the Town on February 6, 2015. The Company provided copies of the MCF document to the First Selectman's office, the Greenwich Library, including the Byram Shubert and Cos Cob Library Branches, as well as to the Planning and Zoning Commission and the Inland Wetlands and Watercourses Agency. Project information was also provided on the Company's Project website. In addition, to allow the public an opportunity to learn about the Project and the Project siting process, and to further facilitate community outreach in the Town, Eversource held an Open House in the Greenwich Town Hall Meeting Room on March 3, 2015. Information regarding the Project was provided to the public and the Company received direct feedback from interested persons concerning the Substation, transmission route and other matters relating to the Project. Eversource also appeared before the Town's Inland Wetlands and Watercourses Agency (on March 23, 2015), Architectural Review Committee (on March 4, 2015) and Planning and Zoning Commission (on March 10 and 24, 2015) to present information about the Substation and other components of the Project and respond to questions. Comments

received from Town representatives and members of the community have been reviewed and incorporated into this application, where feasible.

The issues the Town was most concerned with were: 1) the façade of the new Substation; 2) the location of the new Substation; 3) impacts to Kinsman Lane; and, 4) the design of the modifications to Cos Cob Substation.

ES.9 Regulatory Approvals

In addition to obtaining a Certificate for the Project from the Council, Eversource anticipates securing permits and/or approvals from the Connecticut Department of Energy and Environmental Protection ("CT DEEP") Office of Long Island Sound, including a Coastal Zone Consistency Certification, 401 Water Quality Certificate, and a Tidal Wetlands Permit. The Company also will obtain a permit to discharge Groundwater Remediation Wastewater Directly to Surface Water or Sanitary Sewer from the CT DEEP as well as other minor construction-related permits.

ES.10 Cost and Schedule

The estimated cost for the engineering, design, and construction of the Project, including the Greenwich Substation, transmission lines and Cos Cob Substation modifications is approximately $140,000,000.

Eversource anticipates initiating construction during the fourth quarter of 2016 with a targeted completion and in-service date by second quarter 2018.

A. Purpose of the Application

The Connecticut Light and Power Company doing business as Eversource Energy ("Eversource" or the "Company") is applying to the Connecticut Siting Council (the "Council") for a Certificate of Environmental Compatibility and Public Need ("Certificate") for the Greenwich Substation and Line Project (the "Project").

The purpose of the Project is to provide immediate load relief and add transformation capacity to the electric distribution supply system in the Town of Greenwich ("Town" or "Greenwich") by: (1) establishing a new bulk substation near the center of the customer electrical demand (or "load") to avoid overloads on system equipment; (2) installing two underground transmission supply lines (consisting of two separate 115-kV circuits) that would extend approximately 2.3 miles from Cos Cob Substation on Sound Shore Drive to connect to the new bulk substation at 290 Railroad Avenue; and, (3) upgrading equipment at Cos Cob Substation.

The public can obtain information about the Project in any of the following ways:

- The Project website at www.eversource.com
- By calling 1-800-793-2202
- By emailing TransmissionInfo@eversource.com

B. Statutory Authority for Application

Eversource is applying to the Council pursuant to Section ("§") 16-50g et seq. of the General Statutes of Connecticut ("CGS").

This filing includes the following information concerning the Project:

- Project need and purpose;
- Location and design of the Substation and underground transmission supply lines;
- Modifications to Cos Cob Substation;
- Various alternatives considered and the process by which the location of the proposed Greenwich Substation and the proposed routing options were identified and selected;
- Potential effects on the environment and proposed mitigation measures;
- Construction procedures and methods required for development of the Project;
- Electric and magnetic fields; and,
- Project cost and schedule.

C. Legal Name and Address of Applicant

The Connecticut Light and Power Company doing business as Eversource Energy, with corporate offices at 56 Prospect Street in Hartford, Connecticut.

Mailing Address:

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D. Applicant Contacts

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E. Project Background and Need

E.1 Need for Capacity

Greenwich needs an additional bulk substation located close to the current highest load concentration (electrical demand) in the western part of Town. Presently, this area is served primarily by one bulk substation (Cos Cob Substation), located over two miles east of the current load pocket. Cos Cob Substation was constructed in 1964 to serve a load much lower than what exists today and, even with modifications made since it was first constructed, it has now reached capacity. Based upon current load forecasts, under certain contingency conditions, Cos Cob transformers could reach their permissible load rating[3] in 2017. The Greenwich electric system must have additional capacity in order to avoid potential overloads at Cos Cob.

Since Cos Cob Substation first reached its capacity in 1994, the Company has postponed incurring the substantial cost of an additional bulk substation by implementing a series of incremental improvements to the electric supply system in and near Greenwich. However, the extent and location of the load growth that must be served make further incremental measures imprudent. A robust bulk power solution is required. The construction of the Greenwich Substation will provide the needed reliability of electricity to one of the state's most dynamic growth areas, as well as provide a margin for future growth.

Without the necessary system upgrades, contingency events could result in the overload of Cos Cob Substation transformers by as early as 2017 and could also cause the overload of lines originating at Cos Cob Substation that serve other Greenwich distribution substations. The existing distribution substation in the area of highest load concentration (Prospect Substation) would be exposed to overloads beginning in 2021. If such overloads were allowed to occur, widespread service interruptions to homes and businesses and damage to Eversource's equipment may result. To avoid the overloads, controlled load shedding (targeted blackouts) would likely be required. The construction of an additional bulk substation (the proposed Greenwich Substation) would not only enable the two bulk substations to share the load in normal conditions, but would also provide for continuity of service in many contingency events upon installation of equipment to implement transfers of load from one bulk substation to another. In

[3] Permissible load of a substation is the load the substation can be allowed to carry under normal conditions and loss of one transformer.

towns or areas with a similar amount of customer demand as in Greenwich, the Eversource system is typically designed to be able to transfer load between bulk substations in contingency events. The proposed Greenwich Substation would adequately meet current and projected demand and avoid reliance on a single bulk substation that is near its permissible load rating.

The problem of serving the vast majority of the Greenwich load from a single bulk substation that is nearing its permissible load rating is exacerbated by the location of Cos Cob Substation, over two miles east of the downtown Greenwich area. Most of the projected load growth and the greatest concentration of existing load are in the downtown area. At present, this load is being served by relatively long and heavily loaded distribution feeders, and continuity of service is threatened by the loss of any two feeders. The proposed Greenwich Substation would be located approximately 2.3 miles to the southwest of Cos Cob Substation, near the center of this load concentration. Moreover, the new substation would be served by two new 115-kV transmission supply lines, so that it could remain in service even with the loss of one of its supply lines in a contingency event.

E.2 Reliability Benefits

With the new capacity and an additional bulk substation source, the risk of projected overloads will be mitigated, thereby improving system reliability. The proposed Greenwich Substation will provide immediate load relief and allow for the transfer of approximately one-half of the load currently served by the Cos Cob Substation to the new facility. With the installation of the new distribution equipment, loads could also be transferred between the two bulk substations under contingency operating conditions, thus improving reliability. Finally, bringing a transmission level power source closer to central Greenwich will provide a more reliable power supply than the existing lengthy distribution feeders emanating from Cos Cob Substation.

E.3 Identification of the Facility in the Forecast of Loads and Resources

A new substation for Greenwich was included in the Company's filings to the Council; specifically in tables listing proposed substation projects in the Company's 2012-2015 Forecasts of Loads and Resources. The proposed 115-kV transmission supply lines were included in the Company's 2013-2015 filings. Moreover, in its 2012/2013 Forecast Final Report dated December 12, 2013 (see Council Docket No. F-2012/2013), the Council identified the new Greenwich Substation in Appendix C: Planned Substations, and the new Cos Cob Substation – Greenwich Substation lines as "concept" transmission lines.

The Greenwich Substation was also included in the Connecticut Department of Energy and Environmental Protection's ("CT DEEP") 2012 Integrated Resources Plan for Connecticut, Appendix G, Figure 6, p. G-10, as a "concept" new substation. In the CT DEEP's 2014 Integrated Resources Plan for Connecticut, Appendix F, Figure 9, pp. F-23 & 24, Greenwich Substation is listed as a "planned" new substation, and in Appendix F, Figure 11, p. F-28, two new 115-kV transmission lines, Cos Cob – Greenwich, are also listed as "planned".

E.4 Need for the Substation

E.4.1 Purpose

The purpose of the Greenwich Substation is to provide immediate load relief to the distribution supply system in Greenwich to avoid overloads on system equipment, by establishing a new bulk substation in Greenwich. This new bulk substation would also accommodate anticipated future load growth and greatly improve the reliability of the entire electric distribution system in Greenwich.

Currently, as introduced above, the vast majority of load in Greenwich is served from a single bulk substation, Cos Cob Substation, serving approximately 130.5 Megavolt-Ampere[4] ("MVA") of electric load at 27.6 kV.[5] It feeds three distribution substations at 27.6 kV in Greenwich (Prospect, Byram and North Greenwich Substations), supplies power directly to large commercial customers and the secondary network, and provides a backup power source at 27.6 kV to two other substations in Greenwich (Mianus and Tomac Substations).[6]

E.4.1.1 Cos Cob Substation – The Need for Capacity to Avoid Transformer Overloads

The cornerstone of the electric distribution system in Greenwich is Cos Cob Substation (see Figure E-1). It is a bulk substation that has several distinct functions. First, it acts as an electrical "off-ramp," taking power at 115 kV from the transmission system (the highway system of lines that move high voltage power over long distances) and reducing the transmission voltage levels down

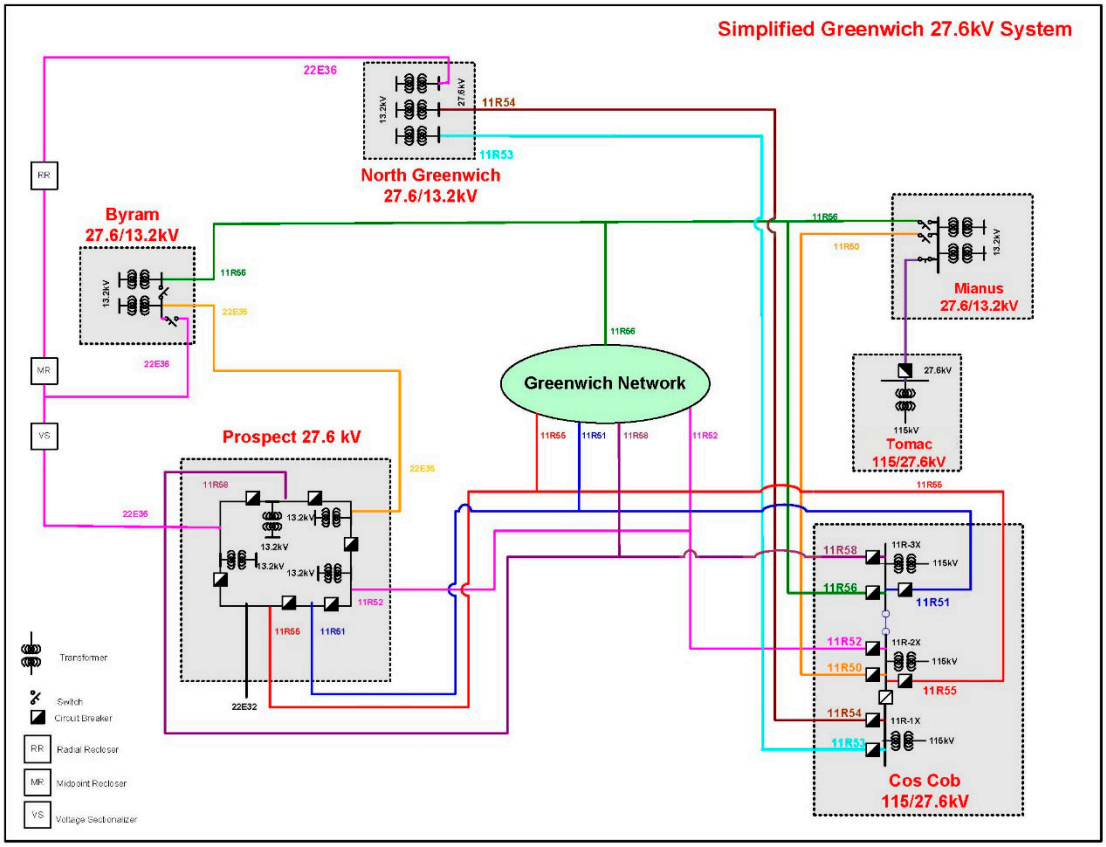
[4] Load is based on 2013 summer peak.

[5] Cos Cob Substation also serves approximately 16.4 MVA of peak load at 115 kV solely for the benefit of Metro-North Railroad and another 29.5 MVA of peak load at 13.2 kV.

[6] Cos Cob Substation provides a reliable level of service now and in the foreseeable future at 13.2 kV; therefore, no improvements at Cos Cob Substation at the 13.2-kV level are recommended or included in the Project.

to distribution voltage levels, in this case 27.6 and 13.2 kV, which levels are reduced further to serve homes and businesses. Second, Cos Cob Substation supplies power at 27.6 kV to other substations in Greenwich to enable those substations to serve homes and businesses. Third, Cos Cob Substation supplies power at 27.6 kV to large commercial customers and the secondary network in downtown Greenwich.

Figure E-1 Greenwich Electric Distribution System



During its on-going planning process, the Company examined actual load levels for 2013 and projected load levels for 2017 for loads served by Cos Cob Substation. Based on this analysis, the Company concluded that Cos Cob Substation's 115- to 27.6-kV transformers could be overloaded starting in 2017 under certain contingency events. To avoid such overloading, 27.6-kV load relief at Cos Cob Substation should be in place in 2018. In addition, 27.6-kV load relief is needed at two distribution substations (Prospect and Byram Substations) that are supplied from Cos Cob Substation. The proposed Greenwich Substation would provide the necessary load relief to the 27.6-kV system by transferring load off the existing 27.6- to 13.2-kV transformers at Byram and Prospect Substations to new 115- to 13.2-kV transformers at Greenwich Substation.

Local load area deficiencies resulting from inadequate transformer and feeder capacities at Cos Cob Substation currently exist in Greenwich, and will be resolved with the construction of the new bulk substation. Based on 2013 actual loads, Cos Cob Substation serves 130.5 MVA of load at 27.6 kV. Eversource's projected 27.6-kV loads at Cos Cob Substation in 2017, without the proposed Greenwich Substation, would be 135.8 MVA. Because Cos Cob Substation's permissible load rating is 135 MVA, Cos Cob Substation is projected to be overloaded in 2017, based on projected load levels under peak load conditions if certain contingency events occur. Table E-1 summarizes the actual and projected load levels on the transformers at Cos Cob Substation.

Table E-1 Summer Peak Load Levels[7]

Cos Cob Substation 27.6 kV – Load in MVA											
Transformers ID Numbers	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
1X	26.8	27.1	27.3	27.6	27.9	28.2	28.4	28.7	29.0	29.3	29.6
2X+3X	103.7	104.7	105.8	106.8	107.9	109.0	110.1	111.2	112.3	113.4	114.5
Total MVA	130.5	131.8	133.1	134.5	135.8	137.2	138.5	139.9	141.3	142.7	144.2

Construction of a new bulk substation in Greenwich to provide load relief is consistent with the Company's current electric distribution system design. In most geographic areas of Connecticut

[7] 2013 are actual summer peak loads; 2014 and beyond are projected peak loads. The actual 2014 load peaked at 107.6 MVA due to an unusually mild summer.

with large amounts of customer load, two or more bulk substations that have multiple transmission supply lines are used to supply power, so that if one power supply source is unavailable, the remaining bulk substation(s) would supply the needed power. For example, Stamford has four bulk substations that serve the load in that area: Glenbrook, Cedar Heights, South End and Waterside. In contingency conditions, significant load can be quickly transferred from any of these substations to one or more of the others, through the use of automatic distribution recloser transfer systems.

The load relief provided by the proposed Greenwich Substation would not only meet the current needs but also the projected future needs that would arise from continued load growth. The Southwest Connecticut region and Greenwich in particular, continues to experience economic growth and, as a result, load has increased at a faster pace than in other parts of Connecticut. Adding the proposed new bulk substation in Greenwich would enable Eversource to meet the projected load in 2018 and approximately 30 years thereafter, as well as provide capacity for additional load increases that will likely arise from continuing economic development in Greenwich.

E.4.1.2 The New Substation Eliminates Potential Distribution Feeder Overloads

In Greenwich, dependence on one bulk substation (Cos Cob) to supply 130.5 MVA of load at 27.6 kV through distribution feeders provides insufficient reliability of service to the majority of customers because it renders the system vulnerable to feeder overloads and potential outages under certain contingency conditions. Such overloads and outages may result not only in an interruption of service to customers, but also in damage to Eversource's equipment. Such damage could, in turn, lead to more widespread and/or longer duration customer outages.

Currently, multiple lengthy distribution feeders (approximately 2.3 miles) are used to supply power to Prospect Substation from Cos Cob Substation. The longer the length of the distribution feeders, the greater the risk of feeder failures, which could result in outages. These reliability vulnerabilities would be substantially reduced by locating a new bulk substation near the load that it will serve and supplying the new substation with power delivered by transmission supply lines.

The electric distribution system in Greenwich was designed more than 50 years ago to serve substantially lower load levels than exist today. Based on the current and projected loads, the transformation capacity and distribution feeders are at or near their maximum load levels in peak

or near peak conditions. Therefore, any event that causes a loss of one or more system components, such as a transformer or distribution feeder, will require the remaining system components to carry higher loads, thereby further stressing those components in contingency conditions. As those components are further stressed, there is increased risk that more components will fail, thus potentially causing the initial loss to "expand" onto additional components throughout the system. For example, such past "double contingencies" have resulted in load loss because essentially all of the eggs are in one basket – Cos Cob Substation is supplying power via long distribution feeders. Moreover, four 27.6-kV circuits operate electrically in parallel from Cos Cob Substation to Prospect Substation, such that if one or more of these circuits is out, the remaining circuits must carry the entire load. Additionally, if a loss of two network feeders occurs during summer peak, then the entire secondary network in Greenwich must be shed by tripping (de-energizing) the transformers that supply power to all five circuits.[8] Finally, secondary network emergencies, such as a manhole fire, damage to a duct bank, or damage caused by lightning storms may require shedding the entire network load.

Further, Greenwich is located at the end of the Company's Southwest Connecticut transmission system. The transmission lines that currently supply Greenwich terminate a substantial distance (approximately 2.3 miles) from the existing distribution substations located west of Indian Harbor, with the result that power for the majority of the Greenwich customer load is supplied from the east only by relatively long distribution feeders of limited capacity. Bringing a transmission source into the center of customer demand will eliminate the need to rely solely on the long distribution feeders to deliver electricity.

A new Greenwich bulk substation is a long-term solution. The numerous upgrades and other short-term distribution measures that the Company has applied to keep the system operational to date have allowed the electric power system in Greenwich to function until a long-term solution could be implemented. That time is now.

E.4.1.3 Prospect Substation – The Need for Capacity to Reduce the Risk of Transformer Overloads

Prospect Substation is a 27.6- to 13.2-kV substation that has four transformers supplying seven 13.2-kV circuits. This substation also serves as a common bus for the 27.6-kV system in Town,

[8] All five feeders carry a total load of 103.7 MVA (based on 2013 actual summer peak).

with four incoming 27.6-kV lines from Cos Cob Substation and three outgoing 27.6-kV lines, which supply several large customers and the distribution network in downtown Greenwich.

As a result of the current system facilities operating in Greenwich and the current high level of demand, the Prospect Substation is a non-bulk substation that carries more load than a typical distribution substation and, in fact, more load than many existing bulk substations. It is served by only one source (the 27.6-kV supply from Cos Cob Substation) with very limited back up (about 1% of the load) for a failure of that one source. Based on current projections, four 27.6- to 13.2-kV transformers at Prospect Substation would be overloaded beginning in 2021 based on a load level of 55 MVA.[9] Table E-2 summarizes the actual and projected load on the transformers at Prospect Substation.

Table E-2 Actual and Projected Loads[10]

Prospect Substation 13.2 kV – Summer Peak Load in MVA												
Transformer ID Number	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
1X	13.3	13.4	13.6	13.7	13.8	14.0	14.1	14.3	14.4	14.5	14.7	14.8
2X	11.9	12.0	12.1	12.3	12.4	12.5	12.6	12.8	12.9	13.0	13.1	13.3
3X	9.8	11.9*	12.0	12.2	12.3	12.4	12.5	12.7	12.8	12.9	13.0	13.2
4X	16.2	14.4*	14.5	14.7	14.8	14.9	15.1	15.2	15.4	15.6	15.7	15.9
Total 13.2kV Load	51.2	51.7	52.2	52.8	53.3	53.8	54.4	54.9	55.5	56.0	56.6	57.1
% Loading**	93%	94%	95%	96%	97%	98%	99%	99%	OVERLOADED			

* Load was transferred from the 4X to the 3X in 2014.

**For each year, total 13.2-kV MVA load divided by the 55 MVA capacity of the substation multiplied by 100.

[9] The capacity of Prospect Substation is 55 MVA, which represents the sum of the nameplate capacities of all its transformers.

[10] 2013 are actual summer peak loads; 2014 and beyond are projected peak loads. The actual 2014 load peaked at 42.8 MVA due to an unusually mild summer.

E.4.1.4 Locating a Source of Electric Supply Near the Load Center

The Greenwich Substation is planned to be located in the heart of the area of greatest customer demand in Greenwich. In addition to the transfer of load to the proposed Substation under normal conditions, field ties between the distribution circuits served by the two substations would allow for transfer of a portion of the load to the other substation if system components were lost at either of these substations.

Cos Cob Substation, the most heavily loaded bulk substation in Connecticut, serves approximately 176 MVA[11] of load. The current load in Greenwich is concentrated in its downtown area, which is well to the west of Cos Cob Substation. With the proposed Greenwich Substation positioned closer to the customer load, reliability risks arising from reliance on power supplied by relatively lengthy distribution feeders would be substantially reduced.

Figure E-2 depicts the locations of Eversource's existing substations and the current load in Greenwich. The highest load concentrations are represented in red and the lowest in dark green. Because the proposed site of the new Greenwich Substation is near the center of the highest load areas in the Town, this location is ideal.

E.4.2 Initial Determination of Need

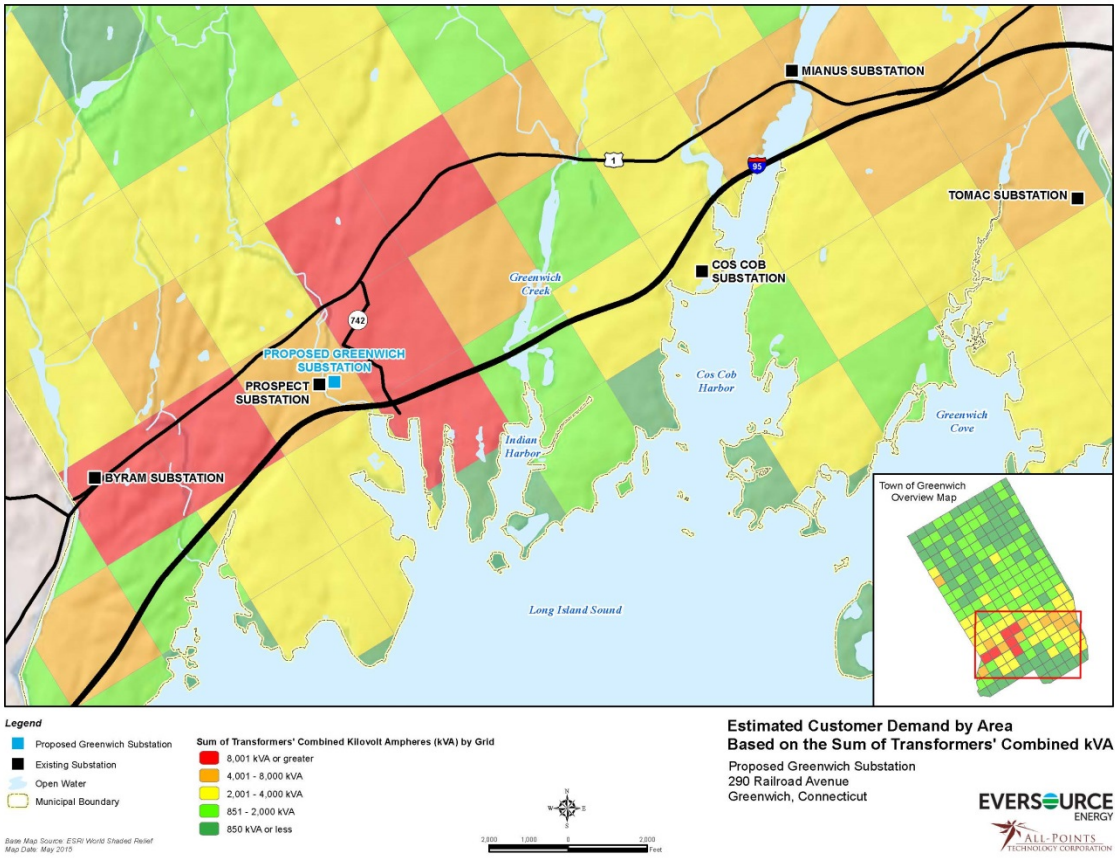
As part of an ongoing analysis of its distribution system, in 1989 the Company identified the need for a new substation in Greenwich because Cos Cob Substation was projected to reach capacity in 1994, and the Company considered building a new substation west of Indian Harbor, as the analysis then suggested. However, in 1994, the Company was able to postpone constructing a new substation west of Indian Harbor and provide the needed additional capacity at a much lower cost by upgrading Tomac Substation located to the east of Indian Harbor, where it could tap into an existing 115-kV transmission line.

To address additional incremental load growth since that time, the Company added a 25-MVA transformer at Cos Cob Substation in 2000. From 2010-2012, the Company was able to further postpone construction of a new substation west of Indian Harbor by upgrading equipment at the existing substations in Greenwich, as explained more fully in Section E.4.3.5, Table E-4 Greenwich Interim Measures. During 2011-2013, the Company was also able to move load to

[11] Cos Cob Substation also serves approximately 16.4 MVA of peak load at 115 kV solely for the benefit of Metro-North Railroad, 130.5 MVA of peak load at 27.6 kV, and another 29.5 MVA of peak load at 13.2 kV for a total of 176 MVA.

Waterside Substation in Stamford to relieve Tomac Substation. However, none of these improvements were a long-term solution for the need of a new substation closer to the load center (west of Indian Harbor).

Figure E-2 Estimated Customer Demand by Area



The Company's planned long-term solution for a new substation west of Indian Harbor was made public by the Company in June of 2011 as part of a series of steps needed to improve reliability in Greenwich and to address vulnerabilities that appeared after the loss of three circuits at Cos Cob Substation due to lightning strikes occurring over two consecutive days during a heat wave. Service to over 5,000 customers was lost during that time. Subsequent to that event, high system loads on the remaining circuits caused three underground circuits to fail. In response, the Company had to quickly implement multiple steps to protect the electric power system in Greenwich. One of those steps included de-energizing approximately 2,300 customers in North Greenwich to help prevent further damage to the electrical distribution system. Additionally, the

Company undertook public appeals to Greenwich customers for conservation and requested commercial customers to operate their on-site generation. The Company also continuously shifted loads between available sources in the Greenwich area to avoid exceeding equipment capabilities and to minimize customer outages. As a final step, the Company mobilized an emergency bulk substation transformer and other equipment into the area, on standby status, to mitigate the risk of additional contingency events.

Once electric service was properly restored and system stability was achieved, the Company began the process of proactively accelerating planned intermediate-term reliability improvements in Greenwich. At that time, the Company also announced that it was accelerating the long-term plan for a new bulk substation in Greenwich.[12]

E.4.3 Existing System and its Current Limitations

E.4.3.1 Background

The Southwest Connecticut area is the largest load area within Connecticut. It comprises 54 towns, including all of The United Illuminating Company's ("UI") service territory, and accounts for approximately 50% of Connecticut's peak electric load demand.[13] Addressing the issues associated with the electric power system in Southwest Connecticut has been the focus of transmission studies that have identified the need for additional transmission capacity in the region. In response, the Company has placed new facilities in service. Initially, the backbone of the transmission grid was the subject of major system improvements to enhance reliability and efficiency. Specifically, the Company constructed and placed in service the Bethel-Norwalk 345-kV Project (2006), Long Island Cables Replacement Project (2008), Middletown-Norwalk 345-kV Project with UI (2008) and the Norwalk-Glenbrook 115-kV Project (2008). Recently, the Company placed in service the Stamford Reliability Cable Project, which is a new 115-kV underground transmission circuit that extends between the Glenbrook and South End Substations located in Stamford. All of these projects have strengthened the reliability and efficiency of the transmission system in the Southwest Connecticut area.

[12] See Docket No. 86-11-18 – DPUC Review of Performance of UI, CL&P and SNETCO in Restoring Service After Storm Carl – Order No. 6 Compliance. Note that pursuant to the final decision in this docket, Eversource has a continuing obligation to report the details of events when implementation of its emergency plan for service restoration occurs, including the events in 2011.

[13] CL&P 2015 Forecast of Loads and Resources For the Period 2015-2024, March 15, 2015, p. 20.

E.4.3.2 Area Substations

As noted earlier, Greenwich is served by Cos Cob Substation (a bulk substation), which supplies power to Prospect, Byram and North Greenwich distribution substations via distribution feeders. Cos Cob Substation is located on Sound Shore Drive; Prospect Substation is located at 330 Railroad Avenue; Byram Substation is located on Pemberwick Road; and, North Greenwich Substation is located on Old Mill Road.

In addition to serving as the Town's primary electric supply source, Cos Cob Substation also provides a back-up source for power to Tomac Substation[14] and Mianus Substation at 27.6 kV.

Figure E-3 illustrates the substations and 115-kV transmission lines located in Greenwich and in Stamford.

E.4.3.3 Load Served by Area Substations in Greenwich and Projected Load

The Company examined the 2013 actual loads and projected the 2017 loads for the distribution (non-bulk) substations, secondary network and commercial customers in Greenwich fed by Cos Cob Substation at 27.6 kV.

[14] Tomac Substation is technically considered a bulk substation; however, it is a very limited one because there is space for only one 115-kV to 27.6-kV transformer.

Figure E-3 Greenwich and Stamford Substations and Transmission Lines

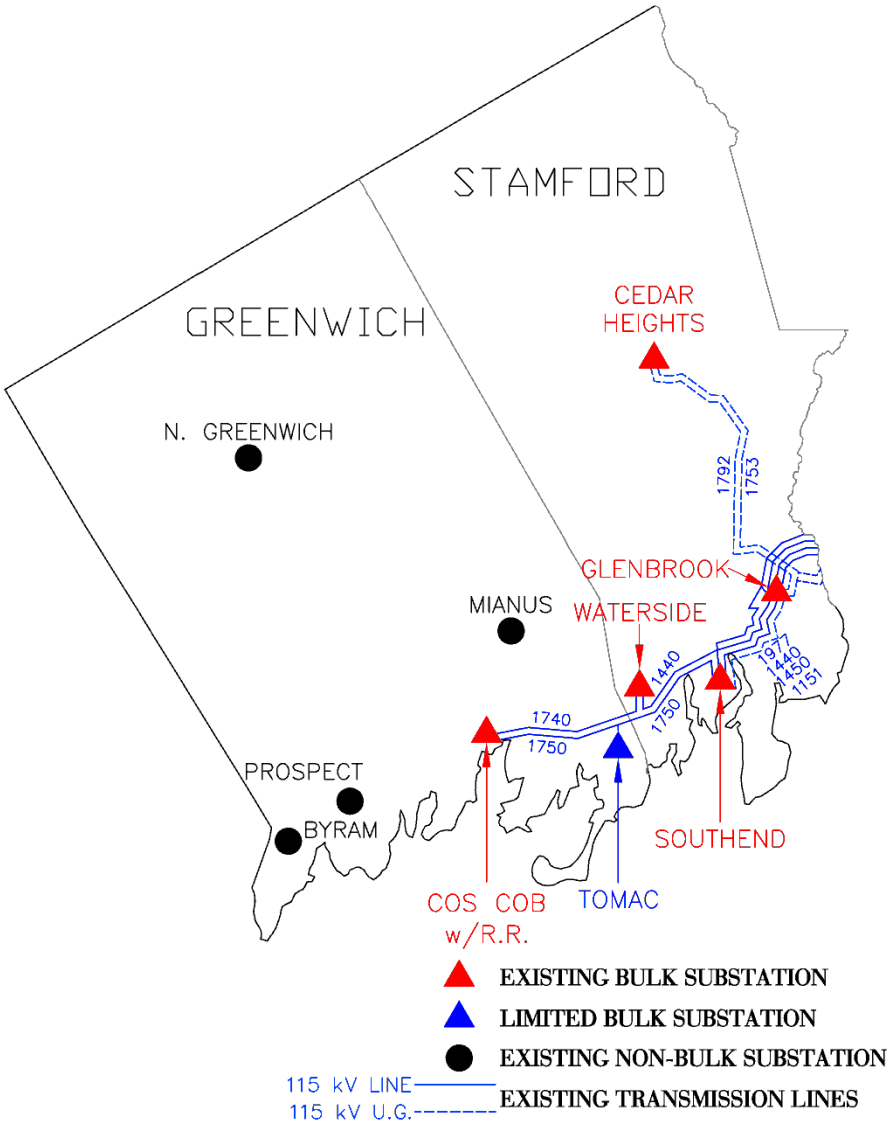


Table E-3 summarizes the Company's findings of existing and future loadings at substations, secondary network and commercial customers in Greenwich fed by Cos Cob Substation at 27.6 kV.

Table E-3 Existing and Future Loads Fed by Cos Cob Substation via 27.6-kV Feeders

Substation/ Customers	Peak Load		27.6- to 13.2- kV Transformer Nameplate MVA
	Actual MVA 2013	Projection MVA 2017	
North Greenwich – 1X, 2X & 3X	31.0	32.3	75
Byram – 1X & 2X	15.9	16.5	25
Prospect – 1X, 2X, 3X and 4X	51.2	53.3	55.0*
Network & Prospect Commercial Customers Loads	32.4	33.7	Supplied directly from Cos Cob
Total MVA	130.5	135.8**	-

*The Prospect 13.2-kV switchgear is nearing its end of life, with components 45 to 60 years old. In addition, loads are approaching maximum capacity with limited distribution field ties to allow for temporary transfer of portions of the load to help address substation overloads. In other towns, portions of load can be transferred between bulk substations by automatic distribution recloser transfer systems to address overloads.

** Permissible load for Cos Cob Substation @ 27.6 kV is 135 MVA.

Projected loads at 27.6 kV on Cos Cob Substation in 2017 will exceed its permissible load of 135 MVA for its 27.6 kV transformers under contingency events. Based on loads projected for years after 2017, the Company concluded that four 27.6- to 13.2-kV transformers at Prospect Substation would also be overloaded in 2021.[15]

E.4.3.4 Area Substation Constraints and Considerations

After closely examining current conditions at each of the area substations (Cos Cob, Prospect, Byram, North Greenwich, Mianus, and Tomac), the Company concluded that the existing distribution system is beyond the capabilities of the current design and cannot be strengthened without a new bulk substation located west of Indian Harbor.

[15] For Byram Substation, one (1) 27.6- to 13.2-kV transformer would be overloaded in 2028 based on current projections.

Constraints on the current system are summarized as follows:

(i) Cos Cob (Bulk Substation)
- was built in 1964 on two properties consisting of 2 acres - 1.506 acres owned by Eversource (0.6 acre is utilized by the Company and 0.9 acre is subject to an exclusive third party easement) and 2.5 acres owned by the Connecticut Department of Transportation ("ConnDOT") (1.4 acres subject to easement to the Company) - and is a fully utilized property, so there is not sufficient space to add three transformers and associated feeders
- is constrained by a public road, ConnDOT property, an office building and new town park

(ii) Prospect (Distribution Substation)
- was built in 1934 on a 0.35 acre portion of a 1.3 acre property
- carries more load than a typical distribution substation and more than many bulk substations
- is bounded by public roads and bisected by an underground brook within a concrete culvert and a municipal sewer main
- is partially located in a 500 year flood zone
- is an operating substation serving load in Greenwich that must remain energized both during and after the construction of the new substation

(iii) Byram (Distribution Substation)
- was built in 1955 on a 0.2 acre portion of a 1.17 acre property
- has severe slopes and is bounded by residential properties on the north, Pemberwick Road on the west, a commercial property on the east and Route 1 on the south
- is too far west of Cos Cob Substation and at the western extent of customer load

(iv) North Greenwich (Distribution Substation)
- was built in 1972 on approximately 0.47 acre property
- is too far from the center of customer load

(v) Mianus (Distribution Substation)
- was built in 1956 on approximately 0.31 acre property
- is bounded by Mianus River and senior care facility, public road and a business
- is too far from the center of customer load

(vi) Tomac (Limited Bulk Substation)
- was built in 1971 on a 0.45 acre portion (includes 0.1 acre for access easement to the railroad) of an approximately 0.86 acre property (0.189 acre subject to railroad easement)
- is bounded by wetlands, a golf course, a railroad and a public road
- is too far east from the center of customer load

E.4.3.5 Interim Measures to Supply the Greenwich Service Area

Beginning in 2010, the Company implemented several interim measures to bolster the functioning and capacity of substations and the distribution system in the Greenwich area. The projects listed in Table E-4 comprise these interim measures, which were designed not only to improve reliability, but also to increase the capacity of the distribution system in the area, until a new bulk substation could be constructed in Greenwich. After the proposed Greenwich Substation is built, the interim measures will complement the new circuits from the Greenwich Substation and improve the distribution tie capabilities between the substations going forward.

Table E-4 Greenwich Interim Measures

Substation		In-service Date	Initiative	Company Investment (millions)
1	Cos Cob	2010	Upgrade switchgear – 27 kV	$3.8
2	Cos Cob	2012	Tie connection between two transformers	$1.2
3	Cos Cob	2012	Add a new 30-MVA transformer	$4.8
4	Byram	2011	Upgrade equipment – install two reclosers	$0.2
5	Mianus	2012	Upgrade equipment – Install underground cable and switching to serve load from Cos Cob	$0.8
6	Distribution Feeder Improvements	2012	Replace distribution cables from Cos Cob Substation to Prospect Substation	$2.0
7	North Greenwich	2012	Add an aerial feed to North Greenwich Substation and upgrade right-of-way	$8.4
8	North Greenwich	2010-2012	Replace three distribution transformers	$14.0
9	Distribution Underground Cable Improvements	2012	Replace underground distribution cable from Cos Cob Substation to Sound Shore Drive	$1.1
			Total	$36.3

Currently, there are no additional feasible interim measures at the distribution level that could be undertaken to continue to provide reliable service, other than to build a new substation in Greenwich. Unlike other communities, Greenwich is electrically isolated because the area transmission lines end at Cos Cob Substation and distribution substations that serve a substantial level of Greenwich's customer load are fed by distribution feeders that originate at Cos Cob Substation.

E.4.3.6 Projected Load Growth

Load growth in Greenwich would exacerbate the anticipated strains on the electric distribution system in Greenwich. The Company projected the load growth as set forth in Table E-5 [transformers at Cos Cob Substation] based on a conservative load growth factor.

E.4.4 Proposed Greenwich Substation

The Greenwich Substation is proposed as a 115- to 13.2-kV bulk substation with capacity to serve approximately 134 MVA of permissible load. This capacity would allow for an equal division of load between the two bulk substations, Cos Cob and the proposed Greenwich Substation.

Table E-5 shows how the customer load would be split when the proposed Greenwich Substation is placed in service.

Table E-5 Customer Load

	Loads in MVA		Permissible Load Ratings in MVA
	2013	2018	
Cos Cob Substation	130.5	66.7	135*
Greenwich Substation	N/A	70.5	134**
Total	130.5	137.2	

*Cos Cob at 27.6 kV. Reflects the loss of largest transformer and two hour rating on remaining 67.5 MVA + 67.5 MVA = 135 MVA.

**Greenwich at 13.2 kV. Based on expected ratings of ratings for new transformers and normal rating for 2 transformers with third out of service 67.0 MVA + 67.0 MVA =134 MVA.

The Company calculated the future loads for the area substations based on 2013 actual loads and 2018 projected loads with the proposed Greenwich Substation in service (2018). The permissible load rating for the proposed Greenwich Substation in 2018 would be approximately

134 MVA and the Substation would serve 70.5 MVA, and the future load served by Cos Cob Substation at 27.6 kV would be 66.7 MVA (reduced from its projected 2018 load of 137.2 MVA without the Greenwich Substation). Next, the Company estimated the projected load for the substations that Cos Cob Substation would continue to serve with proposed Greenwich Substation in service.

Table E-6 sets forth the before and after (once the proposed Greenwich Substation is in service) calculations of the loads fed by Cos Cob Substation. Note that the entire loads formerly supplied by Byram and Prospect Substations (at 13.2 kV) would be transferred to the proposed Greenwich Substation after it is placed in-service. Prospect Substation would continue to be a critical distribution tie station for the existing 27.6-kV system, including customers directly supplied at 27.6 kV and the secondary network. Byram Substation would continue to be utilized for voltage regulation in order to maintain an appropriate voltage in the western portion of Town.

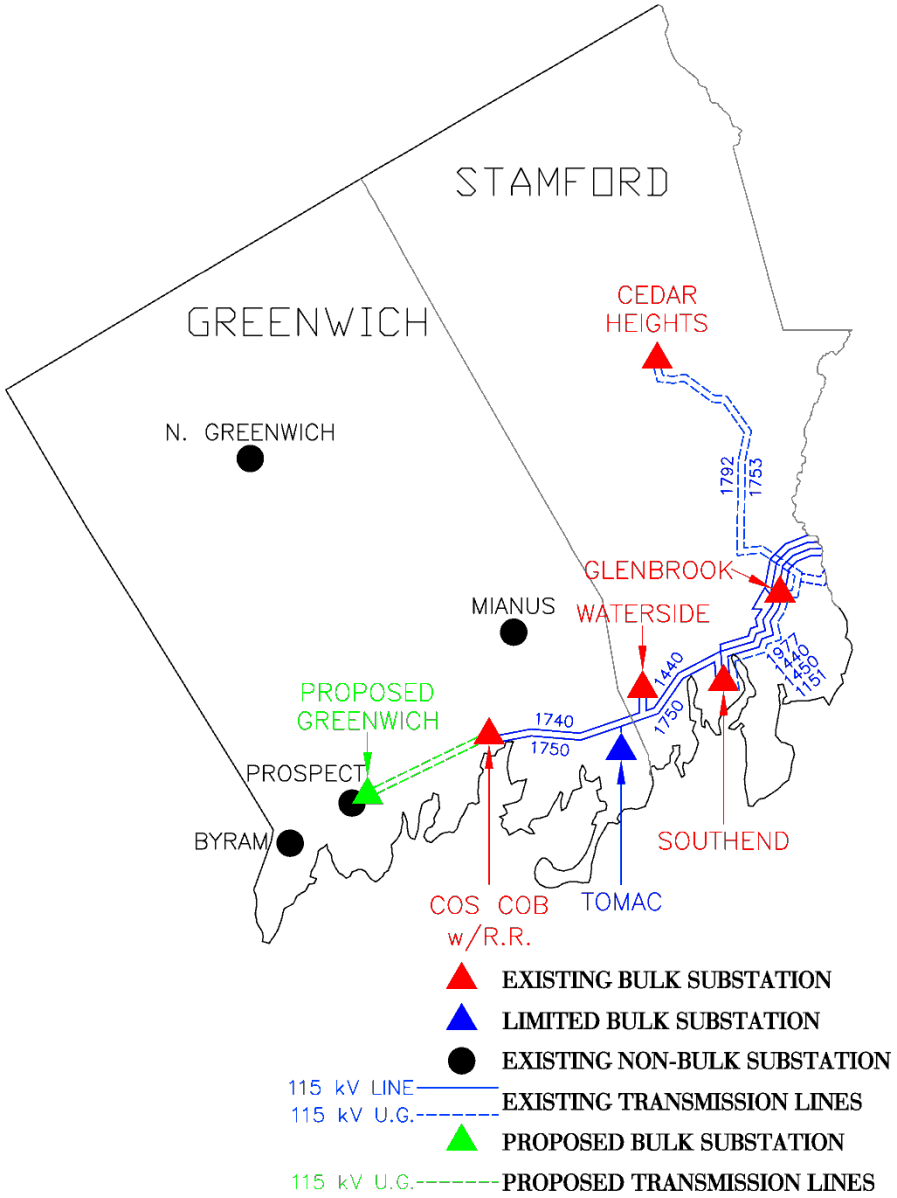
Table E-6 Load Calculations

27.6-kV Loads Fed by Cos Cob Substation with the Addition of the Proposed Greenwich Substation in 2018			
Substation	**Peak Load**		**Transformation Capacity 27.6 kV to 13.2 kV**
	Actual 2013	**Projected 2018**	
North Greenwich – 1X, 2X & 3X	31.0	32.6	75.0
Byram – 1X & 2X	15.9	-	Transformers removed and load transferred to the proposed Greenwich Substation
Prospect – 1X, 2X, 3X and 4X	51.2	-	Transformers removed and load transferred to the proposed Greenwich Substation
Network & Prospect Commercial Customers Loads	32.4	34.1	Supplied directly from Cos Cob
Total MVA	130.5	66.7	135 MVA (permissible load for Cos Cob Substation at 27.6 kV)

In summary, with the proposed new substation in service, both Greenwich Substation and Cos Cob Substation would serve the western part of Greenwich with greater reliability. The projected transformer and feeder overloads at Cos Cob Substation and projected transformer overloads at Prospect Substation would be mitigated.

Figure E-4 depicts the location of the proposed Greenwich Substation and transmission lines with the existing transmission system and substations as shown in Figure E-3, Greenwich and Stamford Substations and Transmission Lines (presented previously in Section E.4.3.3, Load Served by Area Substations in Greenwich and Projected Load).

Figure E-4 Greenwich and Stamford Substations and Transmission Lines with Addition of the Project



The proposed Greenwich Substation would provide the additional capacity that would be sufficient to meet the current projected demand for approximately 30 years. In addition, the proposed Greenwich Substation would allow Eversource to remove aging equipment at Prospect Substation (four transformers and switchgear) and at Byram Substation (two transformers and switchgear). Prospect Substation will remain in service as a distribution tie station for the remaining 27.6-kV circuits; Byram Substation will serve as a voltage regulation site.

E.5 Transmission Supply Lines

For a substation to perform as a bulk substation, it must be connected directly to the transmission system. For the proposed Greenwich Substation, the nearest transmission lines available are at Cos Cob Substation, so new transmission supply lines would be required.

The Project includes two new underground 115-kV transmission supply lines whose purpose would be to extend the 115-kV transmission system and allow transmission of power west from Cos Cob Substation to the location of the new Greenwich Substation.

Although these transmission supply lines are needed to provide a connection between the two bulk substations, the definitions of "line" and "transmission line", applied by the Council in Docket No. 370 in its Findings of Fact Glossary, dictate that the Company treat these lines as a "facility" pursuant to CGS § 16-50i(a)(1):

> Line: A series of overhead transmission structures which support one or more circuits; or in the case of underground construction, a duct bank housing one or more cable circuits.
>
> Transmission Line: Any line operating at 69,000 or more volts.[16]

These lines would be needed to supply the Greenwich Substation. Ideally, new bulk substations are purposely located to require only short line sections to connect to the transmission system. For example, for Sherwood Substation in Westport (see Council Docket No. 398), only short line segments were required to connect the nearest 115-kV transmission line, which was located along the adjacent railroad right-of-way, to Sherwood Substation. Similarly, for Waterford Substation (see Council Docket No. 364), the existing 115-kV transmission line was located

[16] Council Docket No. 370 in its Findings of Fact Glossary 6.

nearby; therefore, only two new structures were needed to connect that line to Waterford Substation.

E.6 Proposed In-Service Date Justification

The proposed in-service date for the Project is second quarter 2018. Given the importance of Cos Cob Substation to the reliability of electric service in Greenwich, the new Greenwich Substation and transmission supply lines should be placed in service as soon as possible to reduce the risk of customer outages and equipment failures. With the proposed new Substation and transmission supply lines in service, reliable electric service can be maintained to meet existing and projected customer demand.

To the extent that customer demand increases beyond current projections in Greenwich, or the proposed Greenwich Substation is not in service when the customer demand to be served by Cos Cob Substation first exceeds its Permissible Load Rating of 135 MVA, and a contingency event occurs during a peak load period, Eversource will implement a limited number of distribution operating actions to maintain service.

During its planning process and as presented in the Municipal Consultation Filing, Eversource originally projected a fourth quarter 2017 in-service date for the Substation and transmission supply lines. However, based on its open and frank dialogue with Town officials and local boards, the Company undertook substantial revisions to the design of the proposed Substation building (including its outer façade, structure and dimensions) and its location on the proposed Site. These design changes provided for a significant reduction in the height of the proposed building and a significant increase in the proposed distance between the building and the property line along Railroad Avenue. Moreover, these changes also will render the building more compatible with the neighborhood of the proposed Site. In addition to changes to the design of the proposed Substation building, the Company developed and analyzed possible route variations into and across Bruce Park to reduce the temporary effects and inconvenience of the proposed Project construction work on adjacent property owners in the Bruce Park area. The Company also made modifications to the Cos Cob Substation design to mitigate impacts to Cos Cob Park.

The time required to complete the design changes to the proposed Substation building and the development and evaluations of the route variations has made it evident that the projected in-

service date for the Substation and transmission lines needs to be extended to second quarter 2018.

E.7 Conformance to Long-Range Plan for Expansion of Electric Power Serving the State and Interconnected Utility Systems

As the Company previously reported in Docket No. 435, the Stamford Reliability Cable Project ("SRCP") was the initial step in a long-range plan for the Stamford-Greenwich Sub-area[17] of Southwest Connecticut. The Company proposed the SRCP to bring the benefits of the major transmission improvements of Southwest Connecticut to the Stamford-Greenwich Sub-area.[18] The next step in the long-range plan for the Stamford-Greenwich Sub-area is to address a local load area deficiency by adding a new bulk substation in Greenwich and adding transmission connections to the new Greenwich Substation.

E.8 Need Summary

The proposed Greenwich Substation would provide immediate load relief to the distribution supply system in Greenwich, greatly improve the reliability of the electric power system and accommodate anticipated future load growth for approximately the next 30 years.

The Project will also extend transmission supply lines to a point near the highest load concentration, in an area currently served only by distribution feeders from the east. It would improve the reliability of the 27.6 kV electric system serving Greenwich by reducing the high level of load served by Cos Cob Substation via lengthy parallel distribution feeders extending to central Greenwich. Lastly, the new substation would further the Company's initiative of infrastructure improvements in Greenwich by addressing existing constraints at area substations by avoiding equipment overloads.

[17] The Stamford-Greenwich Sub-area, which comprises the City of Stamford and the Town of Greenwich, is a component of the Norwalk-Stamford Sub-area, which includes all or a portion of the following municipalities: Bridgeport, Darien, Easton, Fairfield, Greenwich, New Canaan, Norwalk, Redding, Ridgefield, Stamford, Trumbull, Weston, Westport and Wilton.

[18] SRCP was placed in service on November 21, 2014.

F. PROJECT ALTERNATIVES

F.1 No Action Alternative

Under the no action alternative, customers throughout the Town would be at increased risk because the transformers at Cos Cob will reach their capacity limits, under certain contingencies, in 2017. Without additional capacity, anticipated future demand growth could not be reliably served. This alternative was rejected because it would undermine the Company's comprehensive efforts to improve the adequacy of the electric power system in Greenwich.

F.2 Transmission Alternatives

The identified reliability need could not be resolved with new or upgraded transmission facilities alone, utilizing the existing substations, as this alternative would not add the additional source of capacity necessary to meet the existing and growing demand that the new Greenwich Substation will provide.

F.3 Non-Transmission Alternatives

After the Company identified the need for the Project, it analyzed a range of long-term electric system alternatives including distribution alternatives, energy alternatives and demand side management alternatives. While some of the alternatives might reduce customer demand in Greenwich by small increments, none of the alternatives would achieve the reliability and power source of supply diversity of the electric distribution system that the Project would achieve. The Project would achieve the following important benefits:

- reducing dependence on a single heavily-loaded bulk substation that is approaching its permissible load rating (Cos Cob Substation) by transferring part of the load serving customer demand to the proposed new bulk substation;
- reducing dependence on a heavily-loaded non-bulk substation (Prospect Substation) by transferring the job of serving customer demand to the proposed new bulk substation;
- providing an independent and separate power source for the 27.6-kV distribution feeders load so that if a problem occurs on a circuit that serves the secondary network, the customers supplied by the 27.6-kV distribution feeders will not be interrupted or otherwise adversely affected; and
- extending the bulk power transmission system to the center of the customer demand.

The non-transmission alternatives, alone or in combination, that are set out in the following sections were evaluated to determine whether they could be developed and sized to provide sufficient additional capacity to meet the projected demand and provide capacity for future load growth, a key benefit of the proposed Greenwich Substation. Because none of these alternatives could be developed to an extent sufficient to eliminate the pressing need for additional capacity at a cost that is comparable to the Project's cost or less, the distribution alternative, energy alternatives and demand side management alternatives do not present practical alternatives to the Project. Additionally, implementation of such alternatives by the proposed in-service date of the Project to address the Company's need to increase capacity would be challenging. No proposals for distributed generation ("DG") or significant demand side management alternatives have been presented to Eversource from independent power developers that would address the Project need.

Even if any of the alternatives were readily available and could be implemented in a timely fashion to avoid the projected overloads, they would provide only limited load relief (a reduction of load supplied by the Eversource system) and would be insufficient to provide comparable long-term benefits of the Project, including strengthening the reliability of the existing distribution system, in a cost-effective manner. New DG, energy efficiency measures and demand response could provide only incremental load relief benefits; they could not provide enhanced reliability of the distribution system in Greenwich. No proposals for DG, significant demand side management alternatives, or substantial energy efficiency measures have been presented to Eversource. In contrast, the proposed Greenwich Substation would provide the needed capacity and greatly enhance the reliability of the system as a whole beginning in second quarter 2018 and into the future.

F.3.1 Distribution Alternative

To achieve load relief alone, the Company considered a number of actions involving only improvements to its distribution system. Those actions comprised (1) establishing a substation expansion module adjacent to Cos Cob Substation, (2) increasing transformer capacity at Prospect Substation, and (3) enhancing the existing duct bank systems and loop schemes. Because the Cos Cob Substation property is fully utilized, the existing facility cannot accommodate additional transformers without needing to acquire property for the required substation expansion area. There is no available land to accommodate such an expansion due

to existing surrounding land uses (e.g., Cos Cob Park, the Metro-North Railroad ["MNRR"], residential and commercial development).

The specific components of the distribution alternative are as follows:

- Expanding Cos Cob Substation to include: installation of two-60 MVA 115- to 13.2-kV transformers and switchgear, as well as two new 115-kV underground cable connections between the existing Cos Cob Substation yard and the adjacent substation expansion area;
- Modifications to Prospect Substation, including the removal of four transformers (55 MVA in total), the addition of two 47-MVA, 27.6- to 13.2-kV transformers, the replacement of switchgear and installation of flood protection measures;
- Additions to the distribution duct bank system involving the construction of two-duct bank systems with four 1000-kcmil copper feeders each from the new substation expansion area to a location near the center of demand in Greenwich (approximately 15,000 feet for each duct bank); and,
- Modifications to the current distribution loop schemes involving a re-design and construction of the loop schemes between the new expansion area, Cos Cob Substation, and Prospect Substation.

The Company rejected the distribution alternative because (1) the estimated cost would exceed the cost of the proposed Project while providing less capacity than the Project and (2) the same reliability benefits achieved by the Project cannot be achieved by the distribution alternative. The cost of the distribution alternative would be approximately $50 million higher than the Project cost and achieve a capacity increase that is actually 60 MVA lower than the Project capacity increase (more money for less capacity). Moreover, the distribution alternative would not address the long term reliability needs that are met by the proposed Project by adding capacity and bringing a reliable power supply source to the center of the customer demand.

F.3.2 Energy Alternatives

F.3.2.1 Generation

Generation can theoretically provide capacity similar to that which will be provided by the new bulk substation and new transmission supply lines. However, in order to provide a practical substitute for additional capacity available from a new bulk substation and transmission supply

lines, the new generation must be available at the right times when the contingency event occurs, in the right amounts equal to the overloads, and at the right location to reduce loads on the impacted/overloaded equipment. Currently, there are no existing or planned generation facilities near the center of the customer demand in Greenwich.

The closest Eversource substations connected to independently-owned existing generation facilities are Cos Cob Substation and Waterside Substation (in Stamford). Adding generating facilities at either of these substations and interconnecting them to the 115-kV transmission system would not eliminate the capacity need that the new Greenwich Substation would address because the power supplied by the new units would not reduce demand on the Company's 115- to 27.6-kV transformers at Cos Cob Substation or on the distribution feeders that supply the Greenwich customer demand.

New independently-owned generation would have to consist of multiple units at a strategic location that can reliably supply the current and projected customer demand in Greenwich. Specifically, generation would have to meet the following requirements.

- Produce enough power to eliminate thermal overloads on the existing distribution feeders and transformers
- Include redundant units to address the potential unavailability of a portion of the generation resulting from unit failure. The need for multiple units to provide a capacity margin is based on a recognition that all generation units cannot be counted on to be available at all times. This requirement takes into account the ISO-NE target of 80% successful startup of fast start generation when called to be dispatched.
- Meet the Project's in-service date.

For sufficient generation to adequately mitigate the risk of overloads on the 115- to 27.6-kV transformers at Cos Cob Substation and to accommodate an interruption of two of the 27.6-kV distribution feeders (referred to as an N-2 design), the generation must be available (1) during peak periods, (2) any time there is a loss of one of three 115- to 27.6-kV transformers that supply the Cos Cob 27.6-kV distribution system, and (3) any time the 27.6-kV feeders experience power flows above their normal rating.

Table F-1 sets forth the minimum amount of new generation that would be required to eliminate the projected Cos Cob Substation transformer overloads and the Cos Cob Substation to Prospect Substation feeder overloads.

Table F-1 Generation Required to Mitigate Transformer and Feeder Overloads

Year	Cos Cob Transformer Overloads		Cos Cob to Prospect Feeder Overloads	
	MW Overloads *	MW Plus 20% Reserves	MW Overloads**	MW Plus 20% Reserves***
2018	10	12	40	48
2027	23	28	49	59
2037	39	47	61	74
2047	56	68	74	89

* Overloads are based on the transformers "Remaining 22-hours" rating of 124 MVA, which is the maximum load that can be carried for 22 hours after an initial 2 hour emergency rating of 135 MVA.

** The most severe N-2 contingency was considered. The loss of two of the four existing parallel 27-kV distribution feeders was approximately 40 MVA.

*** The 20% Operating Reserve Requirement is a percentage estimate of the quantity of Operating Reserves required to be scheduled, where this quantity is set in accordance with ISO New England Operating Procedure No. 8 and ISO New England Operating Procedure No. 19.

As stated previously, there are no large scale generation units that are located or planned in the downtown Greenwich area nor are there any generation projects in the interconnection process awaiting approval and the Company has not been approached by any generator requesting any interconnection studies seeking to install generation in this area. The Project addresses an immediate capacity need while the development of any new generating units would most likely not meet the proposed Project's in-service date of second quarter 2018. To put this in perspective, the five peaking generating units outside the Cos Cob Substation have a name plate rating of 19 megawatts ("MWs") each. To meet the need for 48 MWs in 2018 four additional units similar to those at Cos Cob would need to be placed in close proximity to the center of customer demand in downtown Greenwich. Then they would need to be interconnected into the existing distribution system through extensive upgrades at Prospect Substation.

Adding any amount of generation to any of the five 27.6-kV network feeders is not recommended due to the Company's and industry standard design criteria, as DG would affect voltages and power flows in the network and could lead to network mis-operations. Complying with such design criteria further limits the available sites for new generation. In addition, generation cannot be connected to the integrated secondary network system that serves downtown Greenwich.[19]

Traditional Generation:

Traditional natural gas-fueled power generation facilities include the following four technologies:

- **Simple Cycle Combustion Turbine** – the presumed power plant design would include a power plant building that houses three approximately 21 MW, combustion turbines for the initial installation. Based on this turbine size, the 40 MW load in year 2018 (Table F-1), could be supplied by operating two of the three turbines. The third turbine would provide at least twenty percent reserve capacity in case of unplanned generator outages.

- **Simple Cycle Reciprocating Engine** – the presumed power plant design would include a power plant building that houses four, approximately 18 MW, reciprocating engines presumed power plant for the initial installation. The driving force for the assumed engine selection was the balance of generator capacity versus the overall plant capital cost. Based on a 18 MW engine, the 40 MW load in year 2018 would be met with three reciprocating engines supplying power to the grid via generator step-up transformers, with the fourth reciprocating engine providing at least twenty percent reserve capacity in case of unplanned generator outages.

- **Fuel Cell** – the presumed power plant design would include a control building that houses all equipment needed to support twenty 2.7-MW fuel cells for the initial installation. Under feeder outage conditions, 16 fuel cells supply power to the grid via generator step-up transformers, with four fuel cells providing a 20 percent reserve capacity in case of service outages.

[19] See CL&P/UI's Interconnection Standards for Distributed Generation approved by Department of Public Utility Control in Docket No. 03-01-15RE02, Decision dated April 28, 2010, and IEEE standard: IEEE 1547.6, Recommended Practices for Interconnecting Distributed Resources with Electric Power Systems Distribution Secondary Networks.

- **Combined Cycle Combustion Turbine** – the presumed power plant design would include two 40 MW combustion turbines, each with an associated a heat recovery steam generator ("HRSG"). Steam from the HRSGs would be fed to a fully-condensing steam turbine that would generate an additional 10 MW of power, based on an additional 10 MW of power for every 100,000 pounds per hour of steam supplied, up to 30 MW of total capacity, providing at least twenty percent reserve capacity in case of unplanned generator outages.

Table F-2 provides a comparison of these four traditional generation technologies.

Table F-2 Comparison of Traditional Generation Technologies

	Gas Turbine	Reciprocating Engine	Fuel Cell	Combined Cycle
Installed Capacity (MW)	**63**	**72**	**54**	**100**
Footprint Acres	**5**	**5**	**9**	**7**
Building Height	**40-60**	**40-60**	**40-60**	**40-60**
Stack/Structure Height	**100-200**	**100-200**	**10-20**	**100-200**
Cost (millions, 2017$)	**$206**	**$241**	**$564**	**$288**

Note: Costs include $56M to upgrade existing substations to support the interconnection

Renewable Generation:

Renewable energy generation facilities include the following three technologies:

- **Solar PV Panels** – To meet a required 20 percent reserve capacity in 2018, 264 MW of solar capacity would be required to supply 40 MW load. Based on June's solar radiation available in Greenwich, nearly 8,800 acres of solar panel coverage would be required in proximity to the load center (roughly equivalent to 147,400 roofs on an average 2,600 square foot northeastern home. These calculations assume all panels are south facing – additional solar panel coverage would be needed if some of the roofs having solar panels were not south facing. Given the much higher capital costs and the amount of solar panels coverage that would be required, solar is not a realistic alternative to the Project. Three commercial solar projects approved to date by the Council range in capacity from 2.2 MW to 5 MW and utilize anywhere from 22 acres to more than 90 acres.
- **Wind Turbines** - To meet a required 20 percent reserve capacity in 2018, 188 MW of on-shore capacity or 107 MW of off-shore capacity would be required to supply a 40 MW

load. According to the National Renewable Energy Laboratory ("NREL") on and off-shore wind farms require roughly 49.4 acres per MW.[20] Wind turbines have a large capital cost, require large parcels of land with adequate buffer zones, and significant maintenance to keep all equipment in optimal working conditions. Given the much higher capital costs and the very large area anticipated to be needed for wind generation in downtown Greenwich, wind generation is not a realistic alternative.

- **Geothermal** – Geothermal energy is the heat from the earth. According to the NREL, Greenwich is in a location of least favorability for deep Enhanced Geothermal Systems with a large reservoir having temperatures between 150˚C and 200˚C, because the Greenwich area does not have a large suitable reservoir. Geothermal power plants have an extremely large capital costs and are highly location specific based on underground reservoir temperature conditions. Given the much higher capital costs and location specific requirements, geothermal generation is not a realistic alternative.

F.3.2.2 Generation Interconnection Limitations

For generation to relieve Cos Cob Substation transformer overloads and distribution feeder overloads it must be interconnected to substations in the Greenwich area to reduce demand. Review of the substations in the Greenwich area reveals that the options to interconnect generation are limited.

- **Cos Cob Substation at 115-kV** - Interconnection of generation at the 115-kV bus at Cos Cob Substation would not reduce overloads on the 115- to 27.6-kV transformers because the demand is connected to the 27.6-kV distribution system. Consequently, the demand on the Cos Cob Substation transformers would remain exactly the same if generation were interconnected at the Substation's 115-kV bus.

- **Cos Cob Substation at 27.6-kV** - Interconnection at Cos Cob Substation at 27.6-kV would not relieve the loads on the distribution feeders from Cos Cob Substation to Prospect Substation. Although the demand on the Cos Cob Substation transformers would be reduced if generation were interconnected at the Substation's 27.6-kV bus, the demand on the feeders would remain exactly the same.

[20] NREL has directed utilities to model wind generation capacity factors in transmission studies at 25.5% of nameplate capacity for on-land and 45% for off-shore.

There are two existing distribution substations that were reviewed for interconnecting generation: Prospect and Byram 13.2-kV Substations.[21]

- **Prospect Substation** - There is no space within the Prospect Substation for the required interconnection facilities and additional substation equipment. These physical space constraints also prohibit the development of generation at the Substation. In addition, Prospect Substation is located in the 500-year flood zone. Eversource's future plan to strengthen reliability includes transferring 13.2-kV demand at Prospect Substation to the proposed Greenwich Substation, which would minimize the consequences caused by flooding at Prospect Street. For these reasons, adding generation at Prospect Substation is not a feasible solution to supply Greenwich demand.

- **Prospect Substation at 27.6-kV Network Feeder Level** - Adding any large amounts of generation to any of the five 27.6-kV network feeders is not recommended due to the limited available cable capacity of the 27.6-kV feeder cables. Therefore, there would be very limited available locations to site the new generation.

- **Prospect Substation Network Feeder 208 Volt Level** - Generation connected to a secondary network system, under The Connecticut Light and Power Company and The United Illuminating Company Generator Interconnection Technical Requirements, May 10, 2010, approved by the then Department of Public Utility Control (now PURA), is limited to 50 kilowatt ("kW") of inverter based equipment at any customer location.

- **Byram Substation at 27.6-kV Level** - A limited amount of generation could be connected to Byram Substation. Installing a large amount of generation that could exceed the load being served from Byram Substation would result in power flows back into the distribution circuits supplying Byram Substation. Furthermore, this would require additional relay equipment at Byram Substation and result in challenges to system protection and voltage control that could impose limitations of generation,

[21] Due to the 27.6-kV system design, generation would be needed to relieve demand supplied from 115- to 27.6-kV transformers at Cos Cob Substation. The possible locations for generation to relieve this demand would be at Byram and Prospect Substations. Locating generation at North Greenwich Substation would not relieve the demand on the distribution circuits in the areas served by Prospect and Byram Substations.

depending on the type of generation and characteristics of the generator(s) and methods of connection.

F.3.2.3 Generation Summary

Any of these generation alternatives, if they could be sited and constructed in the downtown Greenwich area in time to meet the need, could not achieve all the benefits that would be realized by the Project. The Project would provide the following five important benefits: (1) relieve overloads on transformers at Cos Cob Substation, (2) relieve a heavily loaded non-bulk distribution substation (Prospect Substation), (3) enhance the reliability of the distribution system by providing an additional power source for the distribution feeders, (4) extend the bulk power transmission system near the center of the customer demand, and (5) provide sufficient capacity to supply projected customer load in 2018 and for 30 years thereafter. New generation could only provide incremental load relief benefits, that would require additional units over time, but it could not provide enhanced reliability of the distribution system or extend the bulk power transmission system near the center of customer demand in Greenwich.

Even if a generation alternative could be sited in the downtown Greenwich area and interconnected to either Prospect Substation or Byram Substation, the proposed Greenwich Substation and transmission lines have a lower cost and provide more long-term capacity than potential generation alternatives. To obtain the minimum capacity to eliminate the overloads on the Cos Cob Substation transformers and the distribution feeders by installing clean-burning generation (i.e. natural gas-fueled generation, simple cycle combustion turbine, reciprocating engine, fuel cell or combined cycle generation) must be located in proximity to Prospect or Byram Substations. With the size of land required to site a generation facility, the high cost of property in the downtown Greenwich area, the cost of the generating equipment and plant construction, the costs to construct the interconnections to one of the substations, and required distribution upgrades, any generation project would be substantially more costly than the Project. Further, renewable generation, such as large scale solar, wind or geothermal facilities, would require even larger footprints than natural gas-fueled generation at much higher capital costs.

F.3.3 Microgrids

Microgrids are an emerging application of small-scale DG to supply electric demand in a discrete local geographic area that can “island” itself from the remaining distribution system when major disruptions occur. CGS §16-243y defines a microgrid as “a group of interconnected loads and

distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid and that connects and disconnects from such grid to enable it to operate in both grid-connected or island mode." In 2013, the CT DEEP awarded grants to assist in the funding of nine microgrid projects that were dispersed throughout eight communities in Connecticut.[22] The generation assets included in these microgrids were significantly less than the capacity needed in Greenwich, with projects ranging from 400 kW to 5 MWs.

The Company also participated with the CT DEEP on a 2014 second round of microgrids. The goal of the second round of the microgrid program was to deploy an additional set of microgrids, with preference given to projects that include clean, 24/7 operational DG, provide power to critical facilities, and are distributed among Connecticut's five Department of Emergency Management and Homeland Security Regions. The goal of the program is to provide an increased level of safety and quality of life in the event of a large-scale electrical outage. In 2014, the CT DEEP awarded grants to assist in funding for projects in the City of Milford (0.6 MW) and the City of Bridgeport (1.4 MW). Eversource will also participate with CT DEEP on a third round of microgrid program funding in 2015.

There are substantial challenges associated with microgrids. The CT DEEP has recognized:

> *There are many technical, operational and economic challenges with implementing microgrids. Regarding the technical and operational challenges, a "microgrid" requires "micro-operators" – that is, persons responsible for ensuring overall power quality to customers while the microgrid is islanded from the rest of the distribution system. The island's power quality can only be ensured through a complex system of measurement and communications equipment and engineering applications to ensure system stability, voltage control, and frequency control. The microgrid also requires security systems and ongoing maintenance.*
>
> *To achieve high reliability during an extreme weather event, the following must be taken into account, in addition to the technical and operational considerations.*
>
> - *Facilities serving the microgrid are most reliable if constructed underground.*
> - *The microgrid must provide adequate and reliable generation.*

[22] There are no proposed microgrid projects slated for Greenwich in the CT DEEP's funding cycles.

- *Generators should have access to an uninterruptable fuel source.*
- *Generators must possess "black start"[23] capability.*
- *A microgrid system must be able to follow sub-hourly, hourly and daily fluctuations in load.*

Microgrids also have some economic challenges, many of which are not yet fully understood. As systems built to benefit specific locations, the cost and reliability impacts on microgrid versus non-microgrid customers need to be carefully considered. Also, there may be a significant diseconomies of scale tradeoff to enhancing energy security through microgrids. Thus, it is important to balance the costs versus benefits (including reliability benefits) of any microgrid system. Finally, there are uncertainties in the costs of ongoing microgrid maintenance and major capital requirements as the system ages. These costs could be significant and must be carefully considered.[24]

Eversource does not consider a microgrid as a technically-feasible alternative to the proposed Greenwich Substation. This Project is necessary to provide demand relief in 2018 and to accommodate future load growth. A microgrid would need to have a generation source of significant size and control technologies to be able to serve the area demand and maintain reliability. Connecticut's microgrid program is currently designed to support critical facilities only, as identified by the CT DEEP and municipalities, in geographically dispersed communities throughout out the state. Given the state of the available technology, the potential DG capacity from microgrids is insufficient and not practical to eliminate the risk of overloads on the transformers currently serving Greenwich, therefore this option was removed from further consideration. If a municipality is interested in developing a microgrid to serve critical municipal facilities, the city or town may participate in the state funding and approval process.

F.3.4 Demand Side Management Alternatives

Energy efficiency resources are both passive and active demand resources that result in demand reductions through the conservation of energy use and/or the addition of DG at the source of the demand. Passive demand resource programs typically target increasing efficiency for new and existing equipment and often include incentives to replace older less efficient equipment with

[23] Generators capable of black-start can go from offline to online without an initial external power source.

[24] CT DEEP, 2014 Integrated Resources Plan for Connecticut, p. H-8.

newer more efficient equipment and incorporate weatherization measures. The improvement in efficiency means the new equipment will provide the same function with less energy consumption, all else equal. Likewise, an energy efficiency program may provide for more efficient operation of existing equipment through better management or maintenance of that equipment. Active demand resources are controllable resources that respond to particular indicators such as demand levels, dispatch signals, or prices, to activate. Once activated the resource decreases their demand; such as decreasing production. These demand resources are described in more detail below. However, because such resources provide only limited, incremental effects, they could not be a comprehensive alternative to the distribution system relief that the new substation would achieve.

F.3.4.1 Passive Demand Resources

Passive demand resources are technologies that may range from relatively simple residential programs (e.g., Energy Star appliances, high efficiency LED bulbs, improved heating and cooling systems) to complex manufacturing processes at industrial facilities (e.g., high efficiency cooling/refrigeration or variable speed motors). These passive demand resources are assumed to provide system benefits 100% of the time.

Eversource offers a number of energy efficiency and weatherization programs to both its residential and commercial customers. Eversource's efforts at conservation and demand management also include incentive programs through the Connecticut Energy Efficiency Fund. Table F-3 provides net annual kW hour ("kWh"), lifetime kWh, peak summer kW reductions representing the savings installed measures would provide, and includes the number of projects implemented.

Table F-3 Energy Efficiency Data for Town of Greenwich

Energy Efficiency	2009	2010	2011[25]	2012	2013	2014
Annual MWh	1,523	1,801	5,448	3,239	2,176	2,255
Lifetime MWh	20,730	24,318	66,373	38,229	26,220	32,674
Summer Peak MW*	0.331	0.323	0.689	0.563	0.293	0.281
Number of Projects	3,056	1,517	1,930	567	445	807

* Summer Peak represents incremental savings achieved in the respective years.

Projections of peak demand in Greenwich account for the savings achieved by energy efficiency measures installed in prior years as well as anticipated future energy efficiency measures. Consequently, to provide energy savings to reduce peak demand in future years, the electric service customers in Greenwich would need to implement additional energy efficiency measures beyond those already reflected in the projected peak demand. Because of the limited, incremental effects of such measures, there is no basis to reasonably conclude that new energy efficiency measures in Greenwich could provide adequate relief to the distribution system and the reliability improvements that would be achieved by the proposed Greenwich Substation.

F.3.4.2 Active Demand Resources

Active demand resources consist of generation that is located on the customer's side of the electric meter and reduces the demand on the electric system when it is turned on. It could also be demand that a customer agrees can be interrupted when necessary. In either case, the resource must be "dispatchable," that is, voluntarily activated when called upon. Active demand resources could reflect resources that would be located at an end-use location and could serve as either a primary or supplementary source of power for that location. Active demand generation resources located on the customer's side of the electric meter are not limited to a particular type of technology or fuel and may include combustion turbines, small biomass based generators, fuel cells, wind turbines, solar power and photovoltaic systems, etc. Further, active demand operation resources may operate independently or be connected to the electrical distribution grid.

[25] In 2011, there was an extensive energy efficiency lighting project for one very large commercial customer in Greenwich that contributed to significantly higher savings.

Active Load Reduction through ISO-NE's Demand Response Programs is also a means to reduce load on the grid. Commercial and Industrial customers are enrolled (through Eversource or a third party) to participate in this program and are compensated to reduce loads not utilizing emergency generation. Customers manually or through Automated Demand Response (ADR) measures shed internal loads (i.e.; cooling, lighting, processes, etc.) until ISO-NE has issued instructions to return to normal operating conditions.

F.3.4.2.1 Distributed Generation (DG)

In contrast to microgrids, which work together as a group, DG would typically include discreet (sometimes smaller) units located closer to areas of higher demand. The addition of properly sized, properly located, available, and dispatchable DG (interconnected to either distribution feeders or customer-side facilities), can help mitigate the increasing pressure on local electric distribution facilities from demand growth.

For DG proposals to reduce demand on the distribution system in Greenwich:

- an adequate number of generators would be needed;
- reliable interconnections to the distribution network must be established; and
- integration with multiple power supply sources must be carefully planned.

Currently, there are six DG units (0.41 MW in total) fueled by natural gas and 102 photovoltaic units (1.05 MW in total) installed in Greenwich. Also, Eversource is aware of an additional 0.4 MW of intermittent photovoltaic units that are planned in Greenwich. In general, DG might assist in reducing a small amount of demand on the substation and feeders presently serving Greenwich, however, the current forecasted amount of DG could not provide the reduction levels needed to eliminate the need for the proposed Greenwich Substation.

F.3.4.2.2 Real-Time Emergency Generation

Real-time emergency generation resources are similar to active demand resources, which are responsive to a particular event. Often, real-time emergency generators are specific resources that are activated in instances of system outages affecting the specific location and are used for back-up generation. Currently, these types of resources are only activated during ISO-NE Operating Procedure #4 – Action 6 during a Capacity Deficiency, meaning that they are only operated when needed under certain system operating conditions, and are not otherwise available. These resources are referred to as Demand Response generation. At this time, there

is one local Demand Response generator (at the Fairview Country Club) and is capable of providing 200 kW of demand response. Therefore, this type of generation is not considered a viable alternative to the Project.

Reliance on demand resources must be self-sustaining through time and account for demand growth. In such a scenario over time, the activation of active demand resources would become more frequent and at higher kW levels. As demand grows over time, there may be a risk that Greenwich would be exposed to significant attrition of active demand resources by the "fatigue" of being called on extensively and repeatedly in hot weather to decrease demand.

Under the Company's ISO-NE Forward Capacity Market Participation, interruptible demand contracting is based on multi-year agreements; however, the parties who agree to have service interruptions may leave the Demand Resource programs with a 90-day notice and no financial penalties or exit fees. The market changes being undertaken at ISO-NE are also of concern. Active demand response contracts will be eliminated as of June 2017 and will be integrated as actual generation based customers who are required to bid into the energy market on a daily basis. It is assumed that some Real-Time Emergency Generation and Real-Time Demand Response customers for Eversource and other third party customers may not be willing to participate in the daily energy market.

F.3.4.3 Summary Demand Resource Results

Measures implemented under active demand resource programs that reduced demand in 2013 in Greenwich are presented in Table F-4.

Table F-4 2013 Reduced Demand by Programs – Greenwich*

Programs	Reduced Demand (MW)
Energy Efficiency	0.3
Distributed Generation	0.4
Photovoltaic	1.1
Emergency Generators	0.2
Total	**2.0**

* Would require 48 MW to mitigate feeder overloads.

These results demonstrate that active demand resource programs in Greenwich only provide marginal reductions in demand. Such reductions cannot eliminate the need for the proposed Greenwich Substation. In addition, all of these programs are already accounted for in the actual load for Greenwich and the Company's projections for future load in the Town.

F.3.5 Load Curtailment

If contingency events occur after 2017 and under peak demand conditions, in the absence of the proposed Greenwich Substation, Eversource would require demand to be curtailed during the peak demand to forestall overloads of the transformers at Cos Cob and sustain the operability of the electric system in Greenwich. Load curtailment could include measures where it would be necessary for the Company to interrupt electric service to customers and to do so without notice or preparation.

Factors to consider in developing load curtailment alternatives include:

- The frequency and timing of the program requests to curtail would be affected by contingencies (e.g. faults on the 27.6-kV system) and such curtailment requests must be implemented instantaneously;
- The duration of load interruption that would be needed given demand-cycle characteristics and the difficulty of restoring service in a relatively short time period;
- The duration of time that the affected system components could be out of service;
- The number of days or hours in the peak (summer) season that the potential for demand interruptions would exist, and
- The demand characteristics of affected customers and the potential impact to the health and safety of customers.

Currently, there are no Eversource customers in Greenwich participating in the Company's Load Curtailment Program with the ability to curtail demand during peak demand periods when called upon. Accordingly, load curtailment is not a viable system alternative to the proposed Greenwich Substation.

F.3.6 Non-Transmission Alternatives Summary

Any of the above non-transmission alternatives individually, or in combination, have the potential to provide some demand relief to the distribution system. However, they are not currently available, or available in sufficient amounts to meet the immediate needs that the Project would address. Further, such alternatives would not increase the reliability of the system with a new reliable capacity source sufficient to supply anticipated customer demand for the long-term future or extend the bulk power transmission infrastructure closer to the demand center.

G. Project Description

G.1 Introduction

The proposed Project consists of a new 115-kV bulk substation, the installation of two new underground transmission supply lines (comprising two separate circuits) and upgrades to Cos Cob Substation.

G.2 Substations

G.2.1 Greenwich Substation Location and Background Information

The proposed Substation would be located at 290 Railroad Avenue (the "Property" or "Proposed Site") and would be compatible with existing commercial land uses in the vicinity, including warehouses, an electric substation (Eversource's Prospect Substation), utility storage yard, and active rail line. Appendix A includes a photolog of the vicinity of the Property.

The Property is identified by the Greenwich Assessor's Office on Map 01 as Lot 2389/S, and is located within a General Business zone.[26] The Company leased the Property in 1971 pursuant to a written agreement (the "Lease") between the Company and the owners of the Property (the "Landlords") as a potential location for a future substation.

The term of the Lease is a 50-year period that commenced on March 1, 1971 and ends on February 28, 2021. Under the Lease, Eversource has the option to purchase the Property after February 28, 2021, provided that it gives notice to the Landlords of its election, not less than six months prior to February 28, 2021.

The Lease states that the Company as tenant agrees to use the Property for "any lawful purpose". The Company has the right to construct improvements on the Property during the Lease term, including a substation, as long as the Company complies with law. The Company also has the right to demolish the existing building without any obligation to replace it.

[26] See Greenwich Municipal Code, Chapter 6 Land Use, Article 1 Building Zone Regulations, Sec. 6-105 Use Regulations And Special Requirements For The GB [General Business] Zone.

The Lease (with the future option to purchase) has provided the Company the flexibility to transition to the Company's use of the Property based on the timing of the need for distribution system improvements in Greenwich.

The Company has subleased the 0.81-acre Property since 1971. The Proposed Site is currently improved with a commercial building and parking area. In May 1971, the Company subleased the Property to Pet Pantry Products, Incorporated. That sublease was later amended to extend its term through February 1998. In 1995, the Company entered into an amendment of the sublease of the Property with Pet Pantry Super Discount Stores, LLC (the assignee of Pet Pantry Products, Incorporated) ("1995 Amendment") that extended the term of this sublease an additional ten years through February 1, 2008, and also included two five year renewals options. In 2003, Pet Pantry Super Discount Stores, LLC ("Pet Pantry") exercised both such renewal options; therefore, the sublease expires on February 1, 2018 (unless it is previously terminated or cancelled).

The 1995 Amendment of the sublease also includes a cancellation provision that allows the Company to cancel the sublease term "at any time by serving a 24-month prior written notice to the Tenant [Pet Pantry] for the purpose of the following uses: substation, power transformers, pads, switching and sensing structures, enclosures for relaying and controls, and indoor switchgear and/or communication equipment." On October 7, 2013, the Company provided written notice of cancellation of the sublease term in accordance with this cancellation provision. Based on this notice of cancellation, the term of the sublease will end effective on October 8, 2015 (which is approximately 28 months earlier than February 1, 2018).

G.2.2 Greenwich Substation Design and Equipment

The Greenwich Substation would be supplied from two underground 115-kV transmission supply lines originating from Cos Cob Substation on Sound Shore Drive. The two new transmission supply lines would enter the Greenwich Substation via underground pipes and terminate at gas insulated switchgear equipment, which would be housed in a building measuring approximately 121 long feet by 32 feet wide along Railroad Avenue; an angled façade paralleling Field Point Road would extend the southern footprint of the building an additional 13 feet in length. The main roof of the building would stand 31 feet tall, with matching tower fascia on the east and west ends

extending to approximately 36 feet high[27]. A small, rear annex on the building's east end would extend approximately 19 feet southward into the substation yard. For Gas Insulated Substation ("GIS") yards similar to that proposed in Greenwich, the Company typically uses a corrugated metal building enclosure and chain-link fence topped with three strands of barbed wire. Based on the proximity of the substation to the commercial center of the Town, and input received from the municipality as part of the Municipal Consultation process, an alternate design has been developed for the GIS building for a pre-cast concrete façade with brick accents set back over 16 feet from the edge of the property line fronting Railroad Avenue. The Substation yard would be surrounded by an eight-foot high, wrought iron-style fence for security.

The GIS building would house six 115-kV circuit breakers and associated disconnect switches, protective relay and control equipment as well as the battery and charger associated with the transmission equipment. In addition, the Substation yard would also be outfitted with three 115-kV circuit switchers with integral disconnect switches and three 60-Megavolt-Ampere ("MVA") power transformers that would step down the voltage from 115 kV to 13.2 kV. The three 60-MVA transformers would contain insulating oil (not containing polychlorinated biphenyls or "PCBs"). The transformers would be installed on foundations and each would have secondary containment sufficient to contain 110% of the volume of insulating oil in the transformer. Periodic inspections of the containment area would be performed by Eversource personnel to verify proper functioning of the containment systems. One metal switchgear enclosure (measuring approximately 108 feet long, 24 feet wide and 14 feet tall) would also be installed to house the switching equipment and the relaying and control equipment for the 13.2-kV distribution feeders.

The Substation yard would be accessed by a new approximately 20-foot wide, gated entrance from Field Point Road. The Substation yard would be covered with a trap rock surface. The Substation would have low-level lighting for safety and security purposes. Additional lighting would be installed within the Substation yard to facilitate work at night under emergency conditions and during inclement weather. Two or three 65-foot tall lightning masts would also be installed within the yard. Adequate space has been provided for a future mobile transformer.

[27] The GIS building has been reconfigured since the MCF in response to comments received from the Town. As a result, the structure has been angled on its west side by approximately 13 feet, and reduced in depth by 18 feet and the main roof in height by four feet, as well as being set back farther south off the property line abutting Railroad Avenue.

The Substation equipment and supporting infrastructure would have a service life of approximately 40 years.

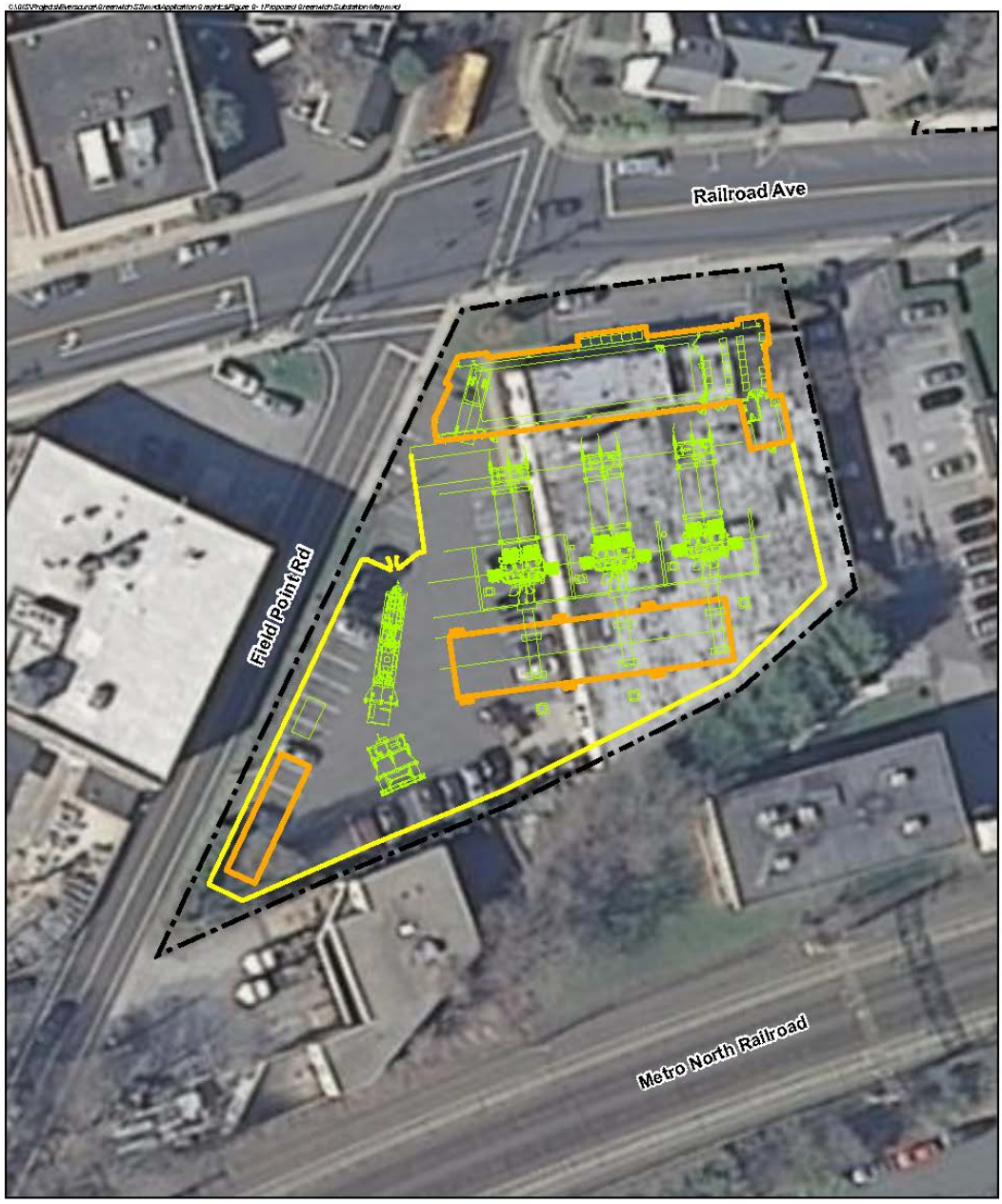
Details of the substation design are presented in Appendix B (Greenwich Substation Site Plan Drawings). Figure G-1, *Proposed Greenwich Substation Map*, depicts the proposed lay out of the Substation on the Property. A depiction of the proposed Greenwich Substation is provided in Figure G-2, *Proposed Greenwich Substation Rendering*.

Pump House

A pump house is required at the new Greenwich Substation to support the high pressure fluid filled ("HPFF") transmission cables and maintain the requisite liquid pressure under all loading conditions. It will also provide for slow or rapid fluid circulation to even out hot spots along the line route. The pump house would measure approximately 12 feet high and 50 feet long by 12 feet wide. It would be placed in the southwest corner of the Proposed Site, along the fence line adjacent to Field Point Road.

The pump house will contain circulating pumps, valves and other controls to maintain fluid pressure, recorders, alarms, and a reservoir tank sized to accommodate fluid expansion and contraction as the load on the circuit cycles. The pump house will be serviced by two separate distribution circuits with automatic transfer for backup in case of power loss.

Figure G-1 Proposed Greenwich Substation Map



Legend
- Subject Property Boundary
- Proposed Building/Enclosure
- Proposed Fence
- Proposed Equipment

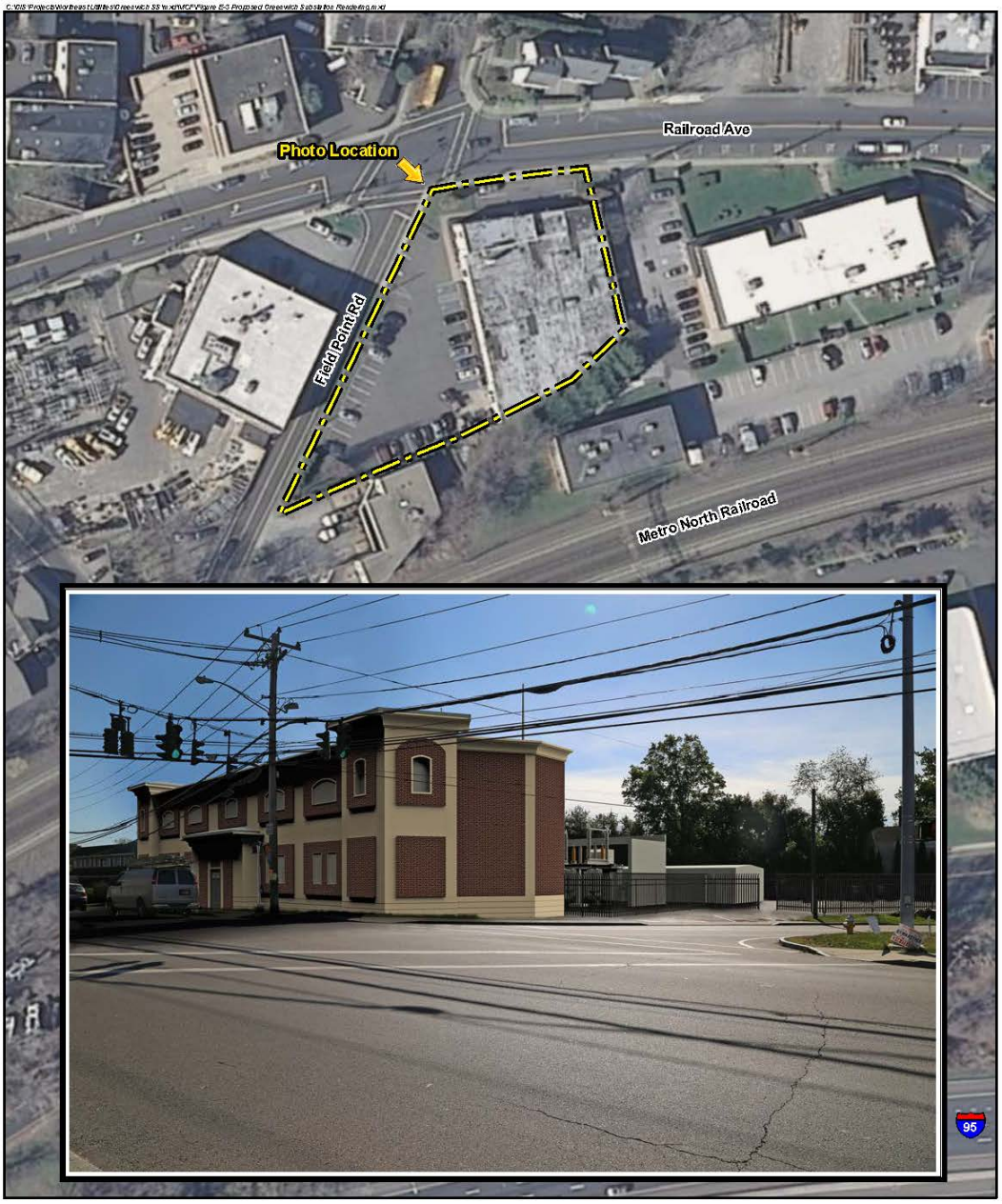
Base Map: 2012 Aerial Photograph (CTECO)
Map Scale: 1 inch = 50 feet
Map Date: June 2015

50 25 0 50 Feet

Figure G-1
Proposed Greenwich Substation Map
Greenwich Substation
290 Railroad Avenue
Greenwich, Connecticut

EVERSOURCE ENERGY
ALL-POINTS TECHNOLOGY CORPORATION

Figure G-2 Proposed Greenwich Substation Rendering



Legend

Subject Property Boundary

Figure G-2
Proposed Greenwich Substation Rendering

Proposed Greenwich Substation
290 Railroad Avenue
Greenwich, Connecticut

N
W E
S

100 50 0 100
Feet

Base Map: 2012 Aerial Photograph (CTECO)
Map Scale: 1 inch = 100 feet
Map Date: June 2015

EVERSOURCE ENERGY

ALL-POINTS TECHNOLOGY CORPORATION

Figure G-3 Typical HPFF Pump House

Distribution Feeders

The Proposed Site would provide optimal connections to existing distribution feeders. It affords two routes for distribution connection via Railroad Avenue and Field Point Road. Cables for each distribution feeder would exit the Substation property via underground duct banks. There would be three duct banks exiting the Substation that would contain cables and tie into existing distribution feeders beneath Railroad Ave and Prospect Street. This configuration also allows for the addition of future feeders.

The new distribution duct banks and cables would have an estimated service life of approximately 40 years. The duct banks would be capable of supporting a total of 18 feeders to accommodate future load.

G.2.3 Cos Cob Substation

The Greenwich Substation would be supplied from two new underground 115-kV transmission lines originating from Cos Cob Substation on Sound Shore Drive. The Project also requires modifications to Cos Cob Substation for the installation of new equipment to support the underground transmission lines. The added equipment would be installed within an existing ConnDOT easement area on the south side of existing substation. The substation fence would be partially extended approximately 140 feet to the south to accommodate the new equipment and provide for safe operation.

The new equipment installation would include:

- Two 115-kV 3000 Amp rated circuit breakers with associated foundations;
- Five manually operated disconnect switches with associated foundations;
- Two motor operated disconnect switches with grounding switch with associated foundations;
- Six instrumentation potential transformers, three per underground line position with associated foundations;
- Two sets of cable termination structures with associated foundations;
- Ten bus support structures with foundations;
- One A-Frame line structure (approximately 45 feet tall) with associated foundation;
- Underground conduits and duct banks for communication and control cables, and, underground lines and bus sections;
- One monopole line structure (approximately 85 feet tall) with associated foundation;
- One steel structure and accessory equipment to reconstruct the mobile transformer position with required foundation;
- Relays, and, control and communication equipment to be installed within the existing control enclosures;
- Bus work; and
- Underground cable vaults for the underground cable transmission lines.

To accommodate the new equipment installation at Cos Cob Substation, the following equipment would be removed:

- Two steel A-Frame line structures and one wood H-Frame structure;
- Strain overhead bus sections;
- One line trap;
- One manual disconnect switch;
- One wood pole structure with guy wires; and,
- One lattice line structure.

Details of the proposed modifications (additions and removals) are provided in Appendix C (Cos Cob Substation Site Plan Drawings).

As part of the Municipal Consultation process, Eversource received input from Greenwich officials concerning the proposed modifications at the Cos Cob Substation. As originally designed Eversource would have needed to extend the fence line into municipal-owned property and acquire an easement from the Town. The design has been modified to minimize the impact to the new Cos Cob Park and the expansion of the fence line will not require the use of municipal-owned property.

G.2.4 Modifications at Other Substations

Other than the proposed modifications at Cos Cob Substation, and removal of distribution transformers and associated equipment at Byram Substation and Prospect Substation, no physical work at other substations would be required for the Project.

A coordination study is usually performed after major new transmission lines are constructed to ensure that all transmission line protective relays in the region only act upon a fault event within their protective zones. The results of such study may identify necessary changes in the software setting of the relays that are located within the control enclosures in other substations, if affected.

G.3 Transmission Supply Lines

Two new underground transmission supply lines would extend approximately 2.3 miles from Cos Cob Substation on Sound Shore Drive to the proposed Greenwich Substation Site using HPFF technology.

The Project's HPFF underground 115-kV line system would consist of three 8-inch steel pipes in a common trench. Two of the steel pipes would house the HPFF lines, while the third (fluid return) pipe would be dedicated for fluid circulation. The trench would also accommodate two 4-inch PVC conduits housing fiber optic cables and three 2-inch PVC conduits for distributed temperature sensing fibers.

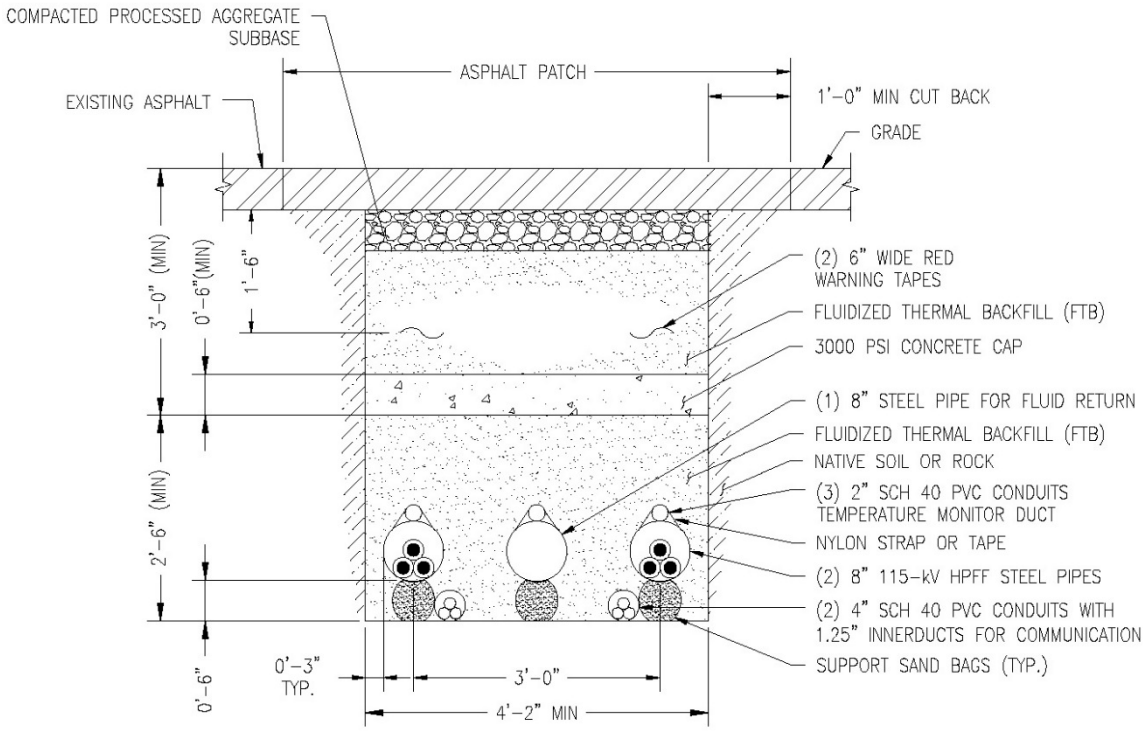
The system would be installed in a trench encased in low-strength concrete slurry, also known as fluidized thermal backfill ("FTB") and capped by a protective layer of high-strength concrete.

Trenching for installing the transmission supply lines will require excavations measuring, at a minimum, approximately 4.5 feet wide by 5.5 feet deep. The underground transmission supply

line system also includes splice vaults, cable splices, grounding, insulating fluid reservoir, pump house, terminations (at the substations), and a cathodic protection system.

Figure G-4 illustrates a typical trench cross section.

Figure G-4 Typical High Pressure Fluid Filled (HPFF) Trench Cross Section with Two Line Pipes, Fluid Return Pipe and Communications and Duct Temperature Sensors Ducts

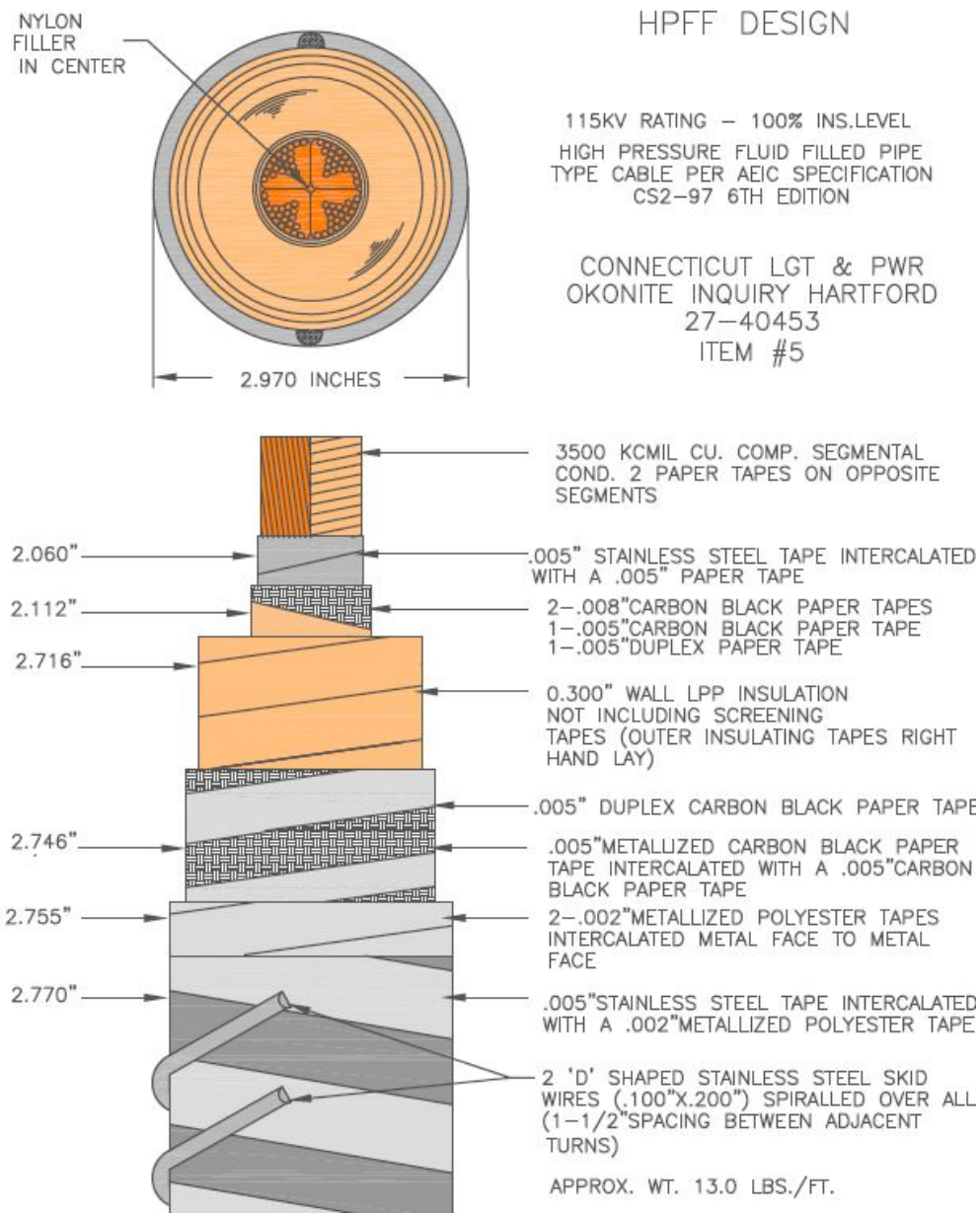


DOUBLE CIRCUIT 115kV HPFF
UNDERGROUND TRANSMISSION LINE WITH FLUID RETURN

The 115-kV HPFF transmission system would consist of three cables per line within the 8-inch electrical cable carbon steel pipes. Each cable would consist of a 3500-kcmil segmental copper conductor insulated to 115 kV with laminated paper insulation and would be approximately three inches in diameter.

Figure G-5 illustrates the cross section of a typical 3500-kcmil segmental copper conductor HPFF 115-kV cable.

Figure G-5 Typical 3500-kcmil Copper Conductor 115-kV HPFF Cable Cross Section



A typical HPFF cable is composed of a conductor, conductor shield (carbon black or metalized paper tapes), insulation (Kraft paper or paper/polypropylene laminate impregnated with polybutene fluid, an insulation fluid that does not contain PCBs), insulation shield (carbon black or metalized paper tapes), a moisture barrier (non-magnetic tapes and metalized Mylar tapes), and skid wires placed in a steel pipe filled with dielectric fluid. The purpose of the dielectric fluid is to keep moisture and contaminants out of the pipe and away from the cable, as well as maintain cable temperature. The moisture barrier prevents moisture and other contamination and loss of impregnating fluid prior to installation. The skid wires prevent damage to the cable during pulling.

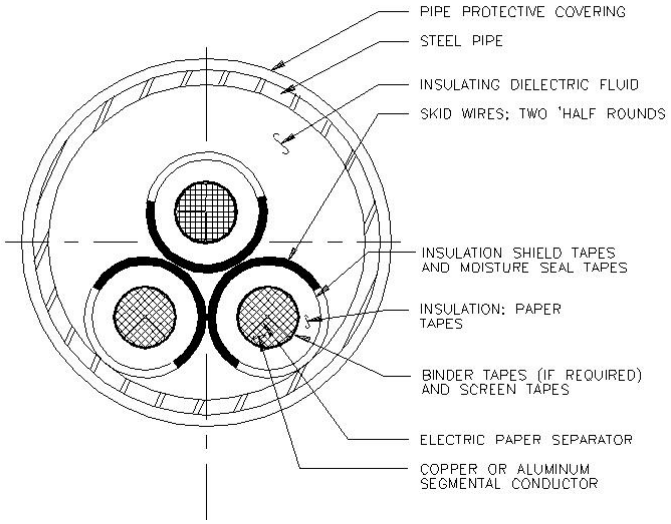
Pipe-type cables are installed inside a coated steel pipe and require the use of a pressurized dielectric fluid. In a pipe-type cable, a viscous fluid is used to transmit a high pressure of 200 psi or greater to any voids that may form to prevent them from discharging. Historically, mineral oils were used for liquid-filled systems, but synthetic liquids, alkylate and polybutene or a mixture of the two, have predominated since the 1970s. These dielectric fluids are formed from environmentally acceptable base fluids consisting primarily of esters, olefins and synthetic paraffins, and are considered biodegradable exceeding the "readily biodegradable" standard of Organization for Economic Cooperation and Development[28] (OECD) 306 while exhibiting low toxicity.

Three HPFF cables are pulled into a carbon steel pipe to constitute a single line (one circuit). The pipe is coated on the inside with an epoxy coating to prevent oxidation prior to pipe filling and to reduce pulling friction and tension. The pipe exterior is typically coated with polyethylene or epoxy to protect the pipe from environmental corrosion and to isolate the pipe from “ground” to allow use of a cathodic protection system.

[28] OECD Guidelines for the Testing of Chemicals, Section 3, Degradation and Accumulation. Test No. 306: Biodegradability in Seawater.

Figure G-6 shows a typical cable and transmission line pipe cross-section.

Figure G-6 Typical HPFF Cable and Transmission Line Pipe Cross-Section



Splice Vaults

Pre-fabricated splice vaults are installed whenever the maximum installable line length is reached or as other factors (e.g., topography, environmental resources, etc.) dictate. Provided no other constraints exist, limiting factors include maximum allowed pulling tension and maximum length of line that can be transported on a reel. Reinforced concrete splice vaults are expected to be spaced up to 2,800 feet apart. Where possible, splice vaults are placed off of the primary roadway to avoid existing underground utilities and also to minimize the impact on traffic flow during splicing of the cable sections or should restoration work be required.

Figure G-7 depicts a typical splice vault installation.

Figure G-7 Typical Splice Vault Installation

The outside dimensions of the splice vault excavations are approximately 24 feet long by 16 feet wide and 12 feet deep. The top of the splice vault is installed a minimum of three feet below grade with two access holes or “chimneys” requiring manhole covers, each approximately 38 inches in diameter.

G.4 Preferred Route

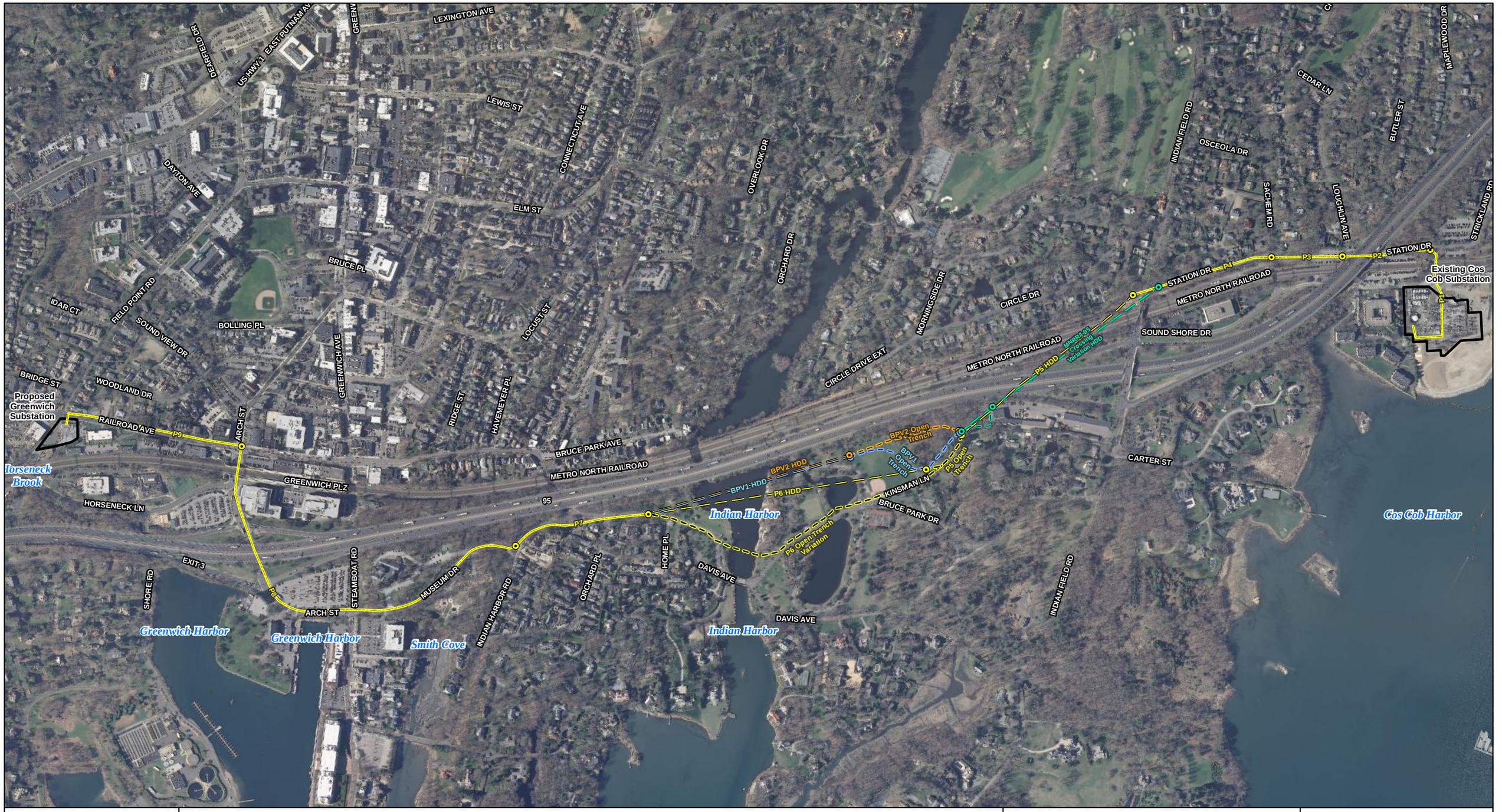
The Preferred Route would exit Cos Cob Substation north under the MNRR, turn west along Station Drive, crossing beneath I-95 and extending to Town-owned property west of Indian Field Road and north of the MNRR (as a staging area for drilling equipment). The route would then require approximately 1,500 feet of horizontal directional drilling ("HDD") beneath the MNRR and I-95 to another staging area at the end and west of Kinsman Lane ("HDD receiving area"), where open trenching would continue in or adjacent to the road and into Bruce Park. HDD technology would be employed again to span Bruce Park and Indian Harbor, a distance of nearly 0.5 mile, to Davis Avenue near Home Place. The HDD crossings would require staging locations for the duration of the Project. The route would then follow Davis Avenue, Indian Harbor Drive and Museum Drive westward before turning north on Arch Street and extending beneath I-95 and the MNRR to Railroad Avenue. The route would turn west and follow Railroad Avenue to the Proposed Site.

Bruce Park Underground Open Trenching Variation: In the MCF, the Company also presented a variation of the Preferred Route through Bruce Park that would generally follow Kinsman Lane and Bruce Park Drive using open trench construction for the installation for the transmission supply lines and eliminate an HDD crossing of the Park.

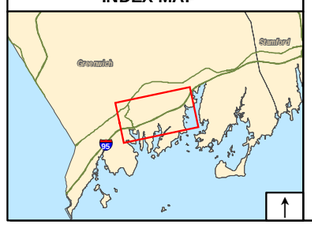
The Preferred Route and Bruce Park Underground Open Trench Variation (depicted in yellow) are shown in Figure G-8, *Preferred Route Map*. The total length of the Preferred Route is approximately 12,190 feet (2.3 miles); it would be extended to approximately 12,630 feet (2.4 miles) with the Bruce Park crossing variation.

MNRR and I-95 HDD Crossing Variation: During the MCF process, the Company evaluated an alternate routing of the HDD crossing beneath the MNRR corridor and I-95. The area of Station Drive, to the east of Indian Field Road, would be used as a staging area for the HDD equipment to accommodate an approximately 1,470-foot long trenchless crossing to the Greenwich Department of Public Works ("DPW") Town Maintenance Facility or the terminus of Kinsman Lane. The Station Drive area was selected as an alternate, and more advantageous, staging location to avoid an open trench crossing of Indian Field Road, which is a very busy access road to I-95.

The MNRR and I-95 HDD Crossing Variation is depicted in green in Figure G-8A.



INDEX MAP



Legend

- Preferred Route
- Preferred Route HDD Crossing
- Preferred Route Open Trench Crossing
- Route Variation HDD Crossing
- Route Variation Open Trench Crossing
- Route Variation HDD Crossing
- Route Variation Open Trench Crossing
- Route Variation HDD Crossing
- Route Variation Open Trench Crossing
- Preferred Route Segment Point
- Route Variation Segment Point
- Route Variation Segment Point
- Route Variation Segment Point
- Proposed Greenwich Substation Site
- Existing Cos Cob Substation

Base Map: 2012 Aerial Photograph (CTECO)

1 inch = 625 feet

625 312.5 0 625 Feet

Figure G-8
Preferred Route Map

Greenwich Substation and Line Project

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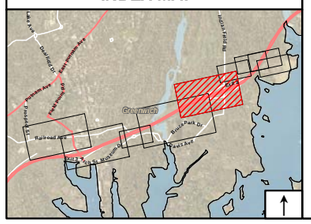
June 2015

INDEX MAP



Legend

- Preferred Route
- Preferred Route HDD Crossing
- Preferred Route Open Trench Crossing
- Route Variation HDD Crossing
- Route Variation Open Trench Crossing
- Route Variation HDD Crossing
- Route Variation Open Trench Crossing
- Route Variation HDD Crossing
- Route Variation Open Trench Crossing
- Preferred Route Segment Point
- Route Variation Segment Point
- Route Variation Segment Point
- Route Variation Segment Point
- Proposed Cofferdam
- Greenwich Parcels (Greenwich GIS)
- Inland Wetland
- Tidal/Coastal Resource

Base Map: 2012 Aerial Photograph (CTECO)

1 inch = 150 feet

75 37.5 0 75 Feet

Figure G-8A
MNRR/I-95 Crossing Variation

Greenwich Substation and Line Project

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June 2015

Additional Bruce Park Variations: Comments received from the Town and members of the community during the MCF process encouraged Eversource to assess additional alternate crossings of the Park. In lieu of crossing Bruce Park with the longer HDD span associated with the Preferred Route, two feasible route variations are under consideration, as depicted in Figure G-8B, including:

1. An open trench that would originate either on the DPW property or the end of Kinsman Lane and extend southwest through a relatively open area on the eastern side of the Park, paralleling Kinsman Lane. The trench would turn north and then west, following outside the existing trees to a point near the eastern-most waterbody, north of the baseball field. This variation would transition to HDD technology to cross westward beneath the remainder of the Park, including Indian Harbor. This variation is depicted in blue in Figure G-8B.

2. An open trench that would also originate on the DPW property or the end of Kinsman Lane and extend west through the northern portion of the Park, immediately south of I-95, to the area described above near the Park's eastern-most waterbody, north of the baseball field. This variation would require removal of trees and some bedrock. Similarly, this variation would transition to HDD technology and cross westward beneath the remainder of the Park, including Indian Harbor. This variation is depicted in orange in Figure G-8B.

The Company would support any of these variations as part of the route for the proposed transmission supply lines if approved by the Council.

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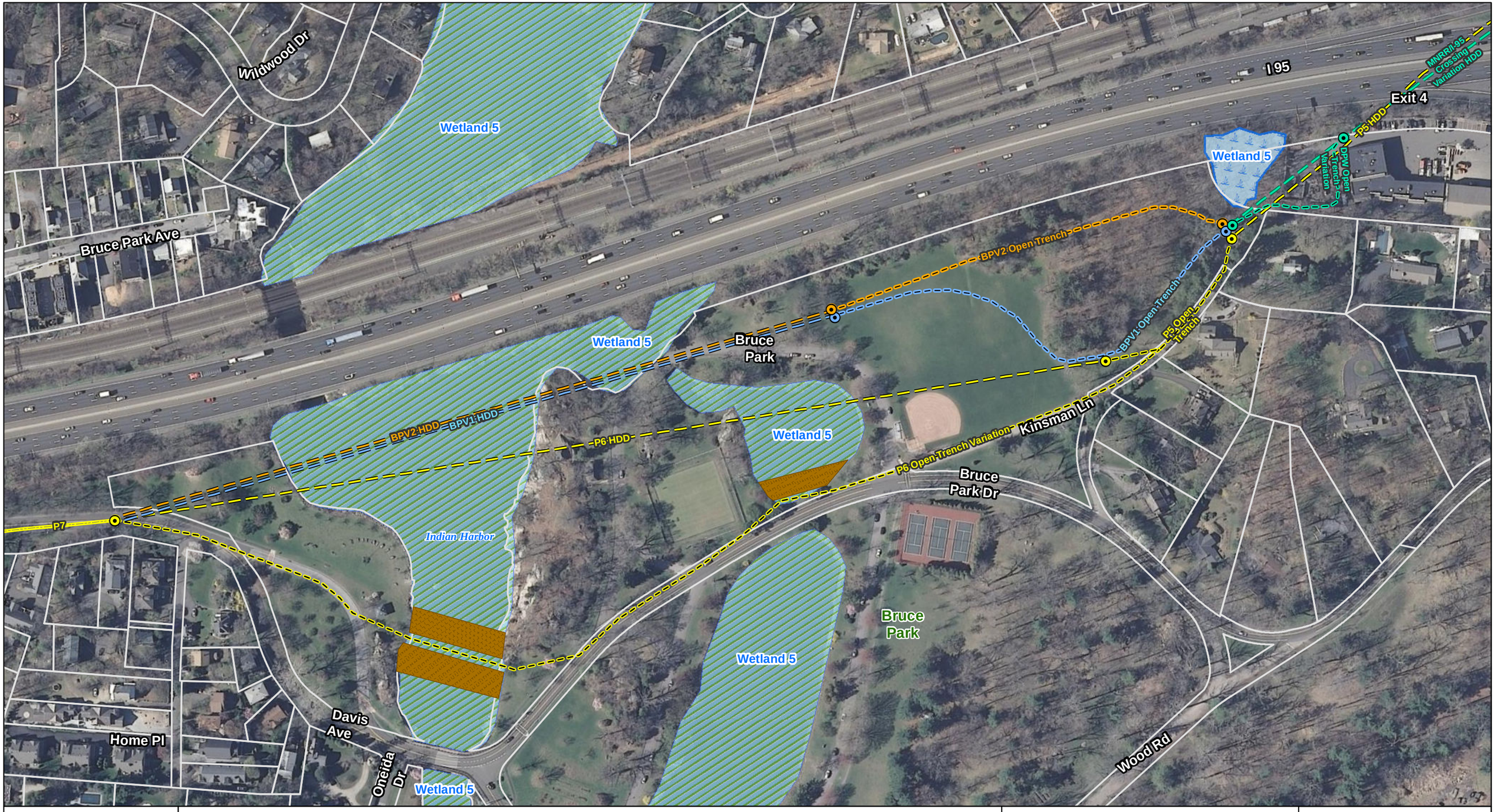
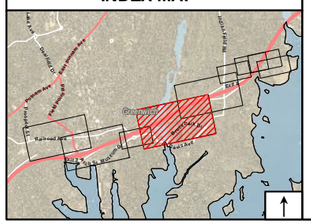


INDEX MAP



Legend

- Preferred Route
- Preferred Route HDD Crossing
- Preferred Route Open Trench Crossing
- Route Variation HDD Crossing
- Route Variation Open Trench Crossing
- Route Variation HDD Crossing
- Route Variation Open Trench Crossing
- Route Variation HDD Crossing
- Route Variation Open Trench Crossing
- Preferred Route Segment Point
- Route Variation Segment Point
- Route Variation Segment Point
- Route Variation Segment Point
- Proposed Cofferdam
- Greenwich Parcels (Greenwich GIS)
- Inland Wetland
- Tidal/Coastal Resource

Base Map: 2012 Aerial Photograph (CTECO)

1 inch = 175 feet

75 37.5 0 75 Feet

Figure G-8B
Additional Bruce Park Crossing Variations

Greenwich Substation and Line Project

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The segments comprising the Preferred Route and Variations are described below. Corresponding Preferred Route and Variations Segments Maps are provided in Appendix D.

P1	Originating in the Cos Cob Substation, the Preferred Route would extend north from the substation. A pipe jacking installation would be used to cross under the MNRR corridor to a parking lot next to Station Drive. This segment would span a distance of approximately 880 feet.
P2	The route would extend west on state-owned property along the north side of Station Drive to the intersection with Loughlin Avenue, a distance of approximately 705 feet.
P3	The route would continue west along Station Drive to the intersection with Sachem Road, a distance of approximately 505 feet.
P4	The route would continue west on Station Drive and crossing Indian Field Road onto Town-owned property to an HDD staging area, a distance of approximately 1,100 feet.
P5HDD	An HDD would be used to cross the MNRR and I-95 southwestward to an HDD receiving area at the end of Kinsman Lane (a span of approximately 1,400 feet).
P5 Open Trench	From there open trenching would extend down Kinsman Lane to a point east of the intersection of Bruce Park Drive for a distance of approximately 500 feet.
P6 HDD	An HDD staging area would be established in the eastern portion of Bruce Park. A trenchless (HDD) crossing would extend westward under the Bruce Park ball fields and waterways to a receiving site on Davis Avenue just west of Home Place, a total distance of approximately 1,800 feet.
P6 Open Trench Variation	This open trenching variation through Bruce Park would continue southwestward from the north side of Kinsman Lane east of Bruce Park (south end of P5 HDD), along the north side of Kinsman Lane and Bruce Park Drive for a distance of approximately 2,240 feet to Davis Lane. This variation would require the installation of coffer dams within the tidal water bodies in Bruce Park.
P7	The route would extend westward along Davis Avenue to its intersection with Indian Harbor Drive, a distance of approximately 1,100 feet.
P8	The route would continue west along Indian Harbor Drive and Museum Drive, which becomes Arch Street beyond the Steamboat Road intersection. The route would continue along Arch Street, turning northward and crossing beneath the I-95 and the MNRR corridor to the intersection with Railroad Avenue, a total distance of approximately 2,940 feet.
P9	The route would turn west on Railroad Avenue to the Greenwich Substation, a distance of 1,260 feet.

G.4.1 Variations to the Preferred Route Resulting from Municipal Consultations

MNRR/I-95 Crossing Variation:

MNRR/I-95 Crossing Variation HDD — An alternate HDD crossing of the MNRR and I-95 corridors would originate from the unimproved area of Station Drive east of Indian Field Road and extend south-west approximately 1,470 feet to a new HDD staging area located on the west side of the Town Maintenance Garage property or the end of Kinsman Lane. An open trench would then extend from the HDD staging area to the southern property line (where variations BPV1 and BPV2 initiate). This route variation is depicted in green on Figure G-8A.

Additional Bruce Park Crossing Variations:

BPV1 Open Trench — An open trench would start south of the DPW property and extend approximately 500 feet southwest through relatively open areas in the eastern portion of Bruce Park (and west of Kinsman Lane) before turning north and west for another approximately 500 feet.

BPV1 HDD — An HDD staging area would be located near the Park's eastern-most waterbody, northwest of the ball field, to accommodate an approximately 1,500-foot long underground crossing westward beneath the remainder of the Park, including Indian Harbor. This HDD crossing would exit on Davis Avenue near its intersection with Home Place. This route variation is depicted in blue in Figure G-8B.

BPV2 Open Trench — An open trench would start south of the DPW property and extend approximately 1,000 feet, initially to the south before turning north and then west through a wooded area parallel to I-95 located within the park boundaries.

BPV2 HDD — An HDD staging area would be located near the Park's eastern-most waterbody, northwest of the ball field, to accommodate an approximately 1,500-foot long underground crossing westward beneath the remainder of the Park, including Indian Harbor. This HDD crossing would exit on Davis Avenue near its intersection with Home Place. This route variation is depicted in orange in Figure G-8B.

G.5 Transmission Supply Line Service Life

The transmission supply lines and supporting infrastructure have a service life of approximately 40 years.

G.6 Estimated Project Costs

The estimated cost for the siting, design, and construction of the Greenwich Substation Project, including the transmission supply lines and Cos Cob Substation modifications is approximately $140,000,000.

G.7 Facility Service Life and Life-Cycle Costs

The estimated capital costs for the Project is $140 million. Of this amount, the transmission lines account for $72 million, and the new Substation and distribution modifications for the balance of $68 million. In accordance with the Council's Life-Cycle Cost Studies for Overhead and Underground Transmission Lines (November 15, 2012, aka "LCC Report"), Eversource performed a present-value analysis of capital and operating costs over a 40-year economic life of the transmission line portion of the project. The following items and assumptions were included in this study:

- Annual Carrying charges of the capital cost (14.1%)
- Annual Operation and Maintenance Costs ($11,435 per mile for 2.3 miles)
- Cost of energy losses (load factor of 0.62, load growth of 2.0%, cost of electricity of $48/mil, Peak current of 352 Amperes/phase)
- Present Value Discount Factor is assumed to be 8%
- Cost of Capacity (assumed to be zero for this Project)

Applying these factors, the life cycle cost for the transmission lines is $121.6 million. The resulting life cycle cost per mile is $52.9 million. Because this is a double circuit HPFF 115-kV transmission line, the project length is so short and includes two proposed HDD installations, there is no analog in the LCC Report.

H. Substation Site and Transmission Line Route Identification and Selection

H.1 Geographic Boundaries of the Project Study Area

As noted in Section E, the Company identified a need for a new substation in Greenwich and found that such need would be met by a 115-kV substation with connecting 115-kV transmission supply lines between the new Substation and Cos Cob Substation. The Company initially defined a geographic Search Area for the Substation and another for the Project Study Area, and then identified and analyzed potential substation sites and transmission line routes within these areas. The Substation Search Area focused in the area of Greenwich with the highest customer demand and where increased substation capacity is needed (i.e., the load pocket), which was north of I-95 and the MNRR corridor.

In formulating the Project Study Area, the Project team took into consideration that the shortest routes between the new and existing substations would typically minimize environmental and community impacts, as well as cost. As a result, the Company generated potential routes that were between two and three miles long trying to utilize a minimum distance between Cos Cob Substation and the Proposed Site. Figure H-1, *Substation Search Area and Project Study Area Map*, depicts the Company's areas of concentration for the Substation and the transmission supply lines.

Once the Substation Search Area and Project Study Area were determined, the Company began its analysis of potential new substation sites and subsequently transmission line routes.

Figure H-1 Substation Search Area and Project Study Area Map

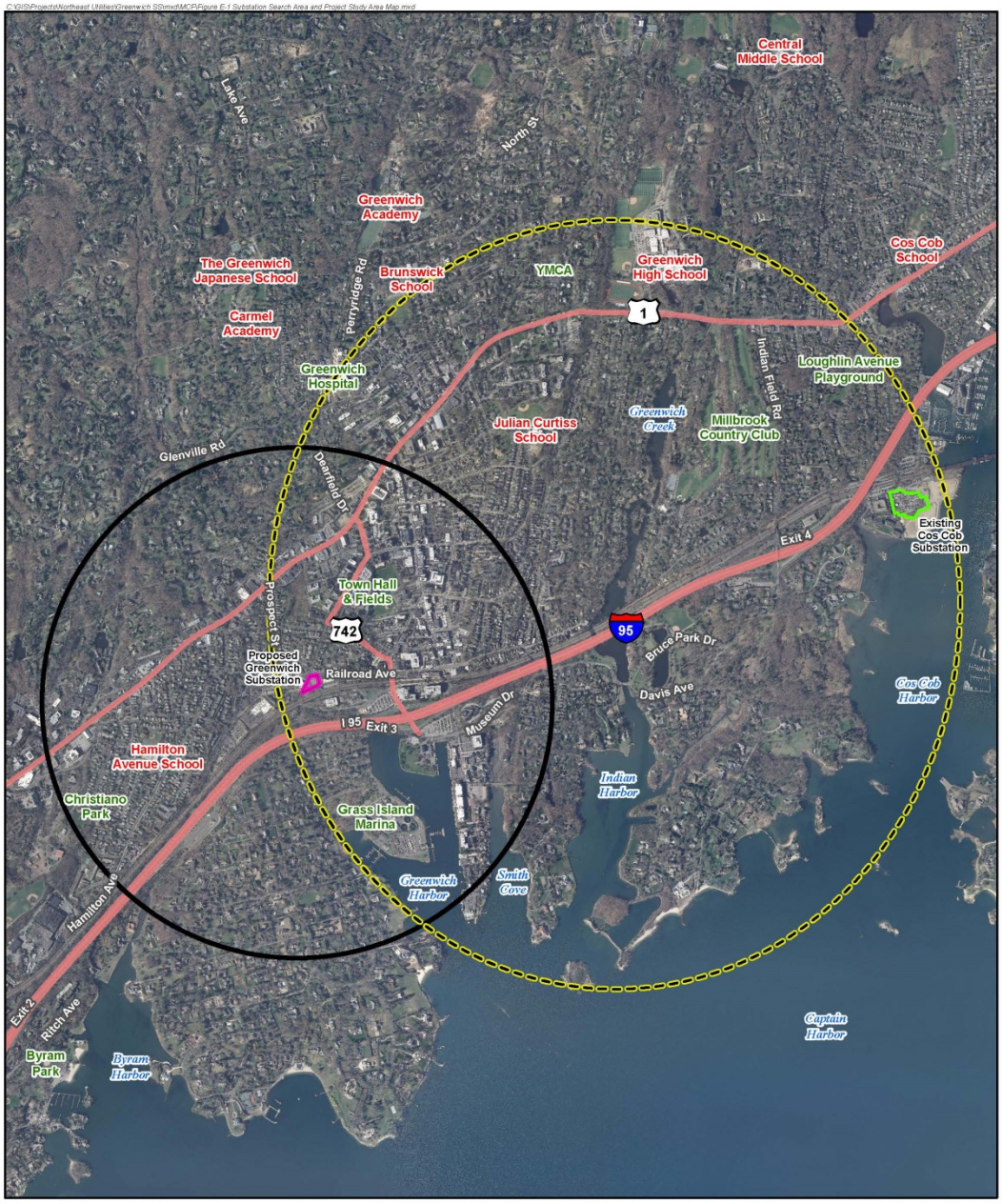

Figure H-1
Substation Search Area and Project Study Area Map

Greenwich Substation
and Line Project
290 Railroad Avenue
Greenwich, Connecticut

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H.2 Substation Site Selection

The Company considered engineering, environmental, community and economic factors in conducting its search for a potential site for the new Greenwich Substation. The objective was to select from among the available candidates the site that would be technically, environmentally and economically practicable and best meet the Project goal to address the need.

The Company's primary selection criteria for locating a new substation included, but were not limited to:

- Proximity to customer demand (or "load pocket");
- Proximity to existing distribution feeders;
- Proximity to existing transmission electrical circuits;
- Proximity to public water supply, watershed and aquifer areas[29];
- Ease of access for both construction and maintenance;
- Zoning and adjacent land uses;
- Earthwork requirements;
- Suitability of a site to accommodate the substation; and,
- Minimizing effects on the environment.

In addition to the above criteria, the Company also considered other relevant factors including community impacts, cost, construction complexities, and timing.

H.2.1 Substation Site Selection Process

In 2012 and 2013, the Company's Real Estate staff, aided by a local real estate broker, conducted site searches for a potential substation site in Greenwich. The Search Area boundaries were determined by the Company's Distribution Design group and encompassed the load pocket. The Company's owned and/or leased sites were also included in the search. Potential available sites under 0.5 acres were rejected, as well as those parcels that did not have at least two sides with a minimum 150 feet property line depth (dimensions estimated to accommodate various substation design scenarios). One parcel mentioned by the Town of Greenwich during preliminary discussions was also considered. The Company's Real Estate staff conducted an

[29] No public water supply wells, aquifers or watersheds are located within the Substation Search Area.

additional site search in January 2014 to determine if any potential new properties had become available.

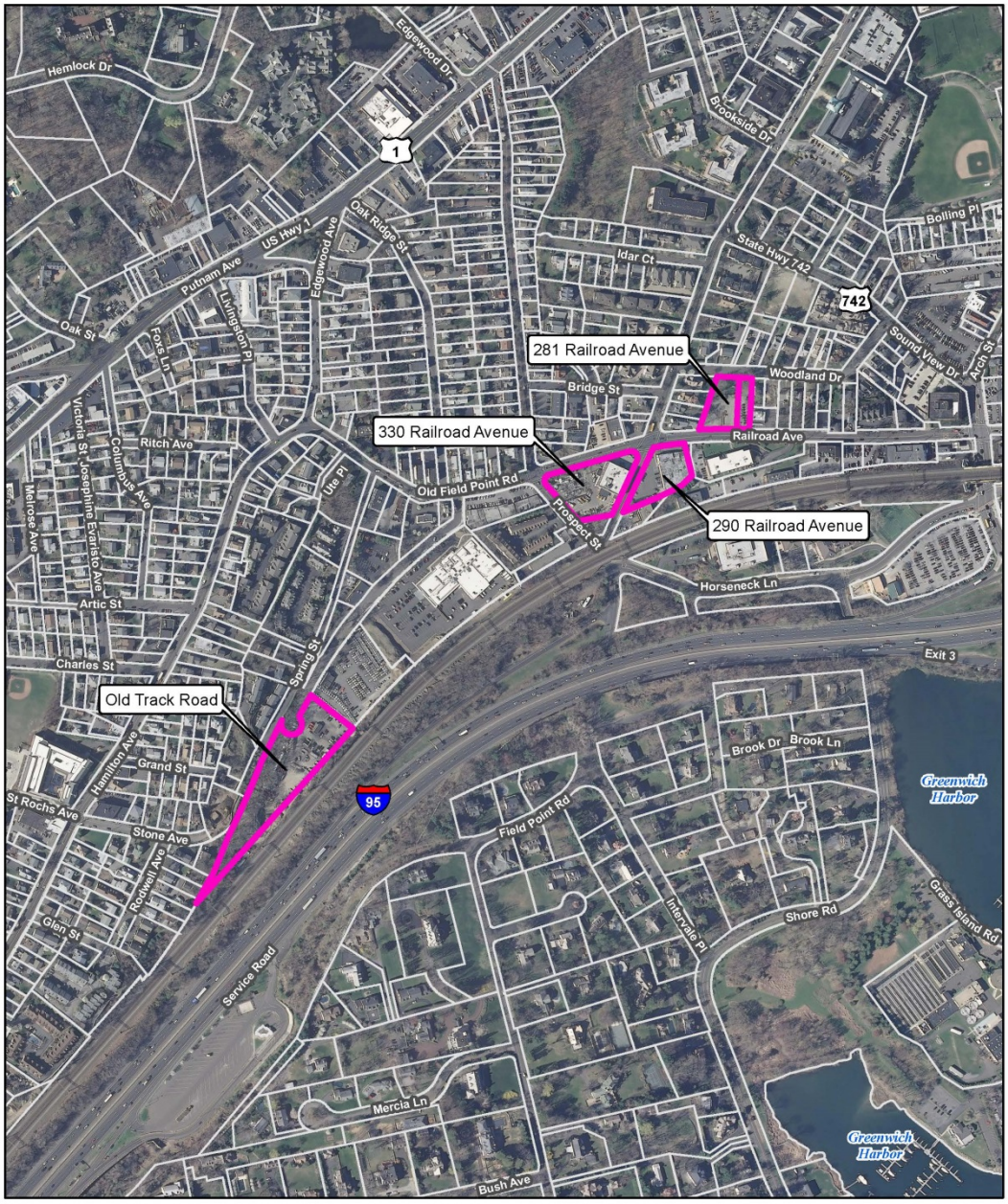
Based on the candidate site information provided by the Company's Real Estate staff and a cross functional Site Selection Evaluation Team's (Team) review of these and other potential candidate sites within the Search Area, four substation location sites were ultimately identified for further consideration and were evaluated by the Team prior to 2014. No new feasible candidate sites resulted from the January 2014 site search.

H.2.2 Sites Evaluated

During the site screening process, the Company reviewed several properties and ultimately identified four potential site locations for further evaluation. For each of the four sites, the Company conducted a more detailed evaluation, assessing each potential site using the selection criteria.

These sites are discussed in order of preference and depicted on the following Figure H-2, *Sites Evaluated Map*.

Figure H-2 Sites Evaluated Map



Legend

Alternate Sites Evaluated

Approximate Parcel Boundary (CTDEEP)

Base Map: 2012 Aerial Photograph (CTECO)
Map Scale:1 inch = 500 feet
Map Date: June 2015

300 150 0 300 Feet

Figure H-2
Sites Evaluated Map

Greenwich Substation
and Line Project
Greenwich, Connecticut

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H.2.2.1 290 Railroad Avenue (the Proposed Site)

This is a commercial property, zoned as General Business that the Company has controlled with a long standing lease for more than 40 years. The Company has an option to buy the Property from the owners that may be exercised in the year 2021. The Company has determined that a substation could be built on this site using GIS technology and equipment. Key features of the Proposed Site are:

- The parcel is located within the customer load pocket north of I-95 and the MNRR.
- The Proposed Site provides optimal connections to existing distribution feeders and affords two routes for distribution via Railroad Avenue and Field Point Road.
- There is direct access to the Proposed Site from Field Point Road and Railroad Avenue.
- There are no residential properties abutting the Proposed Site. The Proposed Site is zoned General Business, is currently developed with an existing commercial building and surrounded by other commercial properties and the railroad.
- The property is level and there would be no major earthwork requirements for development on this property.
- The diamond-shaped parcel is 0.81 acre in size, has no physical encumbrances and is capable of accommodating the necessary substation components.
- No wetlands or watercourses are located on the Property and it is located outside both the 100-year and 500-year flood zones. A small portion of the Property (approximately 1,120 square feet) is located within the State Coastal Zone Boundary[30].

Site Summary: The Proposed Site satisfies the need for proximity to the load pocket and is adjacent to existing distribution feeders. It is a commercially-zoned property that is surrounded by other commercial properties and in close proximity to transportation infrastructure, so a substation on the Proposed Site would be compatible with the existing land uses in the immediate vicinity. The Proposed Site's size and shape are sufficient to properly configure the substation to fit within the Property boundaries and, after removal of the existing building, no physical encumbrances exist that would impede development. The Proposed Site is level and would require minimal earthwork. No wetlands or watercourses exist on or are proximate to the

[30] Connecticut's coastal zone has two tiers incorporated within the 36 coastal townships. The first tier is bounded by a continuous line delineated by a 1,000 foot linear setback measured from the mean high water mark in coastal waters; or a 1,000 foot linear setback measured from the inland boundary of state regulated tidal wetlands; or the continuous interior contour elevation of the one hundred year frequency coastal flood zone; whichever is farthest inland. The second tier is the area between the inland boundary of the 36 coastal communities and the inland boundary of the first tier.

Property. There are no residential properties abutting the Proposed Site. The nearest residential property is located across Railroad Avenue to the northwest.

H.2.2.2 281 Railroad Avenue (the Alternate Site)

This is an Eversource-owned commercial property, zoned as General Business, that is currently used as a storage area for materials (pole yard) and was previously used for additional parking for personnel working at the former Greenwich Area Work Center. The Company has determined that this site could be a candidate site using GIS technology and equipment, however, the property size combined with the location and orientation of the substation equipment would likely cause the substation to exceed State and local noise regulations/ordinances at the property line. At a minimum, Eversource would need to acquire at least three abutting properties to comply with the applicable noise regulations. Key features of this site are:

- This property is located within the customer load pocket, north of I-95 and the MNRR.
- There are existing distribution feeders along Railroad Avenue. This property provides two routes for distribution feeder egress, via Railroad Avenue and Woodland Drive, respectively.
- There is direct access from Railroad Avenue and Woodland Drive for construction and maintenance.
- The property is owned by Eversource and is commercially developed. Commercial and residential properties are located on the east and west sides. Residential properties are located across Woodland Drive to the north.
- The property is level and there would be no major earthwork or clearing requirements for development on this property. The Company currently uses the property for surface storage.
- The property is 0.75 acre in size and encumbered by two utility easements.
- This property abuts residential properties and is believed to have an inadequate buffer for noise emanating from certain substation equipment without acquiring at least three additional properties.
- This property is located outside of the 100-year and 500-year flood zones, and no wetlands or watercourses are on the parcel.

Site Summary: This property is proximate to the load pocket and existing distribution feeders, but is not the preferred location for a substation, as it would require purchasing at least three additional properties to mitigate noise from the substation. Depending on the final substation

design, additional properties may need to be acquired for sufficient noise attenuation from the substation transformers and to provide landscaping and additional screening from substation equipment. This site is being proposed as the alternate site because it meets most of the evaluation criteria and is an environmentally, technically and economically practicable alternative, as compared to the remaining sites evaluated.

H.2.2.3 330 Railroad Avenue

This commercial property, zoned as General Business, is owned by the Company[31] and currently includes the Company's former Greenwich Area Work Center building and Prospect Substation. The Company determined that this site was not a viable option for the new substation because it contains too many impediments that would impact Project cost and schedule, even if these constraints could be effectively managed. The site also has some constructability uncertainties that could put the Project schedule at risk. A majority of the site is located within the 500-year flood plain and would require additional design features to raise the substation elevation above base flood elevation for consistency with the Company's substation reinforcement initiative for storm resiliency as a result of Superstorm Sandy in 2012. Key features of this site are:

- This property is located within the customer load pocket, north of I-95 and the MNRR.
- There are existing distribution feeders along Railroad Avenue. This property provides two routes for distribution feeder egress, from Railroad Avenue and Prospect Street, respectively.
- There is direct access to this property from Field Point Road, Railroad Avenue and Prospect Street.
- The property is commercially developed with the building for the Company's former Greenwich Area Work Center, which occupies the east side of the parcel and Prospect Substation, an existing distribution substation is located on the west side. The Greenwich Area Work Center property is currently being offered for sale; however, Prospect Substation will not be transferred with the sale of this property and must remain in service during and after construction of the new Greenwich Substation. Two major subsurface obstacles exist on the parcel, including Horseneck Brook, which flows beneath the property within a 16-foot wide culvert, and a municipal sanitary sewer easement (containing a 15-inch sewer pipe) located adjacent to the Brook.
- The property is 1.27 acres in size and roughly triangular in shape. Although the former Greenwich Area Work Center building could be removed, nearly half of the property is

[31] This property was evaluated as a site for the proposed Substation. However, the Company determined that other evaluated properties are more suitable for the Substation than this property. In 2014, the Company offered this property for sale as part of its facility consolidation plan.

currently unusable due to the presence of Prospect Substation (occupying 0.35 acre), and the combination of the Horseneck Brook culvert and the municipal sewer line (collectively occupying an additional 0.25 acre). Further, several months of dismantling work would be required when compared to the Proposed Site because of the time necessary to relocate relaying equipment from within the building to Prospect Substation prior to demolition of the structure.

- The property is bisected by Horseneck Brook, which flows north to south from Railroad Avenue to Horseneck Lane. Built in 1934, the subgrade culvert that encloses the brook, which extends beneath a portion of the substation yard, is not designed to withstand the weights of heavy loads that would be required during construction. Access over the culvert would be essential during construction to move equipment into and out of the substation. Eversource could not install equipment foundations on top of the culvert, and no room would be available on the property for an alternate construction access. Permanent structural improvements (replacement or reinforcement) to the culvert would be required to allow for construction and for future access for maintenance and repairs. The culvert could be replaced, reinforced or left in place and bridged over. However, given the culvert's close proximity to the existing energized substation, work associated with reinforcing or rebuilding the culvert would create increased safety and reliability risks and limited access for emergency response personnel and vehicles, as well as extending the overall Project construction period.

- If the physical challenges could be mitigated, the space constraints would necessitate long runs of overhead bus work (nearly three times the length required at 290 Railroad Avenue) and substantial support trusses. This arrangement would create additional clearance, safety and reliability concerns, especially during any future maintenance work on the sewer or culvert, portions of which would be directly beneath the energized bus. In addition, it would increase cost.

- The parcel is located within the 500-year flood zone associated with Horseneck Brook. At a minimum, substation equipment would need to be elevated for storm resiliency, consistent with the Council's *FEMA Flood and Radio Frequency Mapping* letter of May 16, 2014.[32]

Summary: Although this property is proximate to the load pocket and existing distribution feeders, limited space and other site constraints (including Horseneck Brook and the associated culvert, the municipal sewer main and the floodplain area) introduce development complexities that would create risks to the construction schedule and to the safe operation of a substation if left in place. Engineering solutions could conceivably be incorporated to work around these physical impediments; however, development at this property would add costs and introduce risk for constructing, operating and maintaining the new substation, as well as meeting the necessary time schedule for energizing the new substation.

[32] This letter outlines guidance for facilities to be designed for 500-year flood events in response to recent influx of severe storms in the state.

H.2.2.4 Old Track Road

This is a privately owned commercial property, zoned as General Business that was suggested by the Town as a potential substation location. Key features of this site are:

- This parcel is located within the customer load pocket, north of I-95 and the MNRR.
- The length of the distribution feeders required would increase substantially because all of the feeders would have to be extended to this property.
- The new transmission supply lines would need to be extended at least an additional 0.25 mile and built around existing culvert and sewer lines located beneath Railroad Avenue.
- There is no direct access to public roads, so multiple easements would be required for access/egress to the site as well as for both distribution feeders and the new transmission lines. Although Stone Avenue (northwest of the parcel) is a public road, Town ownership of the road ends before abutting the Old Track Road property. The significant elevation change from Stone Avenue to Old Track Road would present constructability challenges. Similarly, Spring Street (to the northeast) is also a public road, but Town ownership of this road ends before abutting the Old Track Road property.
- The parcel is zoned commercial, but several residential homes, including a condominium complex, are located immediately north of the property. A residential area is less than 100 feet away. The adjacent condominium complex sits at a higher elevation than Old Track Road and the units have a clear view of the site. The MNRR is located along the southern boundary of this parcel.
- The property is generally level. There would be minimal earthwork required for the substation construction.
- The parcel is 2.49 acres in size, with adequate room for a substation on the easternmost portion of the property. The property is a narrow strip of land, triangular in shape, with the western half of the property being insufficient to properly configure a substation. There is an existing gas easement in favor of Connecticut Natural Gas extending across the property.
- The property is located outside flood zones, and no wetlands or watercourses are on or adjacent to the parcel.
- This property was not listed for sale at the time of the Company's evaluation.

Summary: This property was suggested by the Town, but was rejected as a viable site based on engineering, constructability and cost factors, as well as the visual impacts to the surrounding residential properties. The parcel is of sufficient size to construct a substation and the location is proximate to the load pocket, but the new transmission lines would need to be extended at least an additional 0.25 mile, when compared to the Proposed Site, and built around the existing culvert

and sewer lines crossing beneath Railroad Avenue. Additionally, the new distribution feeders exiting the new substation would have to be significantly longer to connect to all of the existing distribution feeders currently serving downtown Greenwich. Future expansion of additional feeders would require extending the existing distribution system across the Horseneck Brook culvert, which would be costly and require additional easements to use the privately-owned Old Track Road for access and installation of electrical conduits. Finally, this property is viewed as a less favorable option due to its proximity to the abutting residential properties, located at a higher elevation, to the north. Residents would be able to look directly down into the substation yard.

H.2.3 Site Evaluation Summary

A comparison of the major evaluating criteria is provided in Table H-1. Based on this comparison, the Proposed Site at 290 Railroad Avenue was selected as the preferred location for the new Substation.

Table H-1 Site Evaluation Summary

Site Selection Review Criteria	SITES EVALUATED IN GREENWICH SUBSTATION SEARCH AREA			
	Proposed Site	Alternate Site		
	290 Railroad Ave	281 Railroad Avenue	330 Railroad Avenue	Old Track Road
Proximity to Customer Load	**Within load pocket**	Within load pocket	Within load pocket	Within load pocket
Proximity to Existing Feeders	**Existing distribution feeders in street**	Existing distribution feeders in street	Existing distribution feeders in street	0.25 mile extension of distribution feeders needed via new easement
Proximity to Existing Transmission Circuits	**2.3 miles**	2.3 miles	2.3 miles	2.6 miles
Ease of Access	**Direct access from Field Point Road and Railroad Avenue**	Direct access from Railroad Avenue and Woodland Drive	Direct access from Railroad Avenue, Field Point Road and Prospect Street	Limited vehicular access; additional/expanded access rights would be required from one or more landowners
Size (acres)	**0.81**	0.75	0.92*	2.49
Consistency with Existing Land Uses	**Commercial Neighbors**	Commercial and Residential Neighbors	Commercial Neighbors	Commercial and Residential Neighbors
Earthwork requirements	**Level terrain - limited grading needed**	Level terrain - limited grading needed	Significant earthwork and grading needed	Level terrain - limited grading needed
Site Constraints	**Existing building**	Existing utility easements require relocation - would likely need to purchase adjacent property to meet noise regulations at the property line	Existing building, distribution substation, municipal sanitary sewer line and culvert**	Existing gas easement; easements required for access and utility installations
Environmental Effects	**None**	None	In 500-year Floodplain; Horseneck Brook flows under property in culvert	None

* Does not include 0.35 acre occupied by the existing distribution Prospect Substation and 0.25 acre by existing culvert and sewer line.

** The time required to locate an alternate route (working with the municipality) and then move the municipal sanitary sewer off of the property, in addition to undertaking the supplemental earthwork and the design modifications required to construct the substation in the 500-year flood plain, would likely delay project schedule and jeopardize the facility's target in-service date.

H.3 Transmission Line Route Identification and Route Selection Objectives

Overhead and underground routing alternatives were identified and evaluated within the Project Study Area taking into consideration system benefits (reliability and operability), potential property impacts, environmental impacts, engineering (technical) feasibility, and costs. For the Project, the Company applied the following set of objectives for determining the best route for the transmission supply lines:

- Comply with all statutory requirements, regulations and State and federal siting agency policies;
- Achieve a reliable, operable, constructible and cost-effective solution;
- Maximize the reasonable, practical and feasible use of existing linear corridors (e.g., transmission lines, highways, public roadways, railroads, pipelines);
- Minimize the need to acquire property;
- Minimize adverse effects to environmental resources;
- Minimize adverse effects to significant cultural resources (archaeological and historical);
- Minimize adverse effects on designated scenic resources;
- Minimize conflicts with local, state and federal land use plans and resource policies; and
- Maintain public health and safety.

The objectives and route selection criteria (discussed below) created the framework for the Company to identify an appropriate route for interconnecting the new Substation with Cos Cob Substation. Given the density of the existing development and land uses within the Project Study Area, the Company focused its analysis of route options on the use of existing right-of-way ("ROW"), including public roads, existing utility corridors, the MNRR, and Interstate 95 ("I-95"), while evaluating parking lots and private/public lands in locations where off-ROW properties were needed to complete a potential route option.

H.3.1 Transmission Line Routing Selection Analysis

The Company began the route selection process by evaluating overhead, underground, and marine routes within the Project Study Area. The Company initially identified 12 potential route options with several variations. For these potential route alignments, the Company conducted additional screening analyses involving further field reconnaissance, as well as consideration of

baseline environmental data compilation and review. The Company requested and considered input from Town officials in the route selection process.

Overhead v. Underground

Overhead routes were considered and subsequently eliminated based on the physical constraints posed by the combination of existing dense residential and commercial development within the Project Study Area, the MNRR and the I-95 corridors, and associated community impacts. See Section H.4.1 for additional information.

Underground Route Selection Criteria

The following criteria were applied when evaluating the potential underground routes:

- **Constructability** - Measures the complexity of construction and impact on schedule. Such complexities include trenchless installation techniques (e.g. directional drilling or pipe jacking) requiring specialized equipment during construction, anticipated work hour restrictions and space constraints. Sharp changes in direction for the transmission supply lines may require additional vaults and splices, as well as long radius bends in the cables that can require easements.

- **Existing Utilities Impacts** - Depending on the route, the presence of existing utilities can create conflicts with the alignment of the proposed duct bank installation. Some existing utilities may require relocation or represent challenging geometric requirements for locating portions of the transmission supply lines. External heat sources such as existing electric circuits may negatively impact the ampacity rating of the lines.

- **Operations and Maintenance** - Routes were evaluated based upon the operating performance of the underground transmission lines in terms of ampacity and the proximity to other underground transmission lines. For maintenance purposes, routes that site splice vaults[33] in readily accessible locations and minimize the total number of vaults are more favorable.

[33] A splice vault is a buried enclosure where underground line ends are spliced together.

- **Permits, ROW, and Easements** - Route alternatives that avoid certain permitting requirements, such as those associated with the railroad, ConnDOT or Army Corps of Engineers, can provide project cost and schedule benefits. The type and number of permits required, and anticipated length of time to obtain these permits, vary for different route alignments. Route alternatives that require additional easements and/or property acquisitions increase the overall project cost, could increase the potential for delays in the project schedule, and potentially increase the effects on abutting land uses.

- **Surface Disruption Impacts** - Surface disruptions would be limited to only areas of public ROW and on properties where temporary construction and permanent easements are required. The location, size, depth, and duration of such surface disruptions would vary depending on the final route alignment, the construction method, space requirements for line and casing materials, and overall site constraints. Route alternatives presenting greater surface disruptions may also increase inconveniences to the community.

- **Scheduling Impacts** - Several route options within the Project Study Area would involve limitations with regard to permitting requirements, access or physical space, and the daily work schedule. Work in some areas might only be permitted during day-time hours, and further restricted on weekends and holidays. Some construction activities could be subject to work hour or access restrictions imposed by the MNRR and/or ConnDOT.

- **Length of Route** - Generally, the shorter and straighter a route, the lower the route installation cost, due to the need for less material and construction duration. A shorter route would also likely equate to fewer surface disruptions, splice vaults and conflicts with existing utilities. When comparing routes that have major differences in length, longer routes in general have greater associated construction complexities and can result in significant additional costs.

- **Environmental Resources** - Alignment of underground lines along roadway ROW may also pose potential environmental issues, such as excavation through areas of contaminated soils or groundwater; difficult crossings of watercourse and wetlands that the roads traverse via bridge; and disturbance to vegetation and land uses adjacent to roads (due to construction staging, heavy equipment operation, etc.). Selecting a route that avoids or minimizes adverse environmental effects is preferred.

- **Cost** - The route with the lowest construction cost would have greater weight and significance when selecting a proposed route. Cost must always be reasonably balanced with other factors, such as environmental impacts and effects on the local community.

- **Proximity to Public Services** - Route alternatives that avoid emergency public services such as police or fire stations and hospitals will be more favorably considered, from a construction perspective, as measures to maintain around the clock access to such services would be required.

Some of the underground route options initially identified by the Company were quickly found to be impractical because of overriding environmental, community, or engineering constraints. For example, a route along I-95 was eliminated as a viable alternative because ConnDOT policies limit the longitudinal occupation of interstate corridors unless no other practical option exists. In addition, the I-95 corridor is raised above grade in portions of the Project Study Area, or has both limited land available outside of the highway and difficult topography. Based on past project experience, direct access to work areas and work hours would be significantly restricted to minimize traffic interruptions on I-95 and highway access roads.

Similarly, the MNRR corridor does not present a viable overhead or underground route for the extension of the transmission lines due to the number of easements and property acquisitions that would be required, as well as potential conflicts with the various land uses that abut the railroad. There would also be construction obstacles associated with various above- and below-grade railroad crossings. Additionally, a Greenwich sewer main is located within a portion of the MNRR corridor.

Regardless of the route alternative, at least one crossing of the railroad corridor is required to install the transmission supply lines from Cos Cob Substation to the new Greenwich Substation. During its routing analysis, the Company focused its efforts on minimizing the length of the MNRR ROW required for the Project due to physical constraints and limitations imposed by ConnDOT.

The Company also evaluated a marine line route option through Cos Cob Harbor and Long Island Sound. Spanning over four miles in length, this option was not deemed feasible due to the

significant environmental and construction challenges that would negatively affect the Project's schedule and costs.

H.4 Routes Analyzed

The Company initially evaluated numerous overhead, underground, and marine routes, as well as hybrid combinations incorporating different segments of select options. A total of 12 routes, some with variations, were initially considered and analyzed, including four overhead routes, five underground options, one marine route, and two combination routes. The 12 routes (and their variations) are discussed below.

H.4.1 Overhead Routes Considered and Rejected

The configuration of overhead transmission lines allows flexibility in design and construction, provided that a continuous ROW width is available. Individual structures can often be located to avoid or span conductors over sensitive environmental areas (e.g., wetlands, streams, steep slopes). However, overhead lines require relatively wide ROW, within which certain land uses and tall growing vegetation are precluded. Overhead transmission line support structures that would be required for this Project would rise to heights of approximately 90 to 110 feet above ground level. A typical Eversource overhead 115-kV ROW would require 70 to 100 feet in width, depending on design. Descriptions of the four overhead routes that were considered early in the route evaluation are briefly summarized below.

Overhead Southern Route

This route would exit Cos Cob Substation, south of I-95, extending generally westward over private properties along Cob Island Road and Kinsman Lane before traversing through Bruce Park. On the park's west side, the overhead lines would continue westward along Davis Avenue and Arch Street before turning north and crossing the highway and railroad corridor to reach the Greenwich Substation. No existing ROW is available along this route, so new easements/acquisitions affecting approximately 46 public and private properties would be required. Due to the high level of impacts, easements/acquisitions and substantial clearing requirements associated with this overhead route, this route option was removed from further consideration.

Overhead Central Route

This option would initially exit north out of Cos Cob Substation over the MNRR before turning west, requiring the use of private properties north of Station Road to Indian Field Road. The Company's existing distribution ROW could be expanded to the north using private properties off Circle Drive and Circle Drive Extension. This route would then cross Indian Harbor, north of the MNRR and I-95, and follow Bruce Park Avenue and Railroad Avenue west directly to the Greenwich Substation Property. Although this route option attempts to use existing transportation and utility ROWs, the corridor does not currently have sufficient width to accommodate the transmission lines. Thus, a substantial amount of private properties would be directly affected (approximately 97 parcels would require easements/acquisitions). This option would also require the removal of numerous trees that are currently providing screening for residences from the MNRR and I-95. Due to the high level of impacts, easements/acquisitions and substantial clearing requirements associated with this overhead route, this route option was removed from further consideration.

Overhead Northern Route

This route would also require traversing densely populated residential and commercial areas and pass through the heart of the Greenwich Avenue Historic District and Greenwich Municipal Center Historic District, crossing a wide portion of Indian Harbor in the Millbrook Club area. Similar to the Overhead Southern Option, numerous easements/acquisitions would be required because no existing ROW is available. Based on the high level of impacts to the historic districts and to the very densely populated areas associated with this route, this route option was removed from further consideration.

Overhead Metro-North Railroad Corridor

North Easement: This route would occupy a portion of the existing MNRR ROW as well as adjacent private properties. This route could accommodate a width of at least 40 feet provided that shorter spans between structures are used (which would require substantially more structures compared to a typical overhead transmission line design). West of Indian Field Road, this route would require new ROW beyond the existing MNRR ROW, impacting up to 64 properties. It would initially exit Cos Cob Substation north over parking lots and turn west along the north side of the rail line. This route would then follow the railroad for almost two miles to a point directly south of Railroad Avenue, where it would make a 90-degree turn northward for a short segment into the Greenwich Substation. The Company anticipates that several properties would have to be

acquired due to the extent of the ROW needed on those properties. Further, construction would require removing the existing vegetation buffer for those homes to the north of the ROW. Based on preliminary communications with the MNRR, limited work hours would be imposed by the railroad to avoid conflicts with the rail line's active use, adding substantial time to the construction schedule and could jeopardize the in-service date of the Project.

Two variations to the Overhead MNRR Corridor route were evaluated, as summarized below.

Variation 1 - South Easement: The Company evaluated this variation to the MNRR Corridor route option in an attempt to minimize property impacts. Following the initial path out of Cos Cob Substation westward over Indian Harbor, this route variation would turn south at the end of Bruce Park Avenue, crossing the railroad and I-95 to the west end of Bruce Park. The route would then turn west along the south side of I-95, generally following Museum Drive to an area near the intersection of Arch Street and exit 3 off I-95. This overhead line would then head northwest back over the transportation corridors (MNRR and I-95) into the Greenwich Substation. Although this route could reduce the number of properties directly affected by nearly 50 percent, it would also require installation of new overhead transmission support structures in Bruce Park and adjacent to the Bruce Park Museum, as well as substantial clearing of mature trees that currently provide screening between the I-95 and MNRR transportation corridor and the neighborhoods to the south. Further, ConnDOT policies limit the longitudinal occupation of interstate corridors unless no other practical option exists.

Variation 2 - Middle Easement: The Company also assessed an overhead route that generally follows the MNRR ROW adjacent to the south side of the rail line, primarily between the MNRR and I-95. In addition to the technical requirements and work hour limitations imposed by working within or near the MNRR ROW, this route would also require that construction activities take place within a very narrow area between the MNRR and I-95 (36 feet wide at its narrowest point). In addition, a municipal sewer line and MNRR underground facilities are located in this area, creating a higher level of construction complexities. As with the variation described above, ConnDOT policies limit the longitudinal occupation of interstate corridors unless no other practical option exists.

ConnDOT has determined that all three of the proposed overhead routes are not desirable. Due to the high level of recreational, residential and commercial property impacts, easements/acquisitions and substantial clearing requirements, as well as anticipated and potentially unforeseen construction complexities, the overhead options were removed from further consideration. A copy of the ConnDOT letter is provided in Appendix E, *Agency Correspondence*.

H.4.2 Underground Routes Considered

A total of five potential underground routes were initially evaluated. Subsequently, three underground routes were selected as viable, including the Preferred Route, as discussed in Section G. The two other viable underground routes are identified herein as a Southern Alternative and a Northern Alternative.

H.4.2.1 Southern Alternative

The Southern Alternative would exit Cos Cob Substation south of the MNRR and extend west along Sound Shore Drive, passing under I-95. The route would travel southwesterly under I-95 a second time with an HDD crossing that would require staging locations for the duration of the Project along Sound Shore Drive near One Sound Shore Drive and Kinsman Lane. Open trenching would continue in or adjacent to the road and into Bruce Park. HDD technology would be employed again to span Bruce Park and Indian Harbor, a distance of nearly 0.5 mile. This route then generally follows Davis Avenue, Indian Harbor Drive and Museum Drive west before turning north on Arch Street and extending beneath I-95 and the MNRR to Railroad Avenue. The route would turn west and follow Railroad Avenue to the Proposed Site. The Southern Alternative route segments are listed below.

Bruce Park Underground Open Trenching Variation: Similar to the Preferred Route, an open trenching construction variation for installation of the underground lines would generally follow Kinsman Lane and Bruce Park Drive to Davis Avenue.

Southern Alternative - Total Length = Approximately 11,780 feet (2.2 miles)
Approximately 12,220 feet (2.3 miles) with variation

S1 Originating in the Cos Cob Substation, the underground transmission lines would extend north from the substation and west through the main entrance from Sound Shore Drive, a distance of approximately 750 feet.

S2 The route would continue west on private property along Sound Shore Drive under I-95 to the intersection with Sachem Road, a distance of approximately 1,040 feet.

S3 The route would continue west under private property on Sound Shore Drive to an HDD staging area near One Sound Shore Drive, a distance of approximately 570 feet.

S4 An HDD would be used to cross under I-95 to a staging location near the end of Kinsman Lane (an approximate HDD distance of 1,770 feet). The route would continue with open trenching down Kinsman Lane to the intersection of Bruce Park Drive, a total segment distance of approximately 2,320 feet.

S5 A second HDD would cross under the Bruce Park ball fields and waterways to a receiving site on Davis Avenue just west of Home Place, a distance of approximately 1,800 feet.

S5V This open trenching variation would continue southwestward (from the west end of S4), along the north side of Kinsman Lane and Bruce Park Drive for a distance of approximately 2,240 feet to Davis Lane. This variation would require coffer dams be installed within the tidal water bodies that comprise Indian Harbor in Bruce Park.

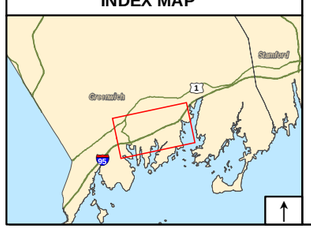
S6 The route would extend westward along Davis Avenue to its intersection with Indian Harbor Drive, a distance of approximately 1,100 feet.

S7 The route would continue west along Indian Harbor Drive and Museum Drive, which becomes Arch Street beyond the intersection with Steamboat Road. The route would continue along Arch Street, turning north and crossing beneath I-95 and the MNRR to the intersection with Railroad Avenue, a distance of approximately 2,940 feet.

S8 The route would turn west on Railroad Avenue to the Greenwich Substation, a distance of approximately 1,260 feet.

This route is not as desirable as the Preferred Route because the eastern portion of the Southern Alternative extends through a constrained area that lacks sufficient width for the new transmission lines to be located under Sound Shore Drive. Existing utilities would have to be relocated for the Project to utilize the roadway corridor and avoid impacting adjacent private properties. Conversely, moving the transmission lines off Sound Shore Drive would require the Company to obtain private property easements. The Southern Alternative route is depicted in Figure H-3, *Southern Alternative Map*.

INDEX MAP



Legend

- Southern Alternative Segment Point
- Southern Alternative
- Southern Alternative HDD Crossing
- Southern Alternative Open Trench Crossing
- Proposed Greenwich Substation Site
- Existing Cos Cob Substation

Base Map: 2012 Aerial Photograph (CTECO)

1 inch = 625 feet

625 312.5 0 625 Feet

Figure H-3
Southern Alternative Map

Greenwich Substation and Line Project

EVERSOURCE ENERGY

ALL-POINTS TECHNOLOGY CORPORATION

June 2015

H.4.2.2 Northern Alternative

The Northern Alternative runs along a lengthy section of US Route 1, mainly within the public ROW. This route would exit north out of Cos Cob Substation under the MNRR before turning east and then north, following Strickland Avenue to Route 1. It would then head generally west along Route 1 for nearly two miles before turning southwest onto Field Point Road, and terminate after crossing Railroad Avenue to enter the Proposed Site. The total length of the Northern Alternative is approximately 16,230 feet (3.1 miles). The route segments are listed below.

N1 Originating in the Cos Cob Substation, this portion of the route would extend north from the substation using a pipe jacking installation to cross under the MNRR corridor to Station Drive, a distance of approximately 880 feet.

N2 The route would extend north on Strickland Road to the intersection with East Putnam Avenue (Route 1), crossing I-95, a distance of approximately 3,150 feet.

N3 The route would turn west onto East Putnam Avenue and extend westward to the intersection with Indian Field Road, a distance of approximately 1,720 feet.

N4 The route would continue west on East Putnam Avenue to the intersection with Overlook Drive, a distance of approximately 2,000 feet.

N5 The route would continue southwest on East Putnam Avenue to the intersection with Milbank Avenue, a distance of approximately 2,830 feet.

N6 The route would continue southwest on East Putnam Avenue, which becomes West Putnam Avenue, to Field Point Road, a distance of approximately 2,880 feet.

N7 The route would follow Field Point Road south and cross Railroad Avenue into the proposed Greenwich Substation, a distance of approximately 2,770 feet.

The Northern Alternative is not as desirable as the Preferred Route because of its greater length (nearly one mile longer), conflicts with existing utilities, and ConnDOT's requirements for off-road vault locations, all of which could increase the Project's cost and likely prolong the construction schedule. Additionally, this route would have greater community and environmental impacts due to its passing through more densely populated areas than the Preferred Route, as well as through four historic districts.[34] Finally, a number of easements on private property would need to be

[34] These resources are listed on the National Register of Historic Places and include the Strickland Road Historic District; the Putnam Hill Historic District; the Greenwich Municipal Center Historic District; and, the Greenwich Avenue Historic District. A fifth area, the Fourth Ward Historic District, is located immediately north of Route 1 between the Putnam Hill and Greenwich Avenue districts.

acquired for the placement of the splice vaults. The Northern Alternative route is depicted in Figure H-4 *Northern Alternative Map*.

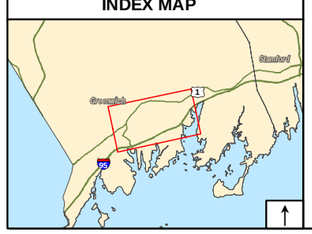
H.4.2.3 Other Underground Routes Considered and Rejected

Underground Central Route

This route would exit Cos Cob Substation north beneath the MNRR and turn west, extending beneath private and Town-owned properties along Station Drive and Circle Drive for nearly 0.75 mile to an HDD staging area to be located on residential property off of Circle Drive Extension. The route would extend southwest beneath private properties, the MNRR, I-95 and Indian Harbor to Davis Avenue via an HDD crossing. At Davis Street the route would revert to open trenching construction and follow Davis Avenue, Indian Harbor Drive and Museum Drive westward before turning north on Arch Street to Railroad Avenue. The route would turn 90 degrees and follow Railroad Avenue before interconnecting with the Greenwich Substation. This option would require the use of several private and Town-owned parcels along Station Drive, Intrieri Lane, Circle Drive, Circle Drive Extension, Woodside Drive, Davis Avenue, and Railroad Avenue, resulting in significant disruption to several residential neighborhoods and, depending on the vault locations, requires 10 or more easements with a high probability for some property acquisitions, due to the size of the parcels and the areas likely needed for the splice vaults.

Based on the high level of community impact and the probable property acquisition requirements, and the availability of a more feasible alternative, this underground option was removed from further consideration.

INDEX MAP



Legend

- Northern Alternative Segment Point
- Northern Alternative
- Proposed Greenwich Substation Site
- Existing Cos Cob Substation

Base Map: 2012 Aerial Photograph (CTECO)

1 inch = 700 feet

625 312.5 0 625 Feet

Figure H-4
Northern Alternative Map

Greenwich Substation and Line Project

EVERSOURCE ENERGY

ALL-POINTS TECHNOLOGY CORPORATION

June 2015

Underground Central Route Using Existing Distribution ROW

This underground option would expand Eversource's existing distribution ROW east of Indian Harbor. After exiting Cos Cob Substation northward under the MNRR, the route would turn west on private properties and parallel the north side of Station Drive for nearly 0.5 mile. After crossing Indian Field Road, this route would follow the north side of the existing ROW for approximately another 0.5 mile to an HDD staging area to be located on a residential property south of Woodside Drive. This option would require open trenching and/or equipment staging on several private and Town-owned parcels along Station Drive, Intrieri Lane, Circle Drive, Circle Drive Extension, and Woodside Drive. The route would extend southwest via HDD beneath private properties, the MNRR, I-95 and Indian Harbor to Davis Avenue. Transitioning back to open trenching, this route would then follow Davis Avenue, Indian Harbor Drive and Museum Drive westward before turning north on Arch Street to Railroad Avenue. The route would turn 90 degrees following Railroad Avenue before entering the Greenwich Substation. Approximately 21 residential properties would be affected by the expansion of the ROW, which would also require the removal of existing trees that currently screen these backyards from the MNRR and I-95. Approximately eight additional residential properties would be impacted in order for the route to reach the ROW from Cos Cob Substation. Similar to the Underground Central Route mentioned above, construction along this route would disrupt several residential neighborhoods and, depending on the vault locations, require an estimated 18 or more easements and six or more property acquisitions.

Due to the high level of community impact and property acquisition requirements, and the availability of a more feasible alternative, this underground option was removed from further consideration.

H.4.3 Marine Route

This route option involves an underground/submarine line exiting Cos Cob Substation under Cos Cob Park directly into Cos Cob Harbor and extending south and west around Indian Field Point and Tweed Island before turning north and coming ashore in the vicinity of the Town's water treatment plant. The lines would continue underground north along Shore Road, under I-95, then turn east onto Horseneck Lane and then north on Arch Street, crossing beneath the MNRR to Railroad Avenue. This route would then turn west following Railroad Avenue to the Greenwich Substation. The marine route is significantly longer than the land routes considered and poses additional permitting, construction and maintenance challenges. Environmental permitting process and review might jeopardize the Project schedule as state and federal regulations and

policies provide much higher levels of protection to water dependent uses. Generally, if there is a reasonable opportunity to avoid impacts on water dependent uses, then alternative overland routes are preferred. Eversource would have to provide overwhelming evidence that no overland routes are feasible for regulatory agencies to consider a marine route through Long Island Sound. Further, installation of transmission supply lines below the seabed would require the use of costly technology and the work within the harbor would be difficult as the channel is very narrow and shallow in several areas.

In addition to these challenges and limitations, future dredging activities could pose a risk to the submerged lines. The route passes through several boat moorings and near marinas, which could significantly hamper construction efforts.

Given the challenges associated with a marine route option, and the availability of feasible alternatives, a marine option for the transmission supply line route was removed from further consideration.

H.4.4 Combination Routes

Two combination routes were also assessed, incorporating underground, overhead and marine route segments. These combination routes are discussed below.

Southern Route Marine and Underground Line Combination Route

This route would exit Cos Cob Substation underground across Cos Cob Park and, using HDD techniques, extend southwest under Cos Cob Harbor and come ashore on private property on Mead Point. An underground line segment would then extend west through private property, across Indian Field Road, and beneath Town-owned property to Bruce Park Drive. A second HDD crossing would be required through Bruce Park and Indian Harbor to Davis Avenue. This route would then follow Davis Avenue, Indian Harbor Drive and Museum Drive westward before turning north on Arch Street to Railroad Avenue. It would then turn 90 degrees following Railroad Avenue before interconnecting with the Greenwich Substation. The marine line segment poses similar challenges to those discussed above regarding the Marine Route. Plus, the transition to the underground line would need to cross private property.

Given the impacts to Cos Cob Park, the need to cross private property, the challenges of a marine route, and the availability of more feasible alternatives, this option was removed from further consideration.

Central Route East Side Overhead and West Side Underground Combination Route

This combination route would extend overhead lines from Cos Cob Substation to Bruce Park Avenue west of Indian Harbor where it would transition to an underground design within private property, and follow Bruce Park Avenue and Railroad Avenue directly to the Greenwich Substation. The overhead line portion would follow Station Drive and Eversource's existing distribution ROW.

Variation: A variation of this route would extend the overhead lines to a staging area to be located on a residential property off Circle Drive Extension, where it would transition to an underground design and cross beneath the MNRR, I-95 and Indian Harbor to Davis Avenue via HDD. From there, the route follows Davis Avenue, Indian Harbor Drive and Museum Drive west and then north on Arch Street to Railroad Avenue, where the route would turn west again to the Greenwich Substation.

The combination routes and variation would encounter similar constraints as those described for the other underground and marine routes considered and rejected. Over 50 properties would be directly impacted in order to expand the existing Eversource distribution ROW to accommodate the new overhead transmission supply lines and would also require the removal of trees that currently provide screening between the MNRR and I-95 corridors and nearby residences.

Given the greater community impacts, potential property acquisition requirements and the availability of feasible alternatives, these options were removed from further consideration.

H.4.5 Selection of Preferred Route Conclusion

After analyzing and comparing key factors associated with the route options discussed above, three potentially viable underground line routes were identified for further consideration: the Preferred Route, Southern Alternative, and Northern Alternative. Table H-2 summarizes the key factors associated with evaluating each of the three potentially viable routes. The Preferred Route was selected by the Company as the most feasible route for building the new transmission supply lines based on its length and impacts to environmental, cultural, and community resources.

Table H-2 Route Analysis Summary

Key Factors	Preferred Route	Southern Alternative	Northern Alternative
Route Length	2.3* miles	2.2 miles	3.1 miles
ConnDOT Encroachment Agreement Required	No	No	Yes
ConnDOT Encroachment Permit	Yes	Yes	Yes
ConnDOT Rails License Agreement	Yes	Yes	Yes
MNRR License Agreement	Yes	Yes	Yes
Impacts on Environmental and Cultural Resources	Minimal	Minimal	Moderate
Underground Utilities Congestion	Least	Greater	Greatest
Constructability Challenges[35]	Minimal	Greater	Greatest
Easements Required[36]	10	6	10
Estimated Number of Vault Locations	6	6	8

*If Bruce Park open trench or other alternative crossing variation is selected, the Preferred Route would be slightly longer.

H.4.6 Selection of Underground Transmission System Design

In addition to analyzing potential routes, the Company also considered different design technologies for the proposed underground transmission supply lines, settling on two underground cable technology options: HPFF (high pressure fluid-filled) pipe type cable and cross-linked polyethylene ("XLPE") cable (the Company had previously concluded that two supply lines would be required to ensure a reliable power source). Based on the Company's analysis, use of two HPFF cable circuits was determined to be the most appropriate for the Project for the following reasons:

- The HPFF cable can be provided in longer lengths, so fewer vaults and cable splices will be required along the route, resulting in a more cost-effective Project (less labor and material costs). Fewer vaults also results in fewer cable splices and accessories, which improves reliability since accessories have a higher rate of failure;
- A double circuit HPFF cable system can take advantage of a single splice vault, unlike XLPE cables, which would require separate vaults for a double circuit installation. Fewer vaults results in less excavation than a comparable XLPE cable system, and require a smaller footprint, have a shorter construction window, and, as such, result in less impact to the community;
- HPFF cable systems have the ability to circulate the dielectric fluid to smooth out (mitigate) hot spots along the cable route, effectively increasing the circuit capacity. This provides a

[35] Includes length and angle of HDD, need for all off-road easements, limited work hours, and space constraints.

[36] Estimated; all with varying complexities.

great advantage over XLPE cable systems when running parallel to existing heat sources (i.e., existing distribution circuits near the substations, capable of de-rating the circuit or in the deeper installations of the route, such as the HDD crossings) whereas XLPE cables must be sized for the worst case condition;

- The three power cables for each circuit are installed in a single 8-inch pipe versus a duct bank consisting of three individual 8-inch PVC conduits encased in concrete as used for the XLPE cable system;
- HPFF cable systems can be upgraded with forced-cooling equipment to expand the load carrying capacity in the future with minimal impacts; and,
- The load at the Greenwich Substation does not require the larger conductors that are available with XLPE cable technology.

I. Existing Conditions

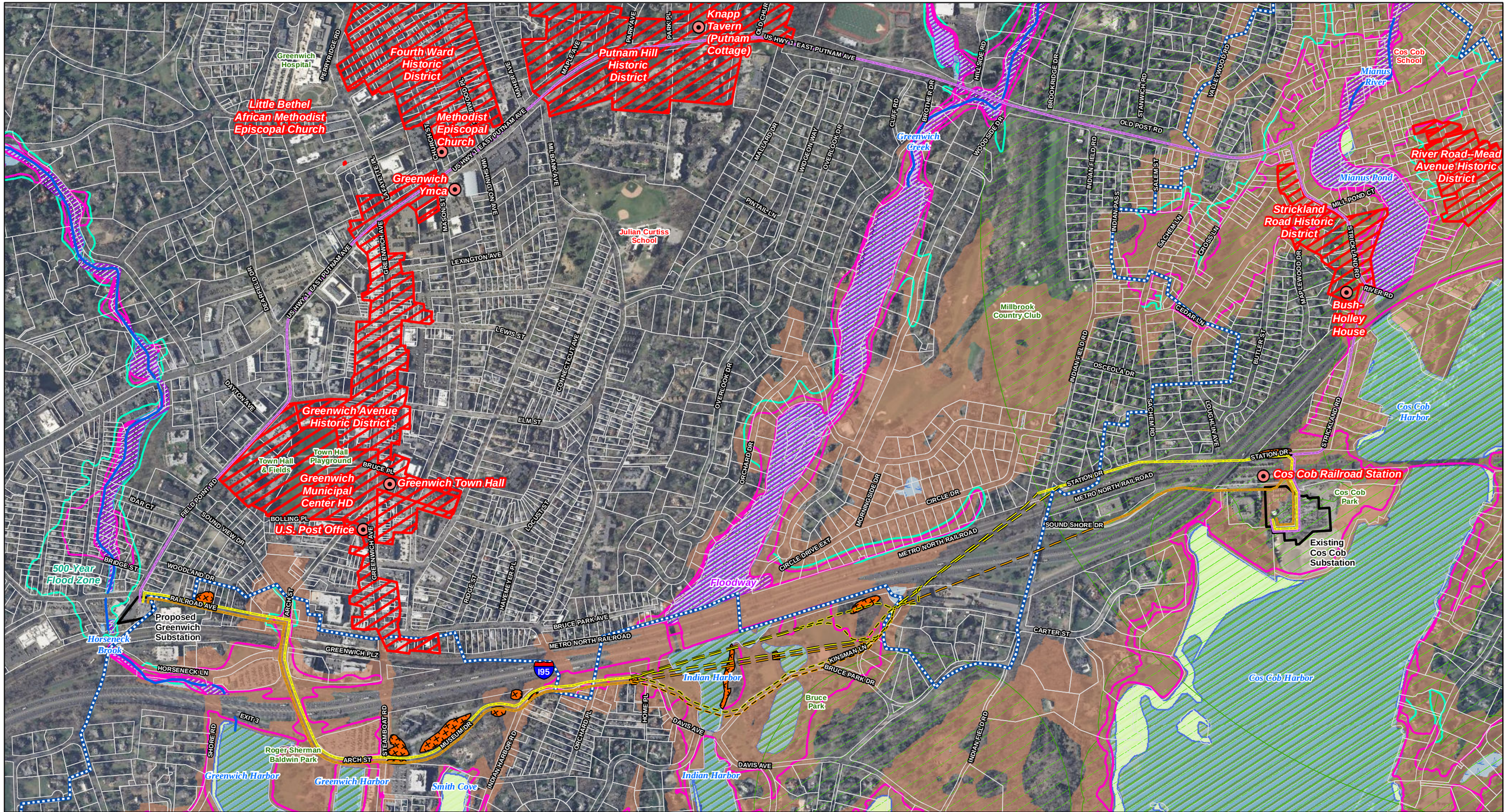
This section describes the existing environmental conditions at the Proposed Site and along the Preferred Route and alternate routes as well as at the Cos Cob Substation property. The information presented herein provides a context for the discussion in Section J, which considers the extent to which the Project could potentially affect resources and how such effects may be mitigated.

I.1 Project Area

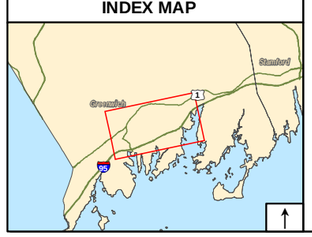
This section summarizes existing land uses and natural resources located within the "Project Area", which is generally defined as being bound to the west by the Proposed Site; to the east by Cos Cob Substation; and to the north and south by the Preferred and Alternate Routes. The principal land use features and natural resources within the Project Area are depicted on Figure I-1, *Project Area Environmental Resources Map*.

I.1.1 Topography, Geology and Soils

Bedrock geology in the Project Area consists of two different forms of gneiss and one form of schist, Pumpkin Ground Member of Harrison Gneiss, Ordovician Granitic Gneiss and The Trap Falls Formation (schist). The Pumpkin Ground Member of Harrison Gneiss is gray to spotted, medium to coarse grained, foliated gneiss. The Ordovician Granitic Gneiss is light-colored, foliate granitic gneiss. The Trap Falls Formation consists of gray to silvery, partly rusty weathering, medium grained schist.



INDEX MAP



Legend

- Preferred Route
- Preferred Route HDD Crossing
- Preferred Route Open Trench Crossing
- Southern Alternative
- Southern Alternative HDD Crossing
- Southern Alternative Open Trench Crossing
- Northern Alternative

- Bedrock Outcrops
- National Register of Historic Places Site
- National Register of Historic Places Historic District
- Natural Diversity Database Area
- Inland Wetland
- Tidal/Coastal Resource
- CTDEEP Tidal Wetland (1990)

- CTDEEP Watercourse
- CTDEEP Coastal Boundary
- CTDEEP Hurricane Surge Inundation

FEMA Flood Zones

- 100-Year Flood Zone
- 500-Year Flood Zone
- Floodway

- Greenwich Parcels (Greenwich GIS)
- Proposed Greenwich Substation Site
- Existing Cos Cob Substation

1 inch = 750 feet

750 375 0 750 Feet

Base Map: 2012 Aerial Photograph (CTECO) Data Sources: CTDEEP GIS, FEMA, CL&P, and APT Field Inventory 2014

Figure I-1
Project Area Environmental Resources Map

Greenwich Substation and Line Project

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June 2015

Surficial geology in the Project Area varies and consists of different thicknesses of sand, gravel and glacial till (till), as well as significant areas of artificial fill deposition. Information concerning the physical properties and classification of soils in the vicinity of the Project is presented in Table I-1.

Table I-1 Principal Soil Associations within the Project Area

Soil Map Unit Name and Symbol	General Description	Hydric Soil	Depth to Bedrock
Urban land Charlton – Chatfield complex	Highly developed areas interspersed with well drained till based soils	No	0-25 feet
Udorthents - Urban land complex	Areas of substantial cutting or filling interspersed with highly developed areas	No	0-25 feet
Urban land	Highly developed areas	No	0-25 feet

Sources: USDA Soil Conservation Service, Soil Surveys of Fairfield County Soil Survey Staff; Natural Resources Conservation Service, United States Department of Agriculture; Soil Survey Geographic (SSURGO) http://soildatamart.nrcs.usda.gov

This information provides a useful baseline for identifying areas of hydric soils (which signal the presence of a wetland); for assessing the potential for erosion and sedimentation ("E&S") during construction; and for planning appropriate mitigation measures (including E&S controls) to be implemented during Project construction.

Descriptions of soil types identified along the Preferred Route were obtained from the U.S. Department of Agriculture ("USDA"), Natural Resource Conservation Service ("NRCS") Web Soil Survey, and the USDA NRCS Soil Survey Geographic ("SSURGO") database.

The Charlton series consists of very deep, well drained loamy soils formed in till derived from parent materials that are very low in iron sulfides. They range from nearly level to very steep soils on till plains and hills. Slope ranges from 0 to 50 percent. Saturated hydraulic conductivity is moderately high or high.

The Chatfield series consists of well drained and somewhat excessively drained soils formed in till derived from parent materials that are very low in iron sulfides. They are moderately deep to bedrock. These are nearly level through very steep soils on glaciated plains, hills, and ridges.

Slope ranges from 0 through 70 percent. Saturated hydraulic conductivity is moderately high or high in the mineral soil.

Udorthents-Urban land complex soils typically consist of variably drained soils that have been disturbed by cutting or filling, and areas that are covered by buildings and pavement. Most areas of these components are so intermingled that it is not practical to map them separately. These soils are in areas that have been cut to a depth of 2 feet or more or are on areas with more than 2 feet of fill.

Urban land consists entirely of man-made surfaces such as pavement, concrete and buildings. Urban land is typically impervious and will not infiltrate water.

I.1.2 Water Resources

The Project Area is located within the Southwest Coast Major Drainage Basin. Major surface water bodies include Long Island Sound, Indian Harbor, Cos Cob Harbor, Greenwich Creek, Horseneck Brook, Greenwich Harbor, Smith Cove and the Mianus River.

I.1.2.1 Groundwater Resources

No private or public water supply wells are located within the Project Area.

I.1.2.2 Flood Hazard Areas

Portions of the Project Area lie within 100-year and 500-year flood boundaries.

I.1.2.3 Coastal Area Resources

Portions of the Project Area lie within the Coastal Boundary. Worst Case Hurricane Surge Inundation data developed by the National Hurricane Center indicate that portions of the Project area are located within Category 1, 2, 3, and 4 areas[37]. These Hurricane Surge Inundation areas are focused along low-lying areas adjacent to Indian Harbor and in Bruce Park.

[37] CT DEEP Geographic Information System data, based on *Worst Case Hurricane Surge Inundation* areas for category 1 through 4 hurricanes striking the coast of Connecticut. Hurricane surge values were developed by the National Hurricane Center using the SLOSH (Sea Lake and Overland Surge from Hurricanes) Model to assist emergency management officials in hurricane preparedness and operations.

I.1.2.4 Inland and Tidal Wetlands and Watercourses

Several wetland resources were identified within the Project Area, as depicted on Figure I-2, *Wetlands Map* and discussed further in this section.

Wetland 1

Wetland 1 is a forested riverine wetland system, associated with Horseneck Brook, located west and south of the Proposed Site for the proposed Greenwich Substation. The system consists of a well incised forested perennial stream that outfalls from a culvert to the rear (south) of the existing Prospect Substation property parking area. It flows south, passing under the intersection of Horseneck Lane and Field Point Road and the MNRR ROW before continuing east paralleling Horseneck Lane. It then passes under Shore Road, at which point indicators of tidal influence were observed. The banks at the crossing point under Shore Road are armored up to the concrete headwalls. Several storm water outlet pipes were observed draining into this stream system. This system continues as an estuarine embayment south of I-95 and west of Shore Road, part of Greenwich Harbor. This area is characterized as having a narrow tidal fringe primarily consisting of common reed, high-tide bush, and various species of grasses. The shore is well developed with rock armoring.

Wetland 2

Wetland 2 is an estuarine bay located south of Arch Street and west of Steamboat Road within Greenwich Harbor. It is primarily developed with a marina.

Wetland 3

Wetland 3 is an estuarine tidal marsh located south of Arch Street and east of Steamboat Road, directly south of Bruce Park Museum. This marsh contains an interior channel within Smith Cove that has broad areas of tidal marsh grasses and common reed.

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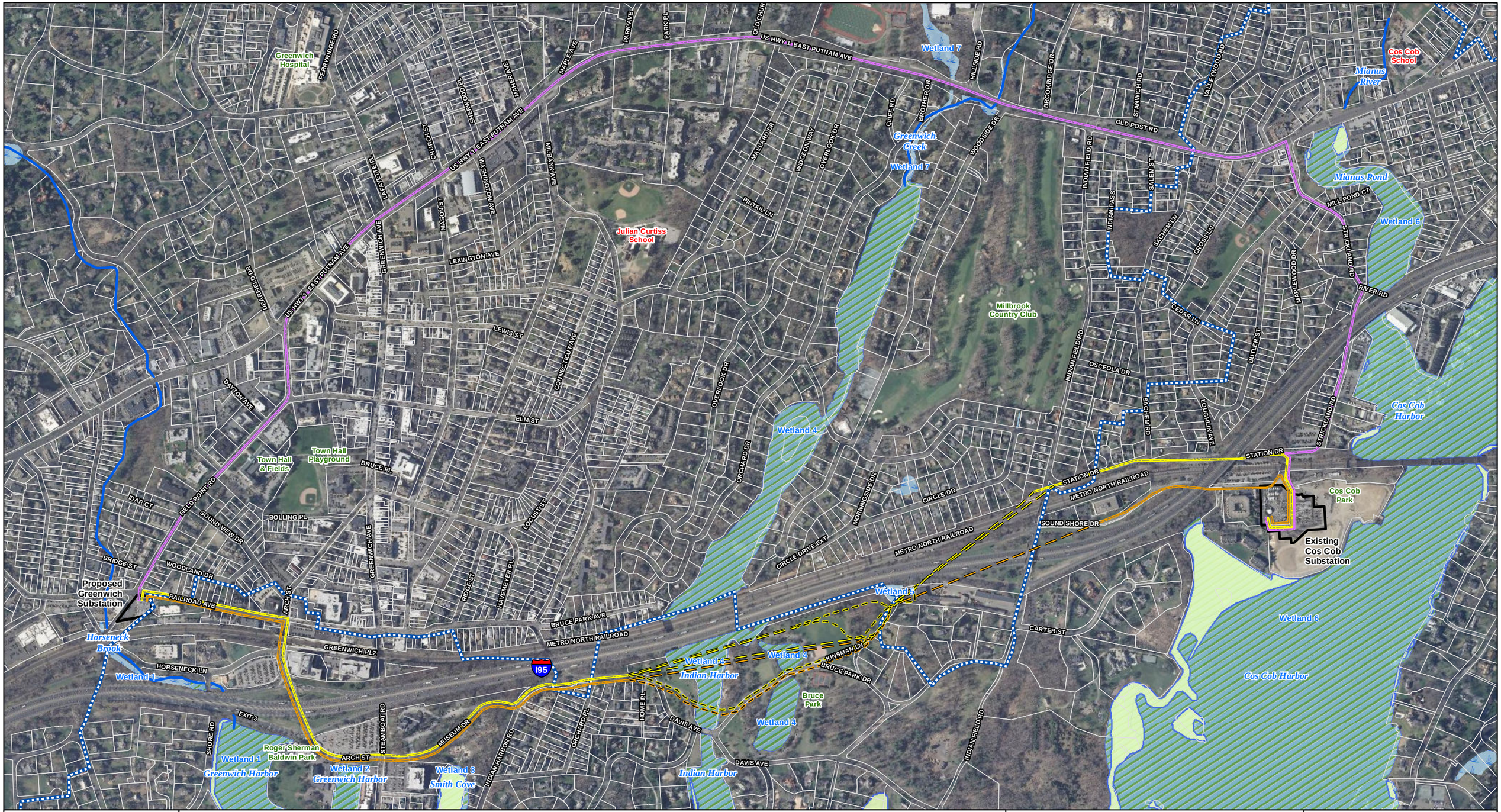
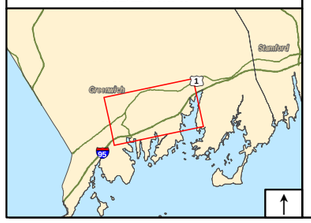


INDEX MAP



Legend

- Preferred Route
- Preferred Route HDD Crossing
- Preferred Route Open Trench Crossing
- Southern Alternative
- Southern Alternative HDD Crossing
- Southern Alternative Open Trench Crossing
- Northern Alternative

Project Area Wetlands

- Inland Wetland
- Tidal/Coastal Resource
- CTDEEP Tidal Wetland (1990)
- CTDEEP Watercourse
- CTDEEP Coastal Boundary

- Greenwich Parcels (Greenwich GIS)
- Proposed Greenwich Substation Site
- Existing Cos Cob Substation

1 inch = 750 feet

750 375 0 750 Feet

Base Map: 2012 Aerial Photograph (CTECO) Data Sources: CTDEEP GIS, FEMA, CL&P, and APT Field Inventory 2014

Figure I-2
Wetlands Map

Greenwich Substation and Line Project

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June 2015

Wetland 4

Wetland 4 is a complex of open water wetland areas south of I-95 consisting of slow moving estuarine tidal open water features located interior to Bruce Park. This large wetland system generally drains southward from its connection to Greenwich Creek via a channel/crossing structure under I-95. This system eventually drains into Indian Harbor and Long Island Sound. The banks of this wetland system are well developed with stone armoring, maintained lawn, sheer bedrock cliffs, and some limited vegetated buffers. Easterly limits of the resource include vegetated buffering and stagnant back-water wetland areas. A small isolated common reed bordering vegetated wetland area occurs within the southeast portion of the delineated resource along the eastern bank. Numerous waterfowl were observed utilizing this wetland habitat including ospreys, double crested cormorants, mute swans, snowy egrets, green heron, and Canadian geese. Northern limits of the resource are heavily influenced by road debris originating from I-95.

Wetland 5

Wetland 5 is an isolated Palustrine forested wetland depression surrounded by dense development including I-95 to the north, commercial operations to the east, residences to the south along Kinsman Lane, and Bruce Park to the west. The area is characterized by large amounts of refuse and debris likely originating from I-95. A sand delta was also noted originating from a storm water outfall to the north likely resulting from road drainage from I-95. Wetland 5 is seasonally flooded consisting of approximately two feet or more of standing water (observed during an April 2015 inspection). This resource does not support vernal pool habitat.

Wetland 6

Wetland 6 is a combination estuarine tidal marsh and estuarine embayment that surrounds three sides of Cos Cob Substation. The tidal marsh, to the south/southwest, consists of a large open water tidal area and various degrees of tidal fringe dominated by common reed. The estuarine embayment, south/southeast side of Cos Cob Substation, extends north to Boston Post Road, east of Strickland Road, and south into Cos Cob Harbor. This portion of Wetland 6 differs from its tidal marsh component in that the banks are entirely developed with no tidal fringe.

Wetland 7

Wetland 7 is associated with Greenwich Creek, which consists of a series of forested Palustrine perennial streams located both north and south of Boston Post Road in the vicinity of Hillside Road. Several well-incised stream channels form this system, generally draining south towards Wetland 4.

I.1.3 Trees and Landscaping in the Project Area:

Figure I-3, *Trees and Landscaping Map* depicts the existing trees and landscaping proximate to the Preferred Route and Alternate Routes. In general, larger stands of trees are found in the southern portion of the Project Area, particularly in and around Bruce Park and the MNRR and I-95 transportation corridors. Landscaping and individual tree specimens measuring 6 inches or greater characterize the northern Project Area along Route 1.

I.1.4 Wildlife and Vegetation

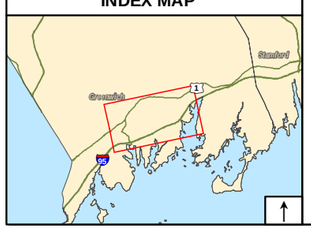
With the exception of Bruce Park, Greenwich Creek and Long Island Sound (including its various harbors) the Project Area possesses little to no wildlife habitat. Vegetation consists primarily of maintained lawns and a combination of natural and ornamental trees and shrubs along roadsides and on private properties.

I.1.4.1 Threatened and Endangered Species

CT DEEP's Natural Diversity Data Base ("NDDB") program performs hundreds of environmental reviews each year to determine the impact of proposed development projects on state-listed species and to help landowners conserve the state's biodiversity. State agencies are required to ensure that any activity authorized, funded or performed by a state agency does not threaten the continued existence of endangered or threatened species. Maps have been developed to serve as a pre-screening tool to help applicants determine if there is a potential impact to state-listed species.

The NDDB maps represent approximate locations of endangered or threatened species, special concern species and significant natural communities in Connecticut. The locations of species and natural communities depicted on the maps are based on data collected over the years by CT DEEP staff, scientists, conservation groups, and landowners. In some cases an occurrence represents a location derived from literature, museum records and/or specimens. These data are compiled and maintained in the NDDB. The general locations of species and communities

INDEX MAP



Legend

- Preferred Route
- Preferred Route HDD Crossing
- Preferred Route Open Trench Crossing
- Southern Alternative
- Southern Alternative HDD Crossing
- Southern Alternative Open Trench Crossing
- Northern Alternative

- Singular Trees
- Grouping of Trees
- Landscaped Areas
- Open Water
- Greenwich Parcels (Greenwich GIS)

- Proposed Greenwich Substation Site
- Existing Cos Cob Substation

Base Map: 2012 Aerial Photograph (CTECO) Source: APT Field Inventory 2014

1 inch = 750 feet

750 375 0 750 Feet

Figure I-3
Trees and Landscaping within Project Area

Greenwich Substation and Line Project

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ALL-POINTS TECHNOLOGY CORPORATION

June 2015

are symbolized as shaded areas on the maps. Exact locations have been masked on the NDDB maps to protect sensitive species from collection and disturbance and to protect landowner's rights whenever species occur on private property.

CT DEEP NDDB mapping depicts polygons (areas of known habitat for state-listed endangered or threatened species, or species of special concern) in the eastern portion of the Project Area. The Company consulted with CT DEEP NDDB regarding the Project and the agency determined that no such resources within the Project Area would be impacted by the proposed activities (see Section J.3.1). A copy of the CT DEEP letter is provided in Appendix E, *Agency Correspondence*. The Project Area does not include any mapped areas of Critical Habitat.[38]

The Company also reviewed information on the U.S. Fish and Wildlife Service ("USFWS") Information, Planning, and Conservation System ("IPaC") to determine if any federally-listed or proposed, threatened or endangered species or critical habitat exist in the Project Area. The Company secured a confirmation letter from the agency that no listed species or critical habitats occur in the Project Area. A copy of the USFWS letter is provided in Appendix E, *Agency Correspondence*.

The Company also consulted with the U.S. Fish and Wildlife Service ("USFWS") to determine if any federally-listed or proposed, threatened or endangered species or critical habit exist on or proximate to the Project Area. The agency responded in writing that no such resources occur in the Project Area. A copy of the USFWS letter is provided in Appendix E, *Agency Correspondence*.

I.1.4.2 Fisheries

No CT DEEP Fisheries Management Areas exist in the Project Area. According to CT DEEP Fisheries Management data, the nearest fishery is associated with the upper portion of the Mianus River, approximately 3,300 feet northeast of the Strickland Road-Route 1 intersection. This portion of the Mianus River is designated as a Sea Run Trout Stream, indicating that the waters

[38] Connecticut Critical Habitats depict the classification and distribution of 25 rare and specialized wildlife habitats in the state. It represents a compilation of ecological information collected over many years by state agencies, conservation organizations and individuals. Critical habitats range in size from areas less than one acre to areas that are tens of acres in extent. The Connecticut Critical Habitats information can serve to highlight ecologically significant areas and to target areas of species diversity for land conservation and protection.

are believed to be able to support anadromous brown trout. The area is periodically stocked with fingerling and yearling brown trout.

I.1.5 Local, State and Federal Land Use

The Company reviewed local planning, zoning and inland wetlands and watercourses regulations to evaluate the Project's consistency with these documents.

The Company has also reviewed the *Conservation and Development Policies Plan for Connecticut 2013 - 2018* ("C&D Plan") for information relating to the state's growth in general, and which also provided information specifically on Greenwich and neighboring communities. The objective of the C&D Plan is to guide and balance regional and state development plans in response to human, environmental, and economic needs in a manner that best suits Connecticut's future.

In addition, the Company also reviewed future land-use and planning objectives of the South Western Regional Planning Agency ("SWRPA"), the regional planning agency encompassing the Project Area. There are no federal properties or federally-designated areas located on or proximate to the Project Area.

I.1.6 Historic and Archaeological Resources

The Company retained the services of Heritage Consultants, LLC of Newington, Connecticut ("Heritage"), to review and evaluate historic and archaeological resources (collectively, "cultural" resources) within the entire Project area. Several sites listed on the National Register of Historic Places ("NRHP") are located in the Project Area, including the Cos Cob Railroad Station, Bush Holly House, Knapp Tavern, Greenwich YMCA, the Methodist Episcopal Church, Post Office and Town Hall. In addition, six Historic Districts are listed on the NRHP, including the: Greenwich Municipal Center Historic District; Greenwich Avenue Historic District; Fourth Ward Historic District; the Putnam Hill Historic District; Strickland Road Historic District; and, River Road-Mead Avenue Historic District. The Heritage assessment report, entitled *Cultural Resources Review of the Project Region Associated with the Proposed Substation and Transmission Line Project in Greenwich, Connecticut* is provided as Appendix F.

I.1.7 Noise

Land uses within the Project Area consist of a mix of transportation, commercial, recreational and residential land uses. The existing noise environment is heavily influenced by traffic noise along local and state roads, including I-95, and the MNRR corridor.

I.1.8 Air Quality

Ambient air quality is affected by pollutants emitted from both mobile sources (e.g., automobiles, trucks) and stationary sources (e.g., manufacturing facilities, power plants, and gasoline stations). Also, naturally occurring pollutants, such as radon gas or emissions from forest fires, affect air quality. In addition to emissions from sources within the state, Connecticut's air quality is significantly affected by pollutants emitted in states located to the south and west, and then transported into Connecticut by prevailing winds. Ambient air quality in the state is monitored and evaluated by the CT DEEP. Air quality is assessed in terms of compliance with the National Ambient Air Quality Standards ("NAAQS") for selected "criteria" pollutants, as well as conformance with regulations governing the release of toxic or hazardous air pollutants.

The state is currently designated as in attainment or is unclassified with respect to the NAAQS standards for five criteria air pollutants: particulate matter no greater than 10 micrometers in diameter (PM10), sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead. In addition to these criteria pollutants, the state is currently designated as being in non-attainment with the 8-hour NAAQS standard for ozone, and the 2006 24-hour fine particulate matter (PM2.5) standard. Fairfield County is non-attainment for both the 8-hour ozone and 24-hour PM2.5 standard.

The U.S. Environmental Protection Agency ("EPA") has determined that carbon dioxide ("CO2") is a pollutant and has included CO2 in its list of criteria pollutants. Areas of non-attainment have not yet been established for CO2 or other greenhouse gases.

I.1.9 Scenic and Recreational Areas, Statutory Facilities and Surrounding Features

Numerous Statutory Facilities are located in the Project Area. Being in close proximity to Long Island Sound, scenic and recreational opportunities exist in the southern portion of the Project Area associated with water access. No scenic or recreational areas exist north of the MNRR and

I-95. Table I-2 lists the Statutory Facilities and other surrounding features[39] within or proximate to the Project Area.

Table I-2 Statutory Facilities and Other Surrounding Features in the Project Area

Type	Name	Address
Child Day Care	Chabad Lubavitch of Greenwich	75 Mason Street
Child Day Care	Children's Day School	8 Riverside Avenue
Child Day Care	Christ Church Nursery School	254 East Putnam Avenue
Child Day Care	Cos Cob Play Group	54 Bible Street
Child Day Care	Family Centers First Steps	Armstrong Court - Building #8
Child Day Care	Family Centers Preschool	40 Arch Street
Child Day Care	First Presbyterian Church Nursery School	37 Lafayette Place
Child Day Care	Greenwich Family YMCA	184 Hamilton Avenue
Child Day Care	Greenwich Family YMCA Child Care	2 St Roch Avenue
Child Day Care	Greenwich Spanish School	6 Riverside Avenue -#109
Child Day Care	Joan Melber Warburg Early Childhood	22 Bridge Street
Child Day Care	Kids Corner Preschool	Armstrong Court - Building #2
Child Day Care	Little Friends	25 Valley Drive
Child Day Care	Mencius Mandarin Preschool	59 East Putnam Avenue
Child Day Care	Putnam Indian Field School	101 Indian Field Road
Child Day Care	Selma Maisel Nursery School	300 East Putnam Avenue
Child Day Care	St Paul's Day School	200 Riverside Avenue
Child Day Care	The Preschool at Second Congregational Church	139 East Putnam Avenue
Child Day Care	First Presbyterian Church Nursery School	1 West Putnam Avenue
Child Day Care	Wideworld Children's Corner	521 East Putnam Avenue
Child Day Care	YMCA Child Care	259 East Putnam Avenue
Recreation	Millbrook Country Club	61 Woodside Drive
Recreation	YMCA	259 East Putnam Avenue
Hospital	Greenwich Hospital	5 Perryridge Road
Park	Bruce Park	Bruce Park Drive
Park	Christiano Park	Holly Hill Avenue/Lyon Avenue
Park	Grass Island Marina	Grass Island
Park	Mianus Park	Cary Road
Park	Roger Sherman Baldwin Park	Arch Street
Park	Town Hall & Fields	101 Field Point Road
Park	Cos Cob Park	Sound Shore Drive
Playground	Christiano Park	Holly Hill Avenue/Lyon Avenue
Playground	Cos Cob School	350 East Putnam Avenue

[39] Statutory Facilities are defined in CGS 16-50*l*(a)(1)(A). The Council's *Application Guide for Electric Substation Facilities* and *Application Guide for Electric and Fuel Transmission Line Facilities* requires applicants to identify a project's proximity to these resources.

Type	Name	Address
Playground	Julian Curtiss School	180 East Elm Street
Playground	Loughlin Avenue Playground	59 Loughlin Avenue
Playground	Town Hall & Fields	Greenwich Avenue
Private School	Brunswick School	100 Maher Avenue
Private School	Carmel Academy	44 Rock Ridge Avenue
Private School	Greenwich Academy	200 North Maple Avenue
Private School	Greenwich Country Day School	401 Old Church Road
Private School	The Greenwich Japanese School	276 Lake Avenue
Public School	Central Middle School	9 Indian Rock Lane
Public School	Cos Cob School	350 East Putnam Avenue
Public School	Eastern Middle School	51 Hendrie Avenue
Public School	Greenwich High School	10 Hillside Road
Public School	Hamilton Avenue School	184 Hamilton Avenue
Public School	Julian Curtiss School	180 East Elm Street
Youth Camp	Boys & Girls Club of Greenwich	4 Horseneck Lane
Youth Camp	Camp Gan Israel	270 Lake Avenue
Youth Camp	Camp Shine	254 Putnam Avenue
Youth Camp	Camp Ta-Yi-To	259 East Putnam Avenue
Youth Camp	ESF Summer Camps	200 North Maple Ave
Youth Camp	Greenwich Country Day School Day Camp	401 Old Church Road
Youth Camp	Greenwich Family YMCA Sports Camp	50 East Putnam Avenue
Youth Camp	Greenwich Historical Society History & Arts Camp	39 Strickland Road
Youth Camp	Millbrook Lion Cubs Camp	61 Woodside Drive
Youth Camp	The Field Club Camp	276 Lake Avenue

Figure I-4, *Statutory Facilities and Other Surrounding Features* depicts the locations of these resources.

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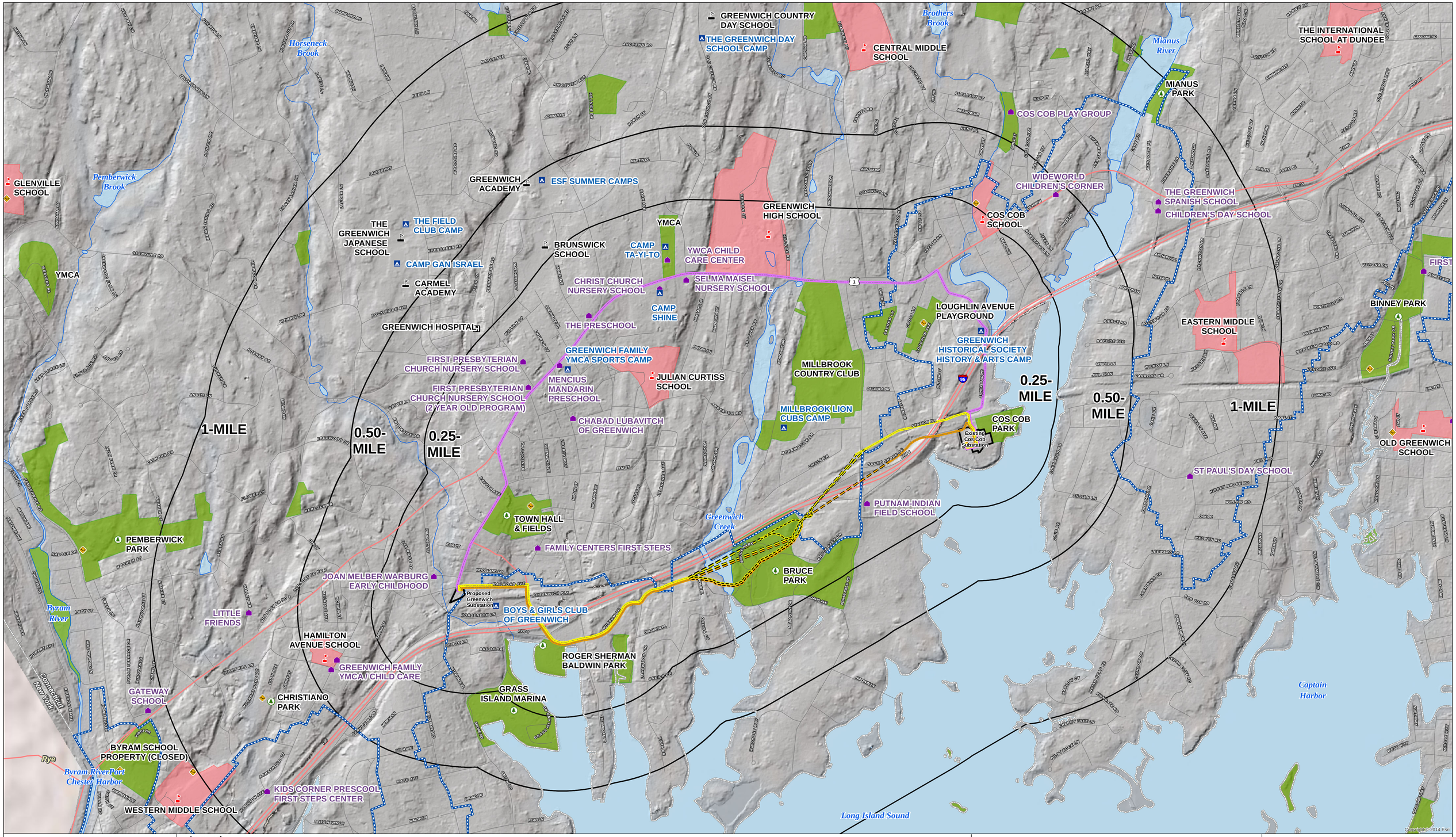


INDEX MAP

Legend

- Preferred Route
- Preferred Route HDD Crossing
- Preferred Route Open Trench Crossing
- Southern Alternative
- Southern Alternative HDD Crossing
- Southern Alternative Open Trench Crossing
- Northern Alternative

- Park
- Public Playground
- Private School
- Public School
- Hospital
- Youth Camp
- Licensed Child Day Care

- Watercourse
- CTDEEP Coastal Boundary
- Municipal and Private Open Space
- Public School
- Municipal Boundary
- State Line

- Proposed Greenwich Substation Site
- Existing Cos Cob Substation

N W E S

10 5 0 10 Miles

Base Map: CTECO Elevation Shaded Relief Imagery (2000 LiDAR)

Figure I-4
Statutory Facilities and Other Surrounding Features

Greenwich Substation and Line Project

EVERSOURCE ENERGY

ALL-POINTS TECHNOLOGY CORPORATION

June 2015

I.1.10 Energy Facilities within a Five Mile Radius

In accordance with CGS §16-50j(59)(15), listed below in Table I-3 are the Company's transmission facilities, including transmission substations, third party-owned generators and transmission lines, located within a five-mile radius of the proposed Project. These facilities are located in the Towns of Greenwich and Darien, and the Cities of Stamford and Norwalk.

Table I-3 Energy Facilities within Five Miles of the Project Area

Transmission Substations	
Cos Cob, Greenwich	
Cos Cob Railroad, Greenwich	
Tomac, Greenwich	
Waterside, Stamford	
South End, Stamford	
Glenbrook, Stamford	
Generators	
Cos Cob Jets, Greenwich	
Waterside Generation, Stamford	
Line Number	**Transmission Lines**
1740	Waterside – Cos Cob
1750	South End – Tomac – Cos Cob
1440	Glenbrook - Waterside
1450	Glenbrook – South End
1977	Glenbrook – South End - Darien
1880	Norwalk – Glenbrook – Norwalk Harbor
1608	SONO – Glenbrook – Norwalk Harbor
1867	Flax Hill – Glenbrook – Norwalk Harbor
1792	Glenbrook – Cedar Heights
1753	Glenbrook – Cedar Heights
1192	Glenbrook – South End
1522	Norwalk – Glenbrook
1734	Norwalk – Glenbrook

I. 2 Greenwich Substation Property

The Proposed Site selected for the Greenwich Substation is 290 Railroad Avenue, a property that is compatible with existing adjacent commercial land uses. Nearly the entire 0.81-acre Proposed Site is currently developed and covered by impervious surfaces. Railroad Avenue and commercial properties are located north of the Proposed Site, including an Eversource-owned

property used for parking and storage. The Company's former Greenwich Area Work Center and its Prospect Substation are located across Field Point Road to the west. Commercial buildings are located east of the Proposed Site. Commercial buildings and the MNRR corridor are located to the south. Environmental resources associated with the Proposed Site are depicted on Figure I-5, *Greenwich Substation Environmental Resources Map*.

I.2.1 Topography, Geology and Soils

The Proposed Site for the proposed Greenwich Substation is located at an elevation of approximately 40 feet above mean sea level ("AMSL"). The Proposed Site is generally flat. The character of the surficial geology at the Proposed Site is predominantly glacial till of varying thickness over irregular bedrock that is almost entirely paved or developed with buildings.

I.2.2 Water Resources

The Proposed Site is located within the Southwest Coast Major Drainage Basin.

I.2.2.1 Groundwater Resources

Groundwater beneath the Proposed Site is classified by the CT DEEP as GB, indicating it is not fit for human consumption without treatment. No water supply wells are located at or in the vicinity of the Proposed Site. Based on available mapping, no portions of the Proposed Site are located within any Aquifer Protection Area.

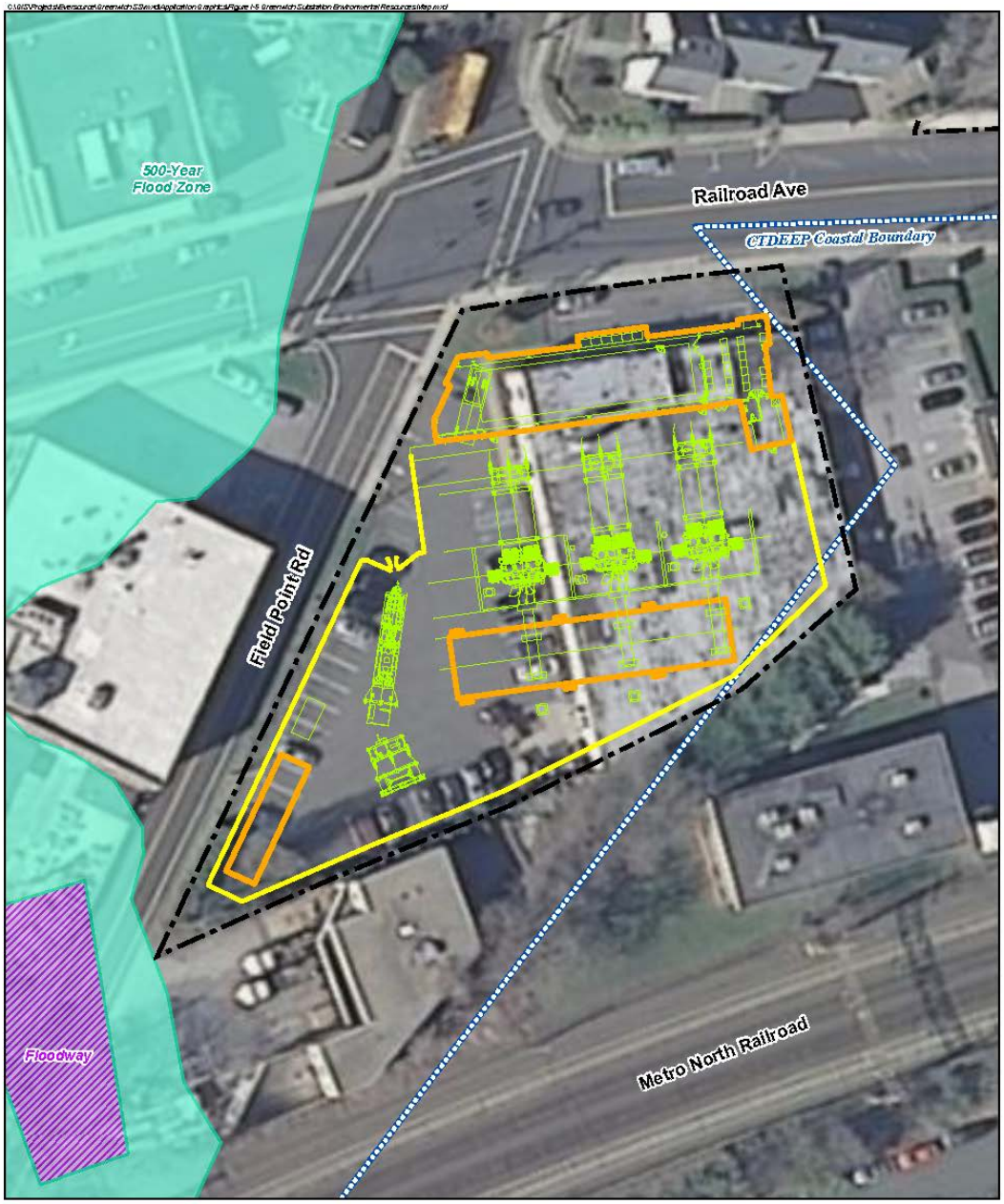
I.2.2.2 Flood Hazard Areas

In addition, the Proposed Site is not located within either the 100-year or 500-year flood zones established by the Federal Emergency Management Agency ("FEMA") or within flood surge limits. The edge of the 500-year flood zone is located approximately 10 feet from the southwest corner of the Proposed Site.[40]

Based on available information on Worst Case Hurricane Surge Inundation data developed by the National Hurricane Center using the SLOSH (Sea Lake and Overland Surge from Hurricanes) Model, no portions of the Proposed Site are within Category 1, 2, 3, or 4 areas.

[40] National Geodetic Vertical Datum of 1929; *FEMA Map*, Panel Number 09001C 0494G, revised July 8, 2013.

Figure I-5 Greenwich Substation Environmental Resources Map



I.2.2.3 Coastal Area Resources

Portions of the northeast and southeast corners of the Proposed Site lie within the Coastal Boundary pursuant to the Connecticut Coastal Management Act ("CCMA"). In total, an area of approximately 1,120 square feet of the Proposed Site is physically located within the Coastal Boundary.

I.2.2.4 Inland and Tidal Wetlands and Watercourses

No tidal or fresh water wetlands/watercourses or coastal resources are located on the Proposed Site.

Horseneck Brook is located west of the Proposed Site across Field Point Road and flows southward via a culvert beneath the 330 Railroad Avenue property (the Company's former Greenwich Area Work Center). Horseneck Brook is not tidally influenced in areas north of I-95 (including the vicinity of the Proposed Site). The CT DEEP surface water quality classification for Horseneck Brook is "A" for locations north of I-95. Designated uses include potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply and other qualifying uses. Permitted receiving discharges are restricted to those from public or private drinking water treatment systems, dredging and dewatering, emergency and clean water discharges.

I.2.3 Wildlife and Vegetation

The Proposed Site is entirely developed and maintains little to no value for any flora or fauna due to its previously disturbed nature and impervious surface coverings.

I.2.3.1 Threatened and Endangered Species

CT DEEP NDDB mapping indicates that the Proposed Site is not located within any polygons depicted as areas of known habitat for state-listed endangered or threatened species, or species of special concern. The Company consulted with CT DEEP NDDB regarding the Proposed Site and confirmed that no such resources exist on or adjacent to the Proposed Site (see Section J.3.1 for additional information). A copy of the CT DEEP letter is provided in Appendix E, *Agency Correspondence*.

The Company also reviewed information on the USFWS Information, Planning, and IPaC to determine if any federally-listed or proposed, threatened or endangered species or critical habitat

exist on or proximate to the Proposed Site. The USFWS confirmed in writing that no listed species or critical habitats were identified on or proximate to the Proposed Site. A copy of the USFWS letter is provided in Appendix E, *Agency Correspondence*.

I.2.3.2 Fisheries

No CT DEEP Fisheries Management Areas are located proximate to the Proposed Site.

I.2.4 Local, State and Federal Land Use

The Proposed Site is situated within an area that is a mix of industrial, commercial, and residential land uses with a major transportation corridor to the south.

I.2.5 Historic and Archaeological Resources

No cultural resources (buried archaeological sites or standing historic structures) occur at or adjacent to the Proposed Site. The Proposed Site is not located within or proximate to a local or national historic district. Refer to Appendix F, *Cultural Resources Review of the Project Region Associated with the Proposed Substation and Transmission Line Project in Greenwich, Connecticut.*

I.2.6 Noise

Existing background noise levels at the Proposed Site are dominated by sound produced by local traffic with occasional higher level sounds from passing trains. Eversource contracted with Cavanaugh Tocci Associates, Inc. to conduct sound readings of existing conditions. The results of the sound monitoring indicate that daytime background sound levels range between 51 and 52 dBA. During late night and early morning hours, when traffic is at a minimum, background sound levels drop to between 44 and 48 dBA.

I.2.7 Scenic and Recreational Areas, Statutory Facilities and Surrounding Features

No Statutory Facilities or scenic or recreational areas occur on or adjacent to the Proposed Site.

I.3 Cos Cob Substation

The Cos Cob Substation property on Sound Shore Drive consists primarily of previously disturbed and developed land, where both Eversource and the MNRR maintain extensive substation and other electrical infrastructure. The MNRR, associated parking lots and the train station are all

located north of the Substation. The Town has recently created a park east and south of the substations.

Environmental resources associated with Cos Cob Substation are depicted on Figure I-6, Cos Cob *Substation Environmental Resources Map*.

I.3.1 Topography, Geology and Soils

Topography at Cos Cob Substation is generally level with man-made earthen berms located south of the existing fence line (and within the planned construction expansion area).

I.3.2 Water Resources

Cos Cob Substation is located within the Southwest Coast Major Drainage Basin. Cos Cob Harbor is classified by CT DEEP as Class A waters with designated uses including potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply and other qualifying uses. Permitted receiving discharges are restricted to those from public or private drinking water treatment systems, dredging and dewatering, emergency and clean water discharges.

I.3.2.1 Groundwater Resources

Groundwater beneath Cos Cob Substation has been classified as GB, indicating it is not fit for human consumption without treatment. No water supply wells are located at or in the vicinity of the Proposed Site. Based on available mapping, no portions of the Proposed Site are located within any Aquifer Protection Area.

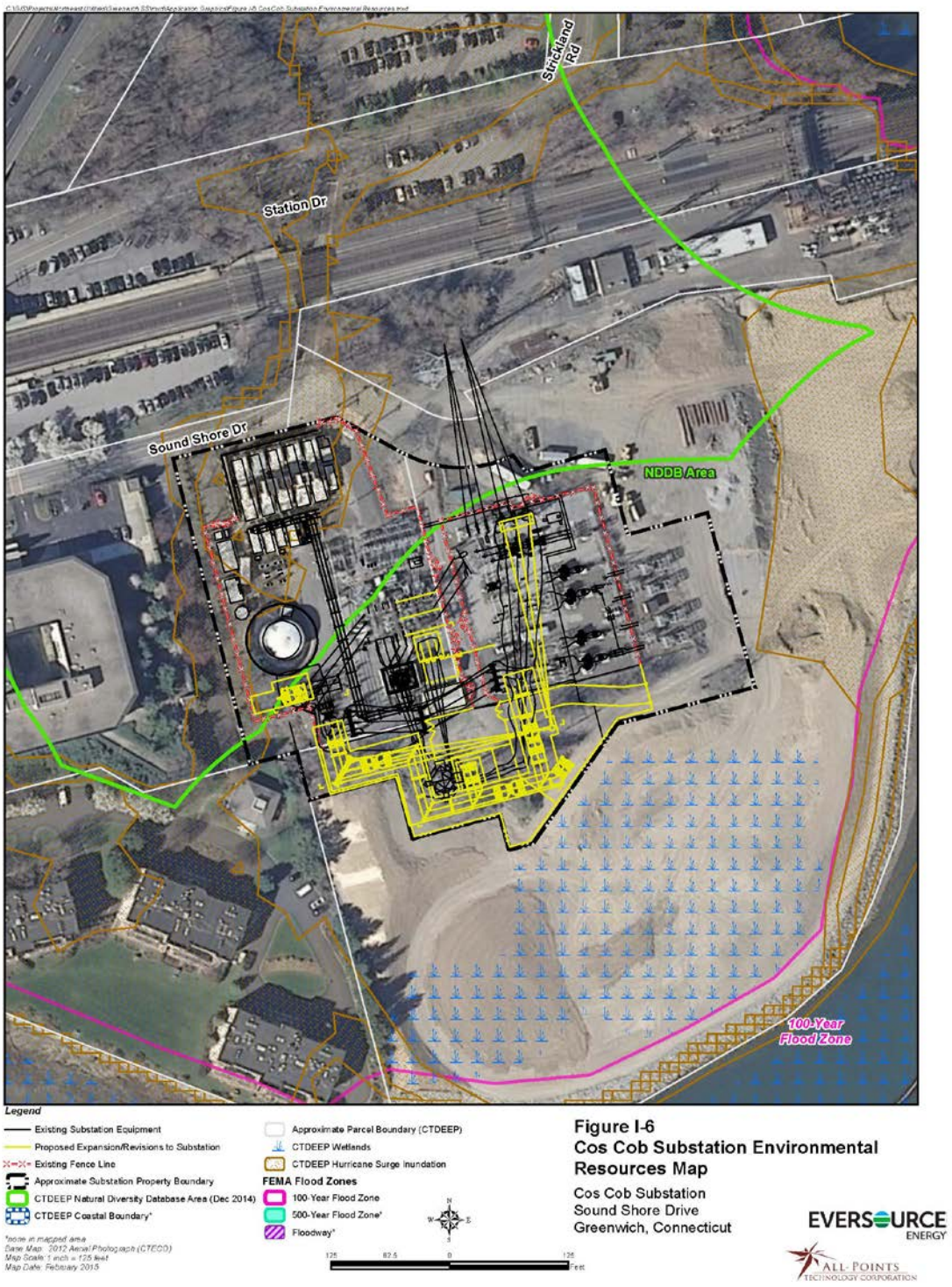
I.3.2.2 Flood Hazard Areas

Cos Cob Substation is located outside of the 100-year and 500-year flood boundaries associated with Cos Cob Harbor. Based on available information, the northwest corner of the substation is located within Category 1, 2, 3, and 4 Hurricane Surge Inundation areas.

I.3.2.3 Coastal Area Resources

Cos Cob Substation is located within the Coastal Boundary.

Figure I-6 Cos Cob Substation Environmental Resources Map



I.3.2.4 Inland and Tidal Wetlands and Watercourses

No wetlands or watercourses are located at the Cos Cob Substation. CT DEEP mapping identifies wetlands immediately south of the substation within developed areas of the property, which is located within approximately 300 feet of Cos Cob Harbor.

I.3.3 Wildlife and Vegetation

Eversource's portion of the Cos Cob Substation property is nearly entirely developed and maintains little to no value for any flora or fauna due to current uses.

I.3.3.1 Threatened and Endangered Species

CT DEEP NDDB mapping depicts polygons (buffered areas that include known habitat for state-listed endangered or threatened species, or species of special concern) covering the majority of the Proposed Site. The Company consulted with CT DEEP NDDB regarding the proposed modifications to Cos Cob Substation and determined that no such resources would be impacted by the proposed modifications (see Section J.3.1). A copy of the CT DEEP letter is provided in Appendix E, *Agency Correspondence*.

The Company also reviewed information on the USFWS IPaC to determine if any federally-listed or proposed, threatened or endangered species or critical habitats exist on or proximate to Cos Cob Substation. No such resources are located on or proximate to the substation property. A copy of the USFWS confirmation letter is provided in Appendix E, *Agency Correspondence*.

Marine and other natural resources associated with Cos Cob Harbor are located in proximity to the property. Cos Cob Substation is not located within or proximate to any mapped areas of Critical Habitat.

I.3.3.2 Fisheries

No CT DEEP Fisheries Management Areas exist proximate to Cos Cob Substation.

I.3.4 Local, State and Federal Land Use

Cos Cob Substation lies within a mix of utility, recreational, commercial, and residential land uses with the I-95 and the MNRR transportation corridors to the north.

I.3.5 Historic and Archaeological Resources

Based on the results of the Heritage report, there are no known cultural resources (buried archaeological sites or standing historic structures) at Cos Cob Substation.

The property immediately to the east of the existing substation, now developed as a Town park, is listed on the NRHP. This listing is associated with the former Cos Cob Power Plant. Completed in 1907 and expanded in 1912, the Cos Cob Power Plant powered the Shoreline Division of the New York, New Haven and Hartford Railway, which was the first long-distance electrified main line railway in the U.S. A complex of six buildings, it included a 3-story power house, a coal crusher house, a dock, two concrete water tanks, and a coal conveyor (as well as structures deemed non-contributing in the NRHP nomination, including a concrete shed, a steel warehouse, and an oil tank). The main building and its early additions had Spanish Mission style decorative elements. The power station was closed in 1986 and all components were later demolished. As a successful experiment in railroad electrification, the power station was significant enough to be listed on the NRHP. Its power format and layout set the standard for similar plants for decades.[41]

I.3.6 Noise

Land uses adjacent to Cos Cob Substation consist primarily of busy roads (including I-95) and the MNRR ROW, where the existing noise environment is influenced greatly by traffic noise.

I.3.7 Scenic and Recreational Areas, Statutory Facilities and Surrounding Features

Scenic and recreational opportunities exist in proximity to Cos Cob Substation, including Cos Cob Harbor and the Town's recently completed Cos Cob Park.

I.4 Preferred Route

I.4.1 Topography, Geology and Soils

Topography along the Preferred Route ranges from approximately sea level to 50 feet AMSL and is characterized by gentle to moderate elevation changes. Low-lying areas are found in conjunction with the MNRR and I-95 corridors and nearby coastal locations.

[41] Roth, Matthew and Clouette, Bruce. 1989. National Register of Historic Places Registration Form for Cos Cob Power Station, Sound Shore Drive, Greenwich, Connecticut. State Historic Preservation Office records, Hartford, CT.

Minor elevation changes occur from Cos Cob Substation along the existing maintained roadway ROWs north of the MNRR and I-95, ultimately achieving a maximum elevation of approximately 50 feet AMSL. Elevations transition from moderate slopes to level terrain south of I-95 and through Bruce Park.

The character of the surficial geology along the Preferred Route is predominantly glacial till of varying thickness over irregular bedrock. As this line route crosses Bruce Park and Indian Harbor, the surficial geology changes to a mix of sand and gravel areas and depressions/watercourse crossings of outwash and alluvium.

I.4.2 Water Resources

The Preferred Route lies within the Southwest Coast Major Drainage Basin and would cross water bodies associated with Indian Harbor within Bruce Park. These surface waters are designated as Class A waters by the CT DEEP. Uses include potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply and other legitimate uses. Discharges are restricted to those from public or private drinking water treatment systems, dredging and dewatering, emergency and clean water discharges.

I.4.2.1 Groundwater Resources

Groundwater beneath the Preferred Route has been classified as GA[42] or GB[43]. No portion of the Preferred Route is located within an Aquifer Protection Area.

I.4.2.2 Flood Hazard Areas

Portions of the Preferred Route are located within 100-year and 500-year flood boundaries. In addition, portions of this route are located within Category 1, 2, 3, and 4 Hurricane Surge Inundation areas established by the National Hurricane Center, primarily in low-lying areas adjacent to Indian Harbor and in Bruce Park.

[42] GA designation assumes ground water quality is fit for human consumption without treatment.

[43] GB designation indicates ground water quality is not fit for human consumption without treatment

I.4.2.3 Coastal Area Resources

Portions of the Preferred Route lie within the Connecticut Coastal Boundary. Coastal and marine resources associated with Long Island Sound, Cos Cob Harbor, Bruce Park, Indian Harbor, Smith Cove, and Greenwich Harbor are located in close proximity to this route.

I.4.2.4 Inland and Tidal Wetlands and Watercourses

Wetland resources are associated with the surface waters in Bruce Park, consisting primarily of tidal influenced open water, wetland forest, scrub-shrub, and emergent habitats.

I.4.3 Wildlife and Vegetation

The Preferred Route traverses areas consisting primarily of disturbed roadside edges with small areas of upland forest, open field/scrub-shrub, and wetlands/watercourses.

I.4.3.1 Threatened and Endangered Species

Data provided by CT DEEP NDDB mapping indicates that the Preferred Route extends through polygons depicted as areas of known habitat for state-listed endangered or threatened species, or species of special concern. The Company consulted with CT DEEP NDDB regarding the potential routing of the underground transmission lines and determined that no such resources would be impacted by development and operation of the Project, including the Preferred Route (see Section J.3.1). A copy of the CT DEEP letter is provided in Appendix E, *Agency Correspondence*.

The Company also reviewed information on the USFWS IPaC to determine if any federally-listed or proposed, threatened or endangered species or critical habitats exist along the Preferred Route. No such resources are located within the Project Area, including the Preferred Route. A copy of the USFWS confirmation letter is provided in Appendix E, *Agency Correspondence*.

I.4.3.2 Fisheries

No CT DEEP Fisheries Management Areas are located along or in proximate to the Preferred Route.

I.4.4 Local, State and Federal Land Use

The Preferred Route passes through a combination of transportation corridors and large areas of impervious surface associated with roads and parking lots, residential areas, the municipal park, small areas of riparian habitat, and very narrow blocks of upland forest and old field/scrub-shrub habitat. After exiting Cos Cob Substation beneath the MNRR and I-95, the Preferred Route would initially pass through areas of residential development as it extends west along Station Drive. The line route continues southwest beneath I-95 and the MNRR before entering Bruce Park. West of Bruce Park, a mix of residential and commercial development characterizes the remainder of this route.

I.4.5 Historic and Archaeological Resources

Based on the Heritage report, one historic resource, Cos Cob Railroad Station, is located proximate to the Preferred Route.

One previously recorded archaeological site with potential to retain intact deposits is located near the southwest end of Bruce Park. If the Open Trench variation following Bruce Park Drive is selected, additional investigations would be initiated to assess this site prior to construction.

I.4.6 Noise

The environment along the Preferred Route is a mix of transportation, commercial, recreational and residential land uses. With the exception of Bruce Park, the existing noise environment along the route is heavily influenced by traffic noise along roads, most prominently I-95, and the MNRR corridor.

I.4.7 Scenic and Recreational Areas, Statutory Facilities and Surrounding Features

The Preferred Route would traverse Bruce Park and settled residential areas, including Station Drive, Intrieri Lane, Kinsman Lane, Davis Avenue, and Railroad Avenue. No scenic or recreational areas exist north of the MNRR and I-95 along the Preferred Route. Bruce Park and Cos Cob Park represents the most significant scenic and recreational resource along this route. Due to its close proximity to Long Island Sound, additional scenic and recreational opportunities exist in the general vicinity of the Preferred Route.

I.5 Southern Alternative

I.5.1 Topography, Geology and Soils

Topography along the Southern Alternative ranges from approximately sea level to nearly 50 feet AMSL. Gentle to moderate elevation changes occur from Cos Cob Substation along existing maintained roadway ROWs north of I-95, ultimately achieving a maximum elevation of approximately 50 feet AMSL.

The character of the surficial geology along the Southern Alternative is predominantly glacial till of varying thickness over irregular bedrock. As this line route crosses Bruce Park and Indian Harbor, the surficial geology changes to a mix of sand and gravel areas and depressions/watercourse crossings of outwash and alluvium.

I.5.2 Water Resources

The Southern Alternative is located within the Southwest Coast Major Drainage Basin and would cross water bodies associated with Indian Harbor in Bruce Park. The surface waters identified along this Route are classified as A waters, with designated uses including potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply and other qualifying uses. Permitted receiving discharges are restricted to those from public or private drinking water treatment systems, dredging and dewatering, emergency and clean water discharges.

I.5.2.1 Groundwater Resources

Groundwater beneath the Southern Alternative has been classified as either GA or GB. No portion of the Southern Alternative is located within an Aquifer Protection Area.

I.5.2.2 Flood Hazard Areas

Portions of this route are located within 100-year and 500-year flood boundaries. Worst Case Hurricane Surge Inundation data developed by the National Hurricane Center indicate that portions of this route are located within Category 1, 2, 3, and 4 areas. These Hurricane Surge Inundation areas are focused along low-lying areas adjacent to Indian Harbor and in Bruce Park.

I.5.2.3 Coastal Area Resources

Portions of this route occur within the Coastal Boundary. Coastal and marine resources associated with Long Island Sound, Cos Cob Harbor, Bruce Park, Indian Harbor, Smith Cove, and Greenwich Harbor are located in close proximity to this route.

I.5.2.4 Inland and Tidal Wetlands and Watercourses

Wetland resources are associated with these surface waters, consisting primarily of tidal influenced open water, wetland forest, scrub-shrub, and emergent habitats.

I.5.3 Wildlife and Vegetation

The Southern Alternative traverses habitat consisting primarily of disturbed roadside edges, with areas of upland forest, parklands, open fields, scrub-shrub, wetlands and watercourses.

I.5.3.1 Threatened and Endangered Species

Data provided by CT DEEP NDDB indicates that the Southern Alternative occurs within a number of polygons depicted as areas of known habitat for state-listed endangered or threatened species, or species of special concern. The Company consulted with CT DEEP NDDB regarding the Proposed Site and determined that no such resources would be impacted by development and operation of the Project, including the Southern Alternative (see Section J.3.1). This route does not occur within any mapped areas of Critical Habitat.

The Company also reviewed information on the USFWS IPaC to determine if any federally-listed or proposed, threatened or endangered species or critical habitats exist along the Southern Route. No such resources are located within the Project Area, including the Southern Route. A copy of the USFWS confirmation letter is provided in Appendix E, *Agency Correspondence*.

I.5.3.2 Fisheries

No CT DEEP Fisheries Management Areas are located along or proximate to the Southern Alternative.

I.5.4 Local, State and Federal Land Use

The Southern Alternative would extend through areas of residential and commercial development, including large areas of impervious surfaces associated with roads and parking areas, Bruce

Park, small areas of riparian habitat, and very narrow blocks of upland forest and old field/scrub-shrub habitat.

I.5.5 Historic and Archaeological Resources

Similar to the Preferred Route, one historic resource (Cos Cob Railroad Station) is located in proximity to the Southern Alternative.

Two previously recorded archaeological sites with some potential to retain intact deposits are located proximate to the Southern Alternative, including the Sound Shore Drive area and a portion of Bruce Park. If the Southern Alternative is selected, additional investigations would be initiated to assess these locations prior to construction.

I.5.6 Noise

The environment along the Southern Alternative consists primarily of heavily travelled roadways, with the exception of Bruce Park. Residential and commercial developments exist along the west portions of this route. The existing noise environment is influenced by associated traffic noise, including from I-95, as well as from the MNRR corridor, which parallel the entire route.

I.5.7 Scenic and Recreational Areas, Statutory Facilities and Surrounding Features

Most of the Southern Alternative follows existing state and local roadways. However, the route does originate next to Cos Cob Park, crosses Bruce Park and extends through (or is proximate to) settled residential areas, including Kinsman Lane, Davis Avenue, and Railroad Avenue. Due to the proximity to Long Island Sound, scenic and recreational opportunities exist in the general vicinity of this alternative.

I.6 Northern Alternative

I.6.1 Topography, Geology and Soils

Topography along the Northern Alternative is characterized by flat and gently sloping areas with elevations ranging from approximately 10 to 20 feet above sea level.

I.6.2 Water Resources

The Northern Alternative is located within the Southwest Coast Major Drainage Basin. The Northern Alternative would require crossing upper portions of Greenwich Creek north and south

of Route 1 at existing bridge/culvert locations. Greenwich Creek is classified by CT DEEP as Class A waters with designated uses including potential drinking water supply, fish and wildlife habitat, recreational use, agricultural and industrial supply and other qualifying uses. Permitted receiving discharges are restricted to those from public or private drinking water treatment systems, dredging and dewatering, emergency and clean water discharges.

I.6.2.1 Groundwater Resources

Groundwater beneath the Northern Alternative has been classified as either GA or GB. Based on available mapping, no portions of the Northern Alternative are located within an Aquifer Protection Area.

I.6.2.2 Flood Hazard Areas

Portions of the Northern Alternative are located within the 100-year and 500-year flood boundaries associated with Greenwich Creek and Cos Cob Harbor. According to data developed by the National Hurricane Center, portions of this alternative are located within Category 1, 2, 3, and 4 Hurricane Surge Inundation areas, along the northern portion of Strickland Road and eastern portion of Route 1, associated with Cos Cob Harbor.

I.6.2.3 Coastal Area Resources

The eastern portion of this route (from Cos Cob Substation north to Route 1 and west to its intersection with Valleywood Road) lies within the Coastal Boundary. Coastal and marine resources in close proximity to this route are Cos Cob Harbor, the Mianus River, and Greenwich Creek.

I.6.2.4 Inland and Tidal Wetlands and Watercourses

With the exception of Greenwich Creek, no inland or tidal wetlands resources occur along the Northern Alternative.

I.6.3 Wildlife and Vegetation

I.6.3.1 Threatened and Endangered Species

Data provided by CT DEEP NDDB indicates that this route extends through polygons depicted as areas of known habitat for state-listed endangered or threatened species, or species of special concern; the polygons appear to be associated with Cos Cob Harbor and lower portions of the

Mianus River. The Company consulted with CT DEEP NDDB regarding the Proposed Site and determined that no such resources would be impacted by development and operation of the Project, including the Northern Alternative (see Section J.3.1). The Northern Alternative does not traverse through any mapped areas of Critical Habitat.

The Company also reviewed information on the USFWS IPaC to determine if any federally-listed or proposed, threatened or endangered species or critical habitats exist along the Northern Route. No such resources are located within the entire Project Area, including the Northern Route. A copy of the USFWS confirmation letter is provided in Appendix E, *Agency Correspondence*.

I.6.3.2 Fisheries

No CT DEEP Fisheries Management Areas are located along or are proximate to the Northern Alternative.

I.6.4 Local, State and Federal Land Use

The Northern Alternative would extend through a mix of commercial and residential development, primarily within or adjacent to areas of impervious surfaces. Isolated narrow blocks of upland forest and old field/scrub-shrub habitat occur in select locations along this route. In the eastern-most portion of this route, along Strickland Road northward from Cos Cob Substation, land uses also include both residential development and marinas. As the route would turn west along Route 1, land use is primarily commercial with small isolated areas of upland forest and open field/scrub-shrub habitat primarily associated with the Millbrook Country Club and Greenwich Creek. Land use transitions from a mix of residential, municipal and commercial uses to primarily residential as the route turns south along Field Point Road to its intersection with Railroad Avenue.

I.6.5 Historic and Archaeological Resources

The Northern Alternative would pass directly by several historic resources listed on the NRHP, including the Bush Holly House, Knapp Tavern, Greenwich YMCA, and the Town Hall. The route would also pass through four areas listed on the NRHP, including: the Strickland Road Historic District; the Putnam Hill Historic District; the Greenwich Municipal Center Historic District; and, the Greenwich Avenue Historic District. A fifth area, the Fourth Ward Historic District, is located immediately north of Route 1 between the Putnam Hill and Greenwich Avenue districts.

I.6.6 Noise

The environment along the Northern Alternative is a mix of mostly commercial and residential land uses. The existing noise environment is influenced greatly by traffic noise along local and state roads, including Route 1 and Field Point Road. Locations along the southern portions of this route are also impacted by noise attributable to activity with I-95 and the MNRR corridor.

I.6.7 Scenic and Recreational Areas, Statutory Facilities and Surrounding Features

Most of the Northern Alternative follows existing state and local routes. This alternative would originate next to Cos Cob Park and pass by the Greenwich High School, YMCA, and numerous day care centers. It would also extend through settled residential areas including Strickland Road, Route 1, Field Point Road, and Railroad Avenue. Scenic and recreational opportunities in proximity to the route include the CT DEEP's Mianus River Water Access, the Millbrook Country Club, Cos Cob Harbor, and Greenwich Creek.

J. Environmental Effects and Mitigation

This section identifies the potential environmental effects of the Project, based on the development of the Greenwich Substation and installation of the transmission supply lines along the Preferred Route, using the proposed design and construction methods as described in Sections G and K.

The proposed design construction and operation of the Project would not have significant permanent adverse effects on the existing environment or on the scenic, historic or recreational values of the surrounding area. Eversource has incorporated, and will continue to incorporate, measures into all phases of Project development and implementation to promote environmental protection measures, in accordance with federal, state and local requirements. The sections below identify potential short- and long-term effects that the Project could have on the environment, including scenic, historic, and recreational resources, and then describe the measures that Eversource proposes to avoid, minimize, or mitigate any potential adverse effects.

Prior to the commencement of any construction activities, Eversource will prepare a Development and Management Plan ("D&M Plan"). The D&M Plan would include *Northeast Utilities Transmission Group Best Management Practices Manual for the State of Connecticut, Construction & Maintenance Environmental Requirements* (December 2011), which contains guidance and other information designed to minimize or eliminate potential adverse environmental effects that may result from construction activities. The D&M Plan will include specific detail as to the procedures and/or methods to be utilized for the Project and provide information on erosion control, construction site dewatering, spill prevention and control, construction staffing and hours of work, and restoration.

Prior to the commencement of construction activities, Eversource would install E&S controls at the limits of work and around adjacent catch basins, in accordance with the approved Project Plans, the D&M Plan and the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control*. The E&S controls would be inspected and maintained throughout the course of the Project until all disturbed sites are stabilized.

J.1 Topography, Geology and Soils

Greenwich Substation

The development of the Greenwich Substation would have negligible, if any, adverse effects on topography and geology. Some earthwork will be required to prepare the Proposed Site and accommodate foundations but no substantive changes in site topography or grades are anticipated.

Transmission Supply Line Routes

Installation of the underground supply lines (including pipes, conduit and splice vaults) will require substantial earthwork. However, all disruption to existing soils would be temporary in nature as excavations would be backfilled upon completion of equipment installations. No changes to existing grades are anticipated as a result of Project[44].

The installation of the transmission supply lines would involve the excavation of a continuous trench, as well as the installations of concrete splice vaults which are typically spaced at intervals of up to 2,800 feet apart, depending upon cable construction and route characteristics[45]. During such excavation activities, measures would be implemented, as required, to contain temporary soil storage piles and to avoid sedimentation into water resource areas and/or catch basins. As appropriate for work in urban areas, suitable temporary E&S control measures would be installed and maintained, as needed. Typical E&S controls may not be required for trenching and other construction activities within road ROWs, where the potential for off-site erosion or sedimentation is limited, but would be employed as needed at any off-road ROW work sites. Any temporary controls would be maintained until the disturbed work sites are properly restored, as determined by standard criteria for storm water pollution prevention and erosion control. After the completion of conduit and splice vault installation, disturbed ROWs would be restored to the appropriate grade. Excess excavated materials and materials not suitable for backfilling the trench would be trucked off-site and disposed of in accordance with applicable regulations.

[44] If the cables are installed adjacent to, but not within, existing road ROWs, some grading may be required to create a level work area.

[45] Cable construction in this instance means the dimension of the conductor and insulation layers. Route characteristics include (but are not necessarily limited to): the number of bends (and also the radius of the bend); elevation changes; available real estate to support the addition of a vault as well as cable pulling, splicing, testing, and maintenance activities; and, existing utility density.

In the event that bedrock is encountered, excavation, drilling, or pneumatic hammer would be the preferred methods to remove rock. If extensive bedrock is encountered during construction, provisions for blasting would be considered and developed by Eversource, in accordance with controlled blasting techniques.

Cos Cob Substation

Modifications to the southern portion of Cos Cob Substation will require grading and other earthwork activities, including leveling of existing earthen berms and installation of foundations. Similar to those procedures discussed above, temporary E&S control measures would be installed, maintained and inspected routinely during construction. After the completion of the substation modifications, disturbed areas would be restored appropriately. Any excess excavated soils and materials not suitable for re-use on the site would be trucked off-site and disposed of in accordance with applicable regulations.

J.2 Water Resources

Neither the construction nor the operation of the Project would have any long-term adverse effects on surface or groundwater resources or water quality.

J.2.1 Inland and Tidal Wetlands and Watercourses

Greenwich Substation

No portion of the Greenwich Substation would be located within wetlands or watercourses and no components or structures would be situated within:

- 100 feet measured horizontally from the boundary of any wetland or watercourse not located within any public water supply watershed;
- 150 feet measured horizontally from the boundary of any wetland or watercourse, located within any public water supply watershed; or,
- 200 feet measured horizontally from the mean high water mark of any public water supply reservoir.

Based on these design considerations and Proposed Site features, the Greenwich Substation would have no adverse environmental impacts on water resources.

Transmission Line Routes

There are wetlands and watercourses proximate to each of the routes. Eversource will implement the Project-specific D&M Plan to minimize or eliminate potential adverse environmental effects during the construction phase of the Project.

Portions of the Preferred Route are located within mapped flood hazard areas. However, no permanent above ground structures are proposed in the areas. Therefore, no adverse effects on these areas are anticipated.

Cos Cob Substation

Proposed modifications to Cos Cob Substation include the addition of 6 potential transformers, each containing approximately 30 gallons of mineral oil (not containing PCBs). Similar to activities at the Proposed Site, the existing stormwater management system would be modified in accordance with the 2004 *CT Stormwater Quality Manual* to continue to adequately treat the quantity and quality of stormwater generated during construction and operation of the Substation.

J.2.2 Groundwater Resources

Greenwich Substation

The three 60-MVA transformers associated with the Greenwich Substation would contain insulating oil (not containing PCBs). The transformers would be installed on foundations and each would have secondary containment sufficient to contain 110% of the insulating fluid capacity of the transformer. Periodic inspections of the containment area would be performed by Eversource personnel to verify proper functioning of the containment systems. In addition, the pump house will be designed with a secondary containment and a monitoring system to trigger an alarm if the fluid level reaches a prescribed level.

Project activities would include the demolition of an existing commercial structure and the construction of the Substation on the Proposed Site. A comprehensive stormwater management system would be designed in accordance with the 2004 *CT Stormwater Quality Manual* to adequately treat the quantity and quality of stormwater generated during construction and when the Substation is in operation.

Based on these design considerations, the Greenwich Substation would have no adverse environmental impacts.

Transmission Line Routes

It is possible that groundwater may be encountered in either the transmission supply lines trench, which would be excavated to depths necessary to cross existing underground utilities, or during installation of the splice vaults, which would require excavations to depths of at least 12 feet. In addition, excavations for pipe jacking pits could extend to depths of 10 feet below grade and HDD to depths of 40 or 50 feet below grade. However, the Project area traverses densely developed urban areas, where groundwater is not used for direct potable water supply. If groundwater is encountered, dewatering would be performed in accordance with authorizations from applicable regulatory agencies and may involve discharge to catch basins, temporary holding tanks (frac tanks) or vacuum trucks for disposal outside of the Project Area. During construction, care would be taken to avoid impacts to municipal water lines and other utilities that may be located within road ROWs.

Cos Cob Substation

No new equipment planned for Cos Cob Substation will contain fluids or other materials that would pose concern to groundwater resources.

J.2.3 Flood Hazard Areas

Portions of the Preferred Route are located within mapped flood hazard areas. However, no permanent above ground structures are proposed in the areas. Therefore, no adverse effects on these areas are anticipated.

J.2.4 Coastal Area Resources

Greenwich Substation

Construction and operation of the Greenwich Substation would not result in adverse impacts to coastal resources, as defined in the CCMA ("Connecticut Coastal Management Act"). The design of the Substation requires portions of the fence to be placed within the Coastal Boundary. No equipment will be installed in the Coastal Boundary. The CCMA identifies eight potential adverse impacts to coastal resources. This section provides a definition of each adverse impact and explains why construction and operation of the Substation would not result in or contribute to these impacts.

1) *Degrading **water quality** of coastal waters by introducing significant amounts of suspended solids, nutrients, toxics, heavy metals or pathogens, or through the significant alteration of temperature, pH, dissolved oxygen or salinity.*

   During construction, E&S controls would be established and maintained in accordance with the CT DEEP Bulletin 34 *Connecticut Guidelines for Soil and Erosion and Sediment Control*, dated 2002. Construction activities associated with the proposed Substation are temporary and, with the appropriate E&S measures in place and maintained, are not expected to impact water quality. Throughout construction and operation of the Substation all stormwater generated at the Proposed Site would be adequately treated, both in quantity and quality, in accordance with the *2004 Connecticut Stormwater Quality Manual*. The existing development consists of a pre-1980s style stormwater management system that currently provides minimal stormwater quantity and quality treatment. The Substation stormwater management system will be designed to manage stormwater runoff and treatment to improve pre-development hydrologic conditions and substantially reduce the average annual total suspended solids loadings. Therefore, with incorporation of these stormwater management measures, the Substation's construction and operation would not result in degradation of coastal water quality.

2) *Degrading **existing circulation patterns of coastal waters** by impacting tidal exchange or flushing rates, freshwater input, or existing basin characteristics and channel contours.*

   The Substation would be located on a parcel that is currently developed and outside of tidally influenced areas and, as such, would not impact current drainage or circulation patterns of coastal waters.

3) *Degrading **natural erosion patterns** by significantly altering littoral transport of sediments in terms of deposition or source reduction.*

   Because the Proposed Site does not border on Horseneck Brook or any other shoreline, the construction and operation of the Substation would not alter natural erosion patterns or affect littoral transport of sediments.

4) *Degrading natural or existing drainage patterns by significantly altering groundwater flow and recharge and volume of runoff.*

Drainage patterns would not be significantly altered by the construction and operation of the Substation. Considering that the Proposed Site currently consists of a majority of impervious surface, construction of the proposed Substation would decrease the area of impervious surface with the application of a trap rock in the substation yard, which would improve existing drainage. As a result, there would be an increase in groundwater recharge and a reduction in the volume of stormwater to be managed.

5) *Increasing the hazard of **coastal flooding** by significantly altering shoreline configurations or bathymetry, particularly within high velocity flood zones.*

As the Proposed Site is outside of the 100-year and 500-year flood zones, development and operation of the Substation would not affect the shoreline configurations or bathymetry.

6) *Degrading **visual quality** by significantly altering the natural features of vistas and viewpoints.*

The Proposed Site is located approximately 1,000 feet from the nearest shoreline and is located within a heavily developed commercial area. The MNRR and I-95 transportation corridors are located between Greenwich Harbor and the Proposed Site and the general area currently includes substantial utility infrastructure. Therefore, development and operation of the Substation would not degrade the visual quality of the natural features and viewpoints within the coastal zone.

7) *Degrading or destroying **essential wildlife, finfish or shellfish habitat** by significantly altering the composition, migration patterns, distribution, breeding or other population characteristics of the natural species or significantly altering the natural components of the habitat.*

The Proposed Site is currently entirely developed with impervious surfaces and does not contain any vegetated or open water habitat. Therefore, the proposed Substation would not degrade or destroy essential wildlife, finfish or shellfish habitat.

8) *Degrading **tidal wetlands, beaches and dunes, rocky shorefronts, and bluffs and escarpments** by significantly altering their natural characteristics or function.*

Development and operation of the Substation would not alter the natural characteristics of any coastal resource area as none exist on or adjacent to the Proposed Site.

Transmission Supply Line Routes

There would be no effect on coastal resources as a result of the construction and operation of the transmission supply lines. Construction activities would take place in previously developed areas and would have no effect on access to the shoreline. Along the portion of the route that traverses within the Coastal Boundary, any effects would be short-term, limited to the construction phase, and highly localized.

Cos Cob Substation

In addition to Eversource's Cos Cob Substation, the MNRR also maintains a separate substation facility at this property. The proposed Cos Cob Substation modifications will require expansion of the existing southern fence line and new equipment installations, all within areas that have been previously disturbed. The proposed modifications would not result in a substantial change to the current natural and physical characteristics of the property. Therefore, no adverse effects on coastal resources are anticipated as a result of the planned modifications and ongoing operation of the substation.

J.3 Wildlife and Vegetation

No significant areas of vegetation exist at the Proposed Site and no negative effects to vegetation or wildlife are anticipated from the construction and operation of the Greenwich Substation. Similarly, the areas planned for expansion at the Cos Cob Substation have been previously disturbed and there is no significant vegetation or wildlife habitat.

Eversource understands the importance of existing vegetation to the Town. As a result, wherever possible, the impacts to existing vegetation would be minimized by proposing routes that avoid such impacts. However, some existing vegetation would have to be removed or pruned. Eversource would work closely with Town officials, and the affected private landowners, to develop an appropriate vegetation restoration plan that would be implemented at the completion of construction.

To accommodate the construction of the transmission supply lines, street (public) trees and trees and other vegetation on private property may have to be trimmed or removed. Wherever possible, Project construction would occur within the street. However equipment such as excavators and cranes would still need the necessary overhead clearances to work safely. Therefore, trees with limbs overhanging the roadway may have to be pruned.

If it is necessary to install splice vaults along the side of the roadway, off the paved surface, it is more likely that trees or vegetation on private property could be affected. In these locations, any vegetation within the construction workspace would have to be removed and it is possible that trees outside the workspace would have to be pruned to provide the necessary overhead clearances.

Where removal or pruning of woody vegetation is required along the roadway, it would be done by a professional crew under the supervision of a licenses arborist. When pruning is necessary, all cuts would be smooth and would be made in front of the branch collar and large, heavy branches would be precut on the underside to prevent splitting or peeling. The use of climbing spurs would be avoided unless safety issues preclude this.

Where a pipe jacking or HDD crossing method is needed (such as under the MNRR), some trees may have to be removed in order to provide the necessary work space for the jacking or drilling equipment. Vegetation removal and pruning in these areas would be done by hand, or with appropriately sized equipment.

Eversource recognizes that the excavation work could have potential impacts to the root systems of nearby vegetation. The impacts would be highly variable and depend on factors such as species type, size and location of the vegetation impacted, and would therefore need to be evaluated on an individual basis.

Upon completion of construction, Eversource would reestablish previously vegetated, disturbed areas with seed mixtures or plantings, where necessary. In the absence of other specific requirements, disturbed areas would be re-vegetated in compliance with the *2002 Connecticut Guidelines for Soil Erosion and Sediment Control* and other approvals, as appropriate.

J.3.1 Threatened and Endangered Species

Based on agency correspondence from both the CT DEEP and USFWS (dated August 1, 2014 and January 7, 2015, respectively), the Project would not impact any extant populations of federal or state-listed Endangered or Threatened Species, or Special Concern Species, or critical habitats. Copies of the CT DEEP and USFWS letters are provided in Appendix E, *Agency Correspondence*.

J.3.2 Fisheries

Based on publicly available CT DEEP Fisheries Management data, the nearest fishery is associated with the upper portion of the Mianus River, approximately 3,300 feet northeast of the Strickland Road-Route 1 intersection. Based on its distance from the nearest point of the Project Area, no impacts to this resource would result from construction of the Project.

J.4 Local, State and Federal Land Use

The Project is consistent with local, state, and federal land use plans. According to the Town of Greenwich Zoning Regulations, the Proposed Site at 290 Railroad Avenue is located within a General Business Zone. The Project Area lies within areas zoned for Business, Industrial and Residential use. The proposed Project would strengthen the reliability of electric utility infrastructure to help the Town meet several of objectives discussed in the *2009 Greenwich Plan of Conservation and Development* (a copy of which has been provided to the Council under a separate Bulk Filing).

The Company has also reviewed the *Conservation and Development Policies Plan for Connecticut 2005 - 2010* ("C&D Plan") for information relating to the state's growth in general, and which also provided information specifically on Greenwich and neighboring communities. The objective of the C&D Plan is to guide and balance regional and state development plans in response to human, environmental, and economic needs in a manner that best suits Connecticut's future.

Based upon the general planning information provided in the C&D Plan, the proposed Project is consistent with the overall goals and objectives of the Plan and serves a public need for a reliable source of electricity for the Town of Greenwich.

As stated in the Plan:

The ability to redevelop Connecticut's Regional Centers requires that existing infrastructure be maintained and updated to support compact urban development. This holds true and is particularly relevant regarding electric capacity and delivery systems. While concentrated development in Connecticut's Regional Centers will require appropriate energy capacity and distribution infrastructure, this type of compact growth can help reduce the need for multiple delivery systems across dispersed areas. (p. 22).

In addition, the future land-use and planning objectives of the SWRPA are also consistent with the Project. The SWRPA *Regional Plan of Conservation and Development 2006-2015* notes the inadequacy of southwestern Connecticut's electrical transmission grid, and encourages coordination between state and federal siting agencies to achieve a balance between the need for expanded services and preservation of the natural environment and community character.

There are no federal properties or federally-designated areas located on or proximate to the Project and therefore, it would not be affected by any applicable federal land use plan.

J.5 Historic and Archeological Resources

The Company's consultant completed a cultural resource assessment of the Project Area which included review of both historic and archeological resources. Refer to Appendix F, *Cultural Resources Review of the Project Region Associated with the Proposed Substation and Transmission Line Project in Greenwich, Connecticut.* This report was provided to the State Historic Preservation Office ("SHPO") on April 30, 2015. The SHPO responded in writing on June 2, 2015. A copy of the SHPO's response letter is provided in Appendix E, *Agency Correspondence*.

Greenwich Substation

Construction of the Substation would not result in impacts to historic or archaeological resources. No inventoried historic structures no archaeological resources were identified on or adjacent to the Proposed Site.

Transmission Supply Line Routes

One historic resource listed on the NRHP, the Cos Cob Railroad Station, is located proximate to the Preferred Route and the Southern Alternative. Multiple historic resources abut Strickland Road and Route 1, along the Northern Alternative. However, as noted by the SHPO in its correspondence, any potential effects on these resources would be temporary in nature, as the entire line would be underground with no permanent visual impacts. As suggested by the SHPO, Eversource would use caution during vibration-causing activities near any historic resources.

Two previously recorded archaeological sites with some potential to retain intact deposits are located proximate to the Southern Alternative, including the Sound Shore Drive area, as well as the Preferred Route within a portion of Bruce Park should the open trench variation along Bruce Park Drive. If selected, additional investigations would be initiated to assess these locations prior to construction.

Cos Cob Substation

No inventoried historic structures or archaeological resources were identified on this site. The current location of Cos Cob Park remains listed on the NRHP for its former use as the Cos Cob Power Plant (see Section I.3.5).

J.6 Noise

Construction noise is exempted under the Connecticut regulations for the control of noise, RCSA 22a-69-1.8(h). However, the temporary increase in construction related noise could potentially raise localized ambient sound levels near work sites. The extent of a noise effect to humans is dependent upon a number of factors, including the change in noise level from ambient, the duration and nature of the noise, the presence of other non-Project noise sources, people's attitudes concerning a specific noise or noise quality, such as tone, the number of people exposed to the noise and the type of activity affected by the noise (e.g. sleep, recreation, conversation). The effect of construction-generated noise on some receptors would also depend on the distance of the receptor from the source location, as sound attenuates with distance and with the presence of vegetative buffers or other barriers.

Standard types of construction equipment would be used for the Project. In general, the highest noise level from this type of equipment (e.g., jackhammer, drill rig, etc.) is approximately 92 dBA at the source.

Greenwich Substation

Noise from the new facility will be minimal. The predominant noise contribution from the Substation would be steady state noise from the new transformers. Infrequent impulse noise would be generated from switching and circuit breaker opening and closing. The projected noise levels at the Property lines will comply with applicable levels permitted by both the Town of Greenwich Noise Ordinance and CT DEEP's noise regulations. Noise levels will be at or below the most restrictive regulation, which is the Greenwich Noise Ordinance. Neighboring properties in the Business Zone will not be subjected to substation noise in excess of 62 dBA. Neighboring properties in the Residential Zone will not be subjected to substation noise in excess of 55 dBA during the day or 45 dBA at night.

The generator would operate during emergencies such as "black out" conditions. The emergency generator will also operate occasionally for maintenance and testing purposes during normal business hours.

Transmission Supply Line Routes

Construction-related noise for the transmission supply lines would be short-term and highly localized in the vicinity of work sites, and would result from the operation of construction equipment including truck traffic, earth moving equipment, drill rigs, and jackhammers.

If blasting is subsequently determined to be required to facilitate line construction, Eversource will retain a certified blasting specialist (licensed by the Connecticut Commissioner of Emergency Services and Public Protection) to develop a site specific blasting plan, in compliance with State and local regulations and Eversource guidelines.

A majority of the transmission supply line construction would be aligned within busy road ROWs, where the existing noise environment is influenced by traffic noise, including from I-95 and noise associated with the trains on the nearby railroad. In general, construction activities for the transmission supply lines are expected to occur over a 12- to 18-month period and would typically be performed during the daytime (7:00 AM to 7:00 PM), 6 days per week (Monday through Saturday)[46] when human sensitivity to noise is lower. During the Council's review process,

[46] Two exceptions to this schedule are cable and pipe pulling (see Section K.1.3) and splicing activities (see Section K.1.4).

Eversource expects to further define appropriate work hours for construction activities and include this detail in the D&M Plan.

Cos Cob Substation

The predominant existing noise emitters at the Cos Cob Substation are the transformers and only a portion of these are owned by Eversource (the others are owned by MNRR or by Connecticut Jet Power LLC[47]). As part of the Project, Eversource is proposing to make certain modifications to Cos Cob Substation, but these modifications do not include adding new transformers. After the Cos Cob Substation modifications are in service, infrequent noise would be generated from switching and from the additional circuit breakers opening and closing. The planned new equipment will not increase existing steady state noise levels at the facility.

J.7 Air Quality

Greenwich Substation

The construction and operation of the Greenwich Substation would result in short-term, highly localized effects on air quality during construction, primarily from fugitive dust and equipment emissions. To minimize the amount of dust generated by construction activities, the extent of exposed/disturbed areas on the Proposed Site at any one time would be minimized. Temporary gravel tracking pads would be installed at points of construction vehicle ingress/egress to minimize the potential for equipment to track dirt onto roads. To minimize dust, water may be used to wet down disturbed soils or work areas with heavy tracking, as needed.

Equipment in the GIS building would contain the insulating gas sulfur hexafluoride[48] ("SF6"). The Company has had long experience with managing its potential for SF6 releases from its GIS equipment and does not anticipate any impacts to air quality as a result of its application at the Greenwich Substation.

[47] Connecticut Jet Power LLC is a subsidiary of NRG Energy Inc.

[48] The most common use for SF6, both domestically and internationally, is as an electrical insulator in high voltage equipment that transmits and distributes electricity. Since the 1950s the U.S. electric power industry has used SF6 widely in circuit breakers, gas-insulated substations, and other switchgear used in the transmission system to manage the high voltages carried between generating stations and customer load centers. Like helium, sulfur hexafluoride is a non-toxic gas, but it has been identified as a "greenhouse gas" and utilities are required to monitor and regularly report on any releases of gas from its equipment and to reduce the potential for releases through improvements in the leak rate of new equipment, refurbishing of older equipment, and the use of more efficient operation and maintenance techniques.

Transmission Supply Line Routes

Construction activities along the selected transmission route would also have temporary effects on air quality. Similar techniques as used for the Substation would be employed to minimize dust.

Cos Cob Substation

Similar to the construction activities at Greenwich Substation, short-term and localized effects on air quality are anticipated. To minimize the amount of dust generated by construction activities, the extent of exposed/disturbed areas on the site at any one time would be minimized. Temporary gravel tracking pads would be installed at points of construction vehicle ingress/egress to minimize the potential for equipment to track dirt onto roads. To minimize dust, water may be used to wet down disturbed soils or work areas with heavy tracking, as needed. The new circuit breakers planned for the Cos Cob Substation will each contain SF6.

J.8 Scenic and Recreational Areas, Statutory Facilities and Surrounding Features

No permanent adverse effects are anticipated to the facilities listed in Table I-2 from construction and operation of the Greenwich Substation, primarily because of their distances from the Proposed Site. The site is surrounded by commercial properties.

Greenwich Substation

Construction and operation of the Greenwich Substation would not result in any adverse effects to Statutory Facilities or on recreational and/or scenic resources. No municipal land, open space, recreation areas or parks are located proximate to the Proposed Site.

Transmission Supply Line Routes

No long-term or permanent adverse effects to recreational and/or scenic resources are expected as a result of the Project. Temporary effects may occur in some locations during construction as the routes under consideration pass by or through municipal land, open space, and recreation areas. All of the routes would originate adjacent to Cos Cob Park. The Preferred Route and Southern Alternative pass through Bruce Park.

Temporary effects to portions of Bruce Park would occur during construction of the transmission supply lines. These areas would be restored after completion of the construction.

Cos Cob Substation

Construction activities associated with the proposed modifications to Cos Cob Substation would not result in any direct effects to Statutory Facilities or to recreational and/or scenic resources, including Cos Cob Park. The property is located adjacent to the Town's recently developed recreational park and is close to Long Island Sound. Existing utility infrastructure currently exists on the property in form of substation equipment and numerous transmission structures and overhead lines. The addition of the relatively modest proposed substation expansion would not create a substantial visual impact over existing conditions.

J.9 Vehicle and Pedestrian Traffic

Eversource recognizes that the Project would cause temporary inconvenience to the public with respect to pedestrian and vehicle traffic patterns. Construction work would be accomplished in several stages, and each stage may require in-road activities that temporarily affect vehicle and pedestrian traffic patterns and land uses in the immediate vicinity. These activities are:

- Reconfiguring traffic patterns and setup of traffic control devices;
- Marking the transmission supply lines within the roadway and locating existing utilities;
- Establishing temporary E&S control measures;
- Conducting soil test borings;
- Relocating existing overhead and underground utilities;
- Trimming or removing trees, fencing and landscaping;
- Installing the splice vaults;
- Trenching and installing the typical cable pipes for the transmission lines;
- Testing/proofing the transmission conduits (mandrelling and video inspection);
- Pulling the transmission cables into the underground steel pipes;
- Splicing the transmission lines;
- Testing lines inside splice vaults;
- Pulling the temperature sensing fiber optic cables;
- Installing pull boxes for remote operation and control of the fiber optic cables;
- Pulling the fiber optic cables for remote operation and control;
- Restoring off-road areas, including sidewalks, lawns, fencing, etc.; and
- Restoring pavement.

J.10 Public Health and Safety

The Project would be designed, constructed, and maintained in compliance with the standards of the National Electrical Safety Code ("NESC") and other applicable electrical safety codes. The facilities would be designed in accordance with sound engineering practices using established design codes, criteria and guides published by, among others, the Institute of Electrical and Electronic Engineers ("IEEE"), the American Society of Civil Engineers ("ASCE"), the American Concrete Institute ("ACI"), and the American National Standards Institute ("ANSI").

Greenwich Substation

When planning for a new substation, the Company carefully incorporates design features to protect the security of the substation yard and the on-going transmission of electricity. The Substation would be constructed in full compliance with the standards of the NESC, and good utility practice. In the event that an energized line or substation equipment fails, protective relaying equipment would immediately remove the failed line or equipment from service, thereby protecting the public and the remaining equipment within the Substation.

The perimeter of the Substation would be enclosed by an eight foot high wrought iron-style fence to discourage unauthorized entry and/or vandalism. The Substation entrance would be gated and locked. All gates would be padlocked at the end of the work day during construction activities and at all times once the Substation is in service. Appropriate signage would be posted at the Substation alerting the general public of high voltage facilities located within the Substation. The Substation would have low-level lighting for safety and security purposes. Additional lighting would be available within the Substation yard for work at night or during inclement weather.

The Greenwich Substation would be equipped with measures to ensure continued service in the event of an outage or fault on a section of the transmission system or substation equipment. Continued reliability would be achieved by providing two 115-kV underground lines, transformer protection, and redundant automatic protective relaying equipment.

Protective relaying equipment would be installed to automatically detect abnormal system conditions (e.g., a faulted transmission line) and would send a protective trip signal to circuit breakers to isolate the faulted section of the transmission system. The protective relaying schemes would include fully redundant primary and backup equipment so that a failure of one

scheme would not require the portion of the system being monitored by the protective relaying equipment to be removed from service.

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

The Company incorporates IEEE/ANSI and National Fire Protection Association standards for fire protection in its Substation design and operates these facilities to minimize the impact of fire, in the unlikely event that a fire at the Substation should occur. Eversource provides safety training for its substation employees and to local fire and police departments on the safe methods to deal with a substation fire. The control enclosure would be locked and equipped with fire extinguishers, as well as smoke detectors that would be monitored from a remote location. Smoke detection would automatically activate an alarm at CONVEX and the system operators would then take appropriate action. Additional devices would constantly monitor the Substation to alert Eversource of any abnormal or emergency situations.

Transmission Supply Line Routes

Trenching, supply line installation, and backfilling would proceed progressively along the route such that relatively short sections of trench (typically 200 feet per day per crew) would be open at any given time and location. During non-work hours, temporary cover (steel plates) would be installed over the open trench within paved roads to maintain traffic flow over the work area. After backfilling, the trench area would be repaved using a temporary asphalt patch or equivalent. Disturbed areas would be permanently repaved as part of final restoration.

Cos Cob Substation

Similar to existing conditions, the perimeter of the substation expansion area would be enclosed by a seven-foot high chain-link fence (1¼" mesh) topped with three strands of barbed wire to discourage unauthorized entry and/or vandalism. The Substation entrance would continue to be gated and locked. All gates would be padlocked at the end of the work day during construction activities and at all times once the modifications are complete and in service. Appropriate signage is posted at the Substation alerting the general public of high voltage facilities. No new lighting

would be installed. Lighting is currently available within the substation yard to facilitate work at night or during inclement weather.

K. Construction Procedures

The Project facilities would be constructed in accordance with established electric utility practices and regulatory requirements, applicable best management practices, final engineering plans, Eversource's specifications and the conditions specified in the Certificate and other approvals and permits obtained for the Project. The following subsections describe the land requirements for the development of the Project and the procedures and methods that would be used to construct the Project facilities. During actual construction, certain work activities and sequences may vary, based on factors such as site-specific conditions, final Project designs, and the requirements of regulatory approvals.

K.1 Typical Underground Transmission Line Construction Procedures

As introduced in Section G, the Project's underground 115-kV transmission lines would consist of HPFF electric transmission cables contained within steel pipes (encased in low strength thermal concrete) and concrete splice vaults. In addition, five fiber optic cables would be installed. Two fiber optic cables are required for remote protection and control of the cable system and associated equipment, and the other three (distributed temperature sensing) fiber optic cables are for monitoring the operating temperature of the cables and the fluid return pipe. The fiber optic cables would be spliced and pulled into a precast manhole located near the cable splice vault locations.

K.1.2 Trench Installation Techniques

The most common method for installing an underground HPFF circuit is by open cut trenching. Typically, mechanical excavation is required to remove the concrete or asphalt road surface (for roadways), topsoil, and sub-grade material to the desired depth. Removed material is relocated to an appropriate off-site location for disposal or reused as backfill. Once a length of trench is opened and shoring installed, where required, the steel pipes are placed, welded, x-rayed, and assorted conduits are assembled and lowered into the trench. The area around the pipe and conduits is filled with a low strength thermal concrete and capped with a layer of high strength thermal concrete. After the concrete is allowed to set up, the trench is then backfilled and the site restored. Backfill materials would be clean excavated material, thermal sand and/or FTB. The minimum dimensions for open trench construction are approximately 4.5 feet wide by 5.5 feet deep.

Figure K-1 illustrates a typical trench trenching operation performed during nighttime hours.

Figure K-1 Typical Trench

K.1.3 Trenchless Installation Techniques

Horizontal Directional Drill (HDD)

Both the Preferred Route and Southern Alternative would require the use of HDD technology. HDD is a steerable trenchless method of installation for underground pipes, conduits and lines in a shallow arc along a prescribed bore path by using a surface-launched drilling rig. HDD is used when open trench excavation is not practical, such as under rivers, highways or areas of congested development.

The HDD installation would consist of three individual bore holes, approximately 14 to 20 inches in diameter, spaced a minimum of 10 feet apart. HDD crossings require both sending and receiving pits at either end of the trenchless span. The sending areas typically measure approximately 100 feet by 150 feet (about 15,000 square feet), although in some instances a modified (slightly reduced) area can be arranged to meet the specific conditions of a site. Receiving areas require an area measuring approximately 750 feet long by 25 feet wide. The

HDD installation would have an entry and exit angle of approximately 11 degrees (i.e. very flat) and a minimum bending radius of 800 feet. Depending upon the soil characteristics, a casing may be needed at both the entrance and exit of the HDD to prevent the bore from collapsing. After the three bore holes have been drilled and reamed to the required diameter, two 8-inch steel pipes, each with one 2-inch and one 4-inch PVC conduit attached, would be pulled together through the two outer holes while the 8-inch fluid return pipe with one 2-inch conduit would be pulled through the center hole. HDD work areas are also required for transmission line entrance and exit locations.

Figure K-2 shows an HDD equipment setup at the entry location.

Figure K-2 Typical HDD Setup – Entry Location

At a minimum, the construction schedule associated with HDD installations requires six 12-hour days; however, Eversource would like to pursue an option to work 24 hours during pipe and cable pulling. In addition, if unusually difficult conditions or an emergency is encountered, the crew will want to work continuously to reduce the risk of losing the drill.

Pipe Jacking

The Preferred Route and Northern Alternative Route will require the use of a trenchless installation known as pipe jacking to cross under the MNRR corridor. Pipe jacking is a trenchless installation involving auguring or hand-mining operations that simultaneously jacks or pushes a casing into the excavated cavity. The set-up areas required for pipe jacking measure, at a minimum, approximately 12,000 square feet and would be placed near the driveway entrance to Cos Cob Park.

Figure K-3 illustrates a typical pipe jacking installation.

Figure K-3 Pipe Jacking

As the equipment progresses forward, subsequent casing segments are added while the soils are removed through the center of the casing. Upon completing the casing installation, the three steel

pipes and the PVC conduits are installed inside the casing pipe using specially designed spacers, and the entire casing is then backfilled with thermally designed grout. The grout not only solidifies the installation from any movement, but also helps dissipate heat away from the line system. The pipe jacking would consist of an approximate 42-inch diameter casing pipe, which will allow personnel to enter the casing should the manual removal of obstacles be necessary.

K.1.4 Cable Splices

Splicing the HPFF transmission line cables is performed inside the splice vault, under a controlled atmosphere. A "clean room" atmosphere would be provided by an enclosure or vehicle (large panel truck) located over the manhole access points during the splicing process. Once the splicing work begins, it cannot be interrupted and requires a work schedule of 24 hours a day, 7 days a week. Splicing will take approximately 14 to 21 days to complete both splices at each location (splice vault). Splicing of HPFF cables begins with removal of the insulation and shields from the conductor; the insulation is tapered down to the conductor and the conductor ends are then joined. Insulation paper tape is wound around the spliced conductor, filling the tapered area of the insulation. Metalized tapes or carbon black tapes are used to re-establish the conductor and insulation shields. Small rolls of paper tape are used, as the three cables are very close together.

Figure K-4 shows a typical nearly-finished HPFF splice installation in a vault along with associated equipment.

Figure K-4 Typical 115-kV HPFF Splice Assembly

K.1.5 Terminations

Terminations are devices that seal the end of the cable to allow it to "transition" to an overhead line or to connect to substation bus or other above ground equipment. Terminations are typically mounted on a termination structure, often called a riser. Terminations are made by first separating the three cables using a trifurcator, which allows the cables to be routed from the 8-inch pipe to smaller stainless steel pipes connecting to the individual phase terminations. Each phase termination is then made in fluid-filled terminators.

The preparation process closely resembles that of a splice and also requires a controlled atmosphere. Following the installation of the taped stress cone, the ceramic insulator is placed over the cable insulation to control electrical and mechanical stresses.

Termination structures would be installed at the Cos Cob Substation. Gas insulated equipment would be used to transition the two 115-kV circuits from underground lines to the substation bus in the Greenwich Substation. Termination structures can vary in design and are commonly engineered for each unique scenario.

Figure K-5 shows an example of a substation termination structure utilizing an above ground spreaderhead as a trifurcator. Final design of the termination structures to be used at Cos Cob Substation will be presented in the D&M Plan.

Figure K-5 Typical 115-kV HPFF Termination Structure

There will not be a termination structure of this nature at the new Greenwich Substation. The underground lines will connect directly into the GIS equipment for transitioning the two 115-kV circuits from underground lines to the substation bus.

K.1.6 Land Requirements

Eversource proposes installing the underground transmission supply lines principally within or adjacent to public roads within the Town. The exact location of the lines and the splice vaults within and adjacent to such roads would be determined based on the route approved by the Council and final engineering designs, taking into consideration the constraints posed by existing buried utilities and the location of other physical features, as well as environmental and community impacts.

Eversource is negotiating with representatives from the MNRR and ConnDOT to obtain rights to install segments of the Project beneath the railroad infrastructure and I-95, respectively.

Depending on the final route, Eversource may also need to acquire rights from public and private parties to accommodate portions of the Project.

K.1.6.1 Trench Requirements for Off-Road Construction

For construction other than within public roads, the transmission supply lines would require a dedicated area and permanent easement for the location of the lines and/or splice vaults, and for future access for maintenance and repair activities. Additional temporary construction easements will be required for maneuverability of equipment and temporary storage of materials at these locations. The size of the temporary construction easements required to accommodate the construction will depend on the design depth of the trench, site-specific topographic conditions and environmental and land-use characteristics.

K.1.6.2 Trench Requirements for In-Road Construction

The installation of the transmission supply lines within a public road usually requires a minimum width of 24 feet to accommodate the excavation of the trench, the equipment, and the staging of materials.

Installation of the transmission supply lines within public roads would require coordination with other underground, and potentially overhead, utilities. Prior to the installation of the pipes, the Project construction detail, including methods and schedule, will be reviewed with the Town, the MNRR and/or ConnDOT for work that will occur within close proximity of Town, the MNRR and/or ConnDOT facilities to address any concerns.

K.1.6.3 Splice Vault Requirements

The outside dimensions of pre-fabricated splice vaults for 115-kV HPFF lines are approximately 13 feet wide by 9 feet high and up to 20 feet long. The installation of each splice vault requires an excavation area approximately 16 feet wide, 12 feet deep, and 24 feet long. The top of the splice vault is installed a minimum of 3 feet below grade with two access holes or “chimneys” requiring manhole covers, each approximately 38 inches in diameter. The actual burial depth of each vault will vary, based on site-specific topographic conditions and on the depth of the pipe sections that must interconnect within the vault (the depth of the lines at any location would be based on factors such as the avoidance of other buried utilities).

Vaults may be installed within public ROWs or, in order to avoid conflicts with other buried utilities, may be installed in suitable locations adjacent to the road (e.g., beneath parking lots, sidewalks, road shoulders, or road medians). However, the location of vaults off-road complicates construction due to the need to cross other buried utilities twice (going into and out of the splice vault).

Within the easements for the off-road splice vaults, most uses such as the placement of structures or planting of trees would be prohibited to avoid damage and impacts to the operation and performance (ampacity) of the lines, as well as limiting access to the facility.

K.1.6.4 Construction Support Areas

During construction, other areas would be required in the vicinity of the transmission supply line route for temporarily storing and staging construction materials, equipment and supplies (including the conduits and splice vaults), as well as to park contractor and personal vehicles. Materials may also be assembled in these staging areas before they are delivered to work sites. To the extent possible, these construction support areas would be located on previously disturbed property (e.g., Eversource property, existing parking lots and other commercial properties, or properties formerly used for other types of construction staging, such as highway work). Landowner permission and regulatory approvals (as appropriate) would be obtained for the temporary use of such sites.

Prior to construction, Eversource and its contractor(s) would establish one or more primary construction support areas near the Project area. After the completion of construction, these sites would be vacated and restored according to the individual agreement with the landowner and the extent to which the support activities altered the site.

Smaller staging areas would be established next to active construction work sites, such as within or adjacent to roads (e.g., within paved travel lanes, on road shoulders, on road medians, or in parking lots), and would be used temporarily to park equipment, sanitary facilities, and store limited amounts of materials needed for line system installation (e.g., trench boxes, backfill material). Material deliveries would be more frequent in areas where less storage space is available.

As construction progresses along the transmission supply line route, temporary support sites would be moved to keep equipment and materials near active work locations. Once a temporary construction support area is no longer needed, it would be restored substantially to its previous condition.

K.2 Underground Transmission Supply Line Construction Sequence and Methods

The Project construction is expected to be completed over a 12 to 18 month period. However, the transmission supply line construction would be divided into multiple components so that the actual work at any one location would be periodic and result in various discrete tasks performed in the area specific location at different times. Such multiple mobilizations to an area cannot be avoided due to the sequential nature of the underground line installation work. However, the transmission supply line installation would involve parallel activities and multiple construction crews which would be deployed at the same time to perform construction activities at various locations along the line route.

For example, trenching and trench installation may be performed at various locations along the line route concurrently, using separate crews. At the same time, other crews may be dedicated to the installation of splice vaults. The time required for both trenching and splice vault installation is based on factors such as subsurface conditions (e.g., the presence of rock or groundwater) that dictate the use of special construction procedures, the depth at which the vaults or trenches must be installed, and conflicts with existing utilities that may need to be relocated. On average, Eversource anticipates that each crew will complete approximately 35 feet per day of trenching and installation of pipe and conduits under favorable conditions. Specific activities involved in the line system construction are further described in Section K.2.2.

K.2.1 Pre-Construction Planning

Prior to the start of construction, Eversource would undertake surveys and other related activities which would include, but not be limited to:

- Conducting surveys to more specifically identify the exact location of existing underground and overhead infrastructure and developing plans for the temporary or permanent relocation, if required, of facilities such as electric, gas, water, and sewer lines, telecommunication facilities, utility poles, traffic signals, hydrants, and bus stops;

- Conducting analyses of soil and groundwater conditions along the line route and preparing plans for soil and groundwater handling during construction; and
- Identifying locations of construction storage yards and construction support areas and obtaining approvals for using such areas. Eversource would continue to consult or coordinate with the Town, as needed.

K.2.2 Construction Details

The first step in the construction process would be to deploy appropriate E&S controls (e.g., catch basin protection, silt fence or straw bales, as necessary) at locations where pavement or soils would be disturbed. Within roads and other paved areas, the pavement then would be saw cut and removed.

For installation of the HPFF pipe, a trench would then be excavated a minimum of 5.5 feet deep and approximately 4.5 feet wide (these dimensions may be enlarged for crossing existing underground utilities, shoring to stabilize exposed sidewalls, etc.). Excavated material (e.g., pavement, subsoil) would be placed directly into dump trucks and hauled away to a suitable disposal site or a temporary storage site for screening/testing prior to final disposal, or re-used in the excavations for backfill. If groundwater is encountered, dewatering would be performed in accordance with authorizations from applicable regulatory agencies and may involve discharge to catch basins, temporary settling basins, temporary holding tanks (frac tanks), or vacuum trucks.

The pipes and conduits would be installed in sections. The steel pipes will be delivered in approximately 40-foot lengths and welded together in the field, while the PVC conduits would be delivered in sections between 10 to 20 feet long and joined together. After installation in the trench, the pipes and conduits would be encased in a low strength thermal concrete. The trench would then be backfilled with material with sufficient thermal characteristics to help dissipate the heat generated by the lines (thermally approved clean excavated material, thermal sand and/or a FTB).

Trenching, pipe installation, and backfilling would proceed progressively along the route such that relatively short sections of trench (typically 200 feet per crew) would be open at any given time and location. Work zones around the trench area usually range from approximately 600 to 800 feet. During non-work hours, temporary cover (steel plates) would be installed over the open trench to maintain traffic flow over the work area. After backfilling, the trench area would be

repaved using a temporary asphalt patch or equivalent. Disturbed areas would be permanently repaved as part of final restoration.

At intervals of up to 2,800 feet along the line route, pre-cast concrete splice vaults would be installed below ground. The length of an underground line section between splice vaults (and therefore the location of the splice vaults) is determined based on engineering requirements (such as the maximum allowable cable pulling tensions; maximum allowable cable sidewall pressure; and, cable weight/length that can fit on a reel and be safely shipped) as well as consideration of community impacts, environmental resources and land constraints. The specific locations of splice vaults would be determined during the final engineering design and provided to the Town and to the Council as part of the D&M Plan.

For safety purposes, the splice vault excavation would be shored and fenced. Vault sites also may be demarcated by concrete (Jersey) barriers. Vault installation within roadways may require the closure of travel lanes in the immediate vicinity of the vault construction.

After the vaults, pipes and conduits are in place, the pipes and conduits would be swabbed and tested (proofed), using an internal inspection device (mandrel), to check for defects that could damage the lines upon pulling or during normal operation. Mandrelling is a testing procedure in which a “pig” (a painted aluminum or wood cylindrical object that is slightly smaller in diameter than the pipe or conduit) is pulled through the pipes and conduits. This is done to ensure that the “pig” can pass easily, verifying that the pipes and conduits have not been crushed, damaged, or installed improperly. After successful proofing, the transmission supply lines and fiber optic cables would be installed and spliced. Cable reels would be delivered by tractor trailers to the vault sites, where the cable would be pulled into the conduit using a truck-mounted winch and cable handling equipment.

To install each transmission supply line within the pipes, 3 large cable reels would be set up over the splice vault and a winch would be set up at one of the adjacent splice vault locations. The lines would then be pulled into the pipes by winching a pull rope attached to the end of a pulling eye attached to all 3 individual cables. The splice vaults would also be used as pull points for installing the temperature monitoring fiber optic cables under a separate pulling operation. In addition, pull boxes (with man holes) would be installed near the splice vaults for the pulling and splicing operations required for the communications fiber optic cables.

After the transmission supply lines are pulled into their respective pipes, the ends would be spliced together in the vaults or terminated inside the substations. Because of the time-consuming precise nature of splicing high-voltage transmission lines, their sensitivity to moisture (moisture is detrimental to their useful life), and the need to maintain a clean working environment, splicing HPFF lines is a complex procedure and requires a controlled atmosphere. A "clean room" atmosphere would be provided by an enclosure or vehicle located over the manhole access points during the splicing process. It is expected to take approximately 14 to 21 days to complete the splicing operation in each splice vault (two 3-phase HPFF115-kV cable splices in each splice vault). During commissioning, access to splice vaults may also be required.

K.3 Substation Construction Sequence and Methods

Construction of these facilities would involve a sequence of activities as discussed below. The order of specific activities and methods of construction may vary based on the specific characteristics of each site and the final detail engineering design for each substation.

K.3.1 Substation Construction Sequence and Methods

K.3.1.1 Site Preparation

Pre-construction work at the new Greenwich Substation and Cos Cob Substation includes:

- Installing temporary E&S controls (e.g., silt fence, straw bales), where necessary. Such controls would be maintained, inspected and replaced as required throughout the construction process.
- Removal of the existing building at 290 Railroad Avenue.
- Grading and drainage improvements.

K.3.1.2 Foundation Construction

Foundation construction would commence after the completion of rough grading. The foundation installation would involve excavation, form work, steel reinforcement, and concrete placement. Excavated material would either be reused on-site or disposed of off-site in accordance with applicable requirements. If stored on-site, excavated material will be managed to prevent runoff.

K.3.1.3 Installation of Equipment

After the foundations are installed, construction activities at both substations would shift to the erection of steel-support structures for electrical equipment, such as insulators, bus work, and disconnect switches. In addition, excavation for the installation of control and power conduits and ground-grid conductors would occur.

At the new Greenwich Substation, the 115-kV GIS equipment would be housed in a new building. Transmission relay and control equipment will also be contained within the GIS building. Three 115- to 13.2-kV transformers would be installed immediately behind the building with partitioning walls separating each unit. Bus work and switching equipment would be erected on the 115-kV side of each transformer. A distribution switchgear enclosure would be constructed to house the 13.2-kV breakers, and associated protection and control equipment. There would also be auxiliary equipment installed adjacent to the switchgear. A pump house will support the HPFF transmission cables and maintain the requisite liquid pressure under all loading conditions. It will also provide for slow or rapid fluid circulation to even out hot spots along the line route.

At Cos Cob Substation, proposed modifications include two 115-kV circuit breakers with associated foundations, five manually operated disconnect switches, two motor operated disconnect switches, six instrumentation potential transformers, two sets of cable termination structures, ten bus support structures, one A-Frame line structure (approximately 45 feet tall) with associated foundation, one monopole line structure (approximately 85 feet tall), and associated foundations, underground conduits, cable vaults and duct banks. Relay and control equipment would also be installed within Cos Cob Substation's existing protective relay and control enclosures.

K.3.1.4 Testing and Interconnections

All of the substation equipment would be tested prior to final connection to the transmission grid. New termination structures and associated conductors and wires would be installed to connect the new transmission line terminals at the existing Cos Cob Substation to the new 115-kV underground transmission facilities.

K.3.1.5 Final Cleanup, Site Security and Restoration

After the equipment at each substation is installed, any remaining construction debris would be collected and properly disposed. Temporary E&S controls would be maintained until soils disturbed by construction activities are stabilized.

Temporary construction security fencing would be replaced with permanent, wrought iron-style fencing at Greenwich Substation. At Cos Cob Substation, new chain-link fencing would be added on the south side of Cos Cob Substation to enclose the expanded area.

L. Project Facilities Reliability, Safety and Security Information

The Project would be designed in accordance with sound engineering practices and constructed in full compliance with the standards of the NESC and good utility practice. Should equipment experience a failure, protective relaying would immediately remove the equipment from service, thereby protecting the public, the equipment within the substations, as well as the associated underground infrastructure.

L.1 Emergency Operations and Shutdown

Protective relaying equipment is incorporated into the Project design to automatically detect abnormal system conditions and send a protective trip signal to the respective circuit breaker(s) at each end of the line to isolate the faulted section of the transmission system. Specifically, fiber optic strands would be installed within a conduit in the underground duct bank. These strands would provide a robust and reliable communications path for the protective relaying systems.

The protective relaying schemes include fully redundant primary and back up equipment. This ensures that if a line or station equipment failure were to occur at a time when one of the protective relaying schemes is removed from service for maintenance, the redundant protective scheme would initiate the removal from service of the faulted transmission facility being monitored.

If one of the transmission supply lines experiences an insulation or conductor failure, then high-speed protective relaying would immediately remove the line from service, thereby protecting the public and the transmission line. If equipment at the substations experiences a failure, then protective relaying would immediately remove the equipment from service, likewise protecting the public and equipment within the substations.

L.2 Fire Detection Technology

Fire/smoke detection systems will be incorporated into the Greenwich Substation. These systems are already in place in the existing relay and control enclosures at Cos Cob Substation. In the event fire or smoke is detected, these detection systems would automatically activate an alarm at the Connecticut Valley Electric Exchange (“CONVEX”) and the system operators would then take the appropriate action. In addition, the relay/control enclosure at the Greenwich Substation will be equipped with fire extinguishers. The relay/control enclosure at Cos Cob Substation is similarly equipped with fire extinguishers.

The new protective relaying and associated equipment within the substations, along with the existing SCADA system for remote control and equipment monitoring would be utilized to ensure the safe operation of the transmission system at both substations.

L.3 General Site Security

The access drive to the proposed Greenwich Substation would be gated and the perimeter of the substation would be surrounded by an eight-foot high, wrought iron-style fence for security. Lighting would be installed within the Substation yard to facilitate work at night under emergency conditions and during inclement weather. The Substation would have low-level lighting for safety and security purposes.

The access drive to Cos Cob Substation is presently gated and the perimeter of the substation is enclosed with a 7-foot high chain link fence topped with an additional foot of 3 strands of barbed wire to discourage unauthorized entry and vandalism. Lighting presently exists at Cos Cob Substation to facilitate work at nighttime or during inclement weather.

All gates would be padlocked at the end of the workday during the construction phase and at all times after the Project is completed. Appropriate signage is posted at Cos Cob Substation alerting the general public of the high voltage facilities within the substation. Similar signage would be placed at the Greenwich Substation.

L.4 Physical Security of Proposed Facilities

The physical security of the proposed facilities would be consistent with the Council's *White Paper on the Security of Siting Energy Facilities,* as amended, initially adopted in the Council's Docket 346 (“White Paper”). The *White Paper* Guidelines focus on the unpredictable intentional act of perpetrators designed to damage the physical structures of the certificated facilities (as opposed to, for instance, cyber security).

L.4.1 Summary of Physical Security Measures

The following summary follows the format suggested by the Council in its *White Paper,* which focuses on security issues associated with four areas: Planning, Preparedness, Response, and Recovery. Each section first presents the discussion topic included in the *White Paper,* and then provides Eversource's proposed security approach for the particular area.

L.4.2 Planning

L.4.2.1 Identification

Identify the physical vulnerabilities most likely to pose a security threat.

The physical vulnerabilities at the proposed Greenwich Substation would be similar to any other substation, which would be primarily a risk of unauthorized access and the damage to or destruction of electrical equipment. The new Substation would be located near the intersection of two well-travelled roads and therefore would be visible and known to the public.

The Project will also include modifications to the existing Cos Cob Substation. The proposed modifications to Cos Cob Substation will not increase the types of vulnerabilities, but it will add more equipment with similar characteristics to what currently exists.

L.4.2.2 Facility Type/Characteristics

Identify the type and characteristics of the facility and any ways in which the facility's setting affects security concerns.

The proposed Greenwich Substation will consist of a GIS building for the 115-kV transmission equipment, circuit breakers and switchgear, a pressurizing plant for the pipe type cables, and additional distribution equipment consisting of circuit switchers, transformers, 13.2-kV switchgear and other auxiliary equipment. Other than the circuit switchers, transformers and associated aluminum bus conductors, all equipment will be housed inside buildings or enclosures. The proposed Greenwich Substation would be located in a commercial area with no known history of vandalism. The location of the GIS building near the intersection of two well-travelled roads could be a risk for vehicle impact. Security cameras will be installed for monitoring activity within the fenced area.

The Cos Cob Substation consists of outdoor substation equipment and is located between the railroad tracks and a town park. This setting is visible to the public, and there is no known history of vandalism.

The setting of the proposed facilities poses no particular security concern. Cos Cob Substation is secure and is classified as a “low” risk per the NERC Physical Security Standard. Access control and Closed Circuit TV on the control house are planned for “low” risk sites and the Cos Cob work is planned for completion in 2016.

L.4.2.3 Interdependencies

Examine any pertinent ways in which the facility is linked to other facilities and systems and potential repercussions from a facility or system interruption. Examine whether the proximity of the facility to other electric facilities, either dependent or independent, presents security challenges.

The proposed new Substation and its two 115-kV transmission lines will be fed from the existing Cos Cob Substation and therefore will be dependent on the Cos Cob Substation. An interruption that affects all of the Cos Cob Substation would also affect the Greenwich Substation.

Because two 115-kV transmission lines will feed Greenwich Substation, there is redundancy that would allow transmitting power to the Greenwich Substation over the remaining 115-kV transmission line for the period of time required to effect emergency repairs on the damaged 115-kV line.

L.4.2.4 Awareness

Examine if there is an established method to help regional, state and national security officials maintain situational awareness of this facility.

Eversource has established procedures to help regional, state and national security officials maintain situational awareness of its facilities. CONVEX monitors Eversource's transmission facilities and those of other member utilities in Connecticut and Western Massachusetts in real time, and ISO-NE similarly monitors the security status of the entire New England bulk power system.

Causes of outages are investigated promptly and, when appropriate, reported to law enforcement officials. Maintaining situational awareness is a dynamic task. In 2006, when NERC applied to be designated by the FERC as an Electric Reliability Organization (ERO), NERC included a provision for maintaining situational awareness and it continues to develop improvements to address and/or improve awareness.

L.4.3 Preparedness

L.4.3.1 Support Infrastructure

Examine site security infrastructure, including site monitoring, physical and nonphysical barriers and access controls.

The proposed Greenwich Substation will be protected by an eight-foot-high anti-scale wrought iron style fence. Access will be limited through a locked gate and only authorized personnel are permitted to enter. Most 115-kV equipment, including all transmission relays and controls, would be located within a locked GIS building and therefore will not be visible or readily accessible. Security cameras will be installed for monitoring activity within the fenced area. During construction, all gates are locked at the end of the work day. During operation, all gates will be locked at all times.

Site security monitoring will largely be provided by Eversource's SCADA system that connects to CONVEX. The SCADA system collects data from various sensors at remote locations and then sends this data to CONVEX, which manages and controls the data. As part of its duties, CONVEX maintains a procedure as to how sabotage events will be identified and reported to local and federal officials, neighboring entities and to regulatory bodies. NERC provides guidelines for assessing the degree of protection each component of the grid should receive and recommended types of precautions that these faculties should have in place.

Cos Cob Substation is protected by a seven-foot-high chain link fence topped with approximately one foot of barbed wire (three strands). Access is limited through a locked gate and only authorized personnel are permitted to enter. Access control and Closed Circuit TV on the control house are planned for “low” risk sites and the Cos Cob work is planned for completion in 2016.

L.4.3.2 Personnel

Review any simulated exercises that include local police, fire, and other emergency response teams.

Examine whether local law enforcement/emergency response liaison is in place, and review mutual aid agreements between affected entities.

Eversource has regularly consulted with first responders across its service territory. The addition of the proposed new facilities will not call for any change in established procedures that are in place for notification and response. Eversource Community Relations personnel remain available

to act as liaisons between Greenwich officials and the Company through well documented and exercised protocols.

The Connecticut Department of Emergency Services and Public Protection ("DESPP") Training and Exercise Division sponsors emergency preparedness training, seminars, exercises, and conferences for local first responders as defined in Homeland Security Presidential Directive 8 (i.e., police, fire, emergency management, emergency medical services, public health, public works, private sector, non-governmental organizations and others) that are designed to cover Mitigation, Preparedness, Response and Recovery. Eversource is represented on the Private Sector Council of DESPP, which meets quarterly and more frequently as needed. Eversource has participated, and will continue to participate, in state and regional emergency exercises.

L.4.4 Response

L.4.4.1 Access to Information

Examine notification procedures to public and/or local officials, including the types of security issues that would warrant such notification.

Upon completion of construction, the proposed Project will not require any change in existing, pre-established public notification procedures. After the Project is constructed, Eversource will adhere to NERC and CONVEX protocols and will coordinate further with these entities regarding the best mechanism for communicating incidents.

L.4.4.2 Mitigation

Examine mitigation measures, including alternate routing of power, strategically located spares and mobile backup generation.

Eversource continually prepares for outage contingencies. The system is planned and operated so that the sudden and unexpected loss of any single piece of equipment would not result in a widespread loss of power or damage to utility or customer equipment. In the event of an interruption of one of the new 115-kV lines, power flow would be automatically redirected to the remaining line. Also, Eversource keeps an inventory of spare equipment in order to quickly restore facilities to service after most failures.

L.4.5 Recovery

L.4.5.1 Recovery Measures

Identify measures that will be taken, if necessary, to restore natural resources at the site of the facility.

In the event of an incident, the first priority would be to eliminate any threat to public safety and to then repair the transmission facilities. During the response to an incident, natural resources at or adjacent to the site would be protected to the extent practical and subsequently restored to pre-incident conditions as appropriate. In general, the resource protection and mitigation measures expected to apply would be the same as those employed during Project construction. If wetlands or water resources are involved, mitigation protocols would be coordinated with the appropriate resource agencies, such as the U.S. Army Corps of Engineers and (ACOE) the CT DEEP.

L.4.5.2 Reporting

Determine whether reporting procedures are established to evaluate and improve the effectiveness of local emergency response teams, methods to limit negative impacts on neighboring electric facilities, and restoration of the natural environment.

Eversource will investigate and respond to any incident associated with its infrastructure. Depending on the magnitude and consequences of the incident, Eversource's processes and/or after action reviews will evaluate what improvements may be needed to minimize the potential for future adverse effects on its facilities and the environment and neighboring electric facilities in future incidents response, as well as the effectiveness of the interface with local emergency response teams.

M. Electric and Magnetic Fields

This section provides information about electric and magnetic fields ("EMF") and presents Project-specific projections for future EMF levels associated with the proposed transmission supply lines. The base case underground 115-kV line system that was modeled for these projections includes two HPFF pipe cables.

In addition, Eversource contracted with an engineering and scientific consulting firm, Exponent, Inc., to prepare a report reviewing scientific literature regarding health effects of electric and magnetic fields (see Appendix G.3).

M.1 Electric and Magnetic Fields from Power Lines and Other Sources

Electricity used in homes and workplaces is transmitted over considerable distances from generation sources to distribution systems. Electricity is transmitted as alternating current ("AC") to all homes and over electric lines delivering power to neighborhoods, factories, and commercial establishments. The power provided by electric utilities in North America oscillates 60 times per second (i.e., at a frequency of 60 hertz ("Hz")).

Electric fields are the result of voltages applied to electrical conductors and equipment. The electric field is expressed in measurement units of volts per meter ("V/m") or kilovolts per meter ("kV/m"); 1 kV/m is equal to 1,000 V/m. Most objects, including fences, shrubbery, and buildings, easily block electric fields. Therefore, certain appliances within homes and the workplace are the major sources of electric fields indoors, while power lines are the major sources of electric fields outdoors (Figure M-1, lower panel). It should be noted that electric fields from HPFF cables are contained within the sheaths of the individual cables. Therefore, measured electric fields from these cables in the environment will be zero.

Magnetic fields are produced by the flow of electric currents; however, unlike electric fields, most materials do not readily block magnetic fields. The level of a magnetic field is commonly expressed as magnetic flux density in units called gauss ("G"), or in milliGauss ("mG"), where 1 G = 1,000 mG.[49] The magnetic field level at any point depends on characteristics of the source,

[49] Scientists more commonly refer to magnetic fields in units of microTesla (μT). Magnetic fields in units of μT can be converted to milliGauss (mG) by multiplying by 10, i.e., 0.1 μT = 1 mG.

including the arrangement of conductors, the amount of current flow through the source, and its distance from the point of measurement. The levels of both electric fields and magnetic fields diminish with increasing distance from the source.

Background AC magnetic field levels in homes are generally less than 20 mG when not near a particular source, such as some appliances. Higher magnetic field levels can be measured outdoors in the vicinity of distribution lines, sub-transmission lines, and transmission lines (Figure M-1, upper panel).

Electric appliances are among the strongest sources of AC magnetic fields encountered in indoor environments. Magnetic fields near appliances can reach 1,000 mG or more. For example, Gauger (1985) reports the maximum AC magnetic field at 3 centimeters from a sampling of appliances as follows: 3,000 mG (can opener), 2,000 mG (hair dryer), 5 mG (oven), and 0.7 mG (refrigerator). Similar measurements have shown that there is a tremendous variability among appliances made by different manufacturers. The potential contribution of different sources to overall exposure over long periods is not very well characterized, but both repeated exposure to higher fields for short times and longer exposure to lower intensity fields for a long time contribute to an individual's total exposure.

Considering EMF from a range of specific sources or environments, as illustrated in Figure M-1, does not fully reflect the variations in an individual's personal exposure as encountered in everyday life. To illustrate this, magnetic field measurements were recorded, over a two-hour period, by a meter worn at the waist of an individual who conducted a range of typical daily activities in a Connecticut town.

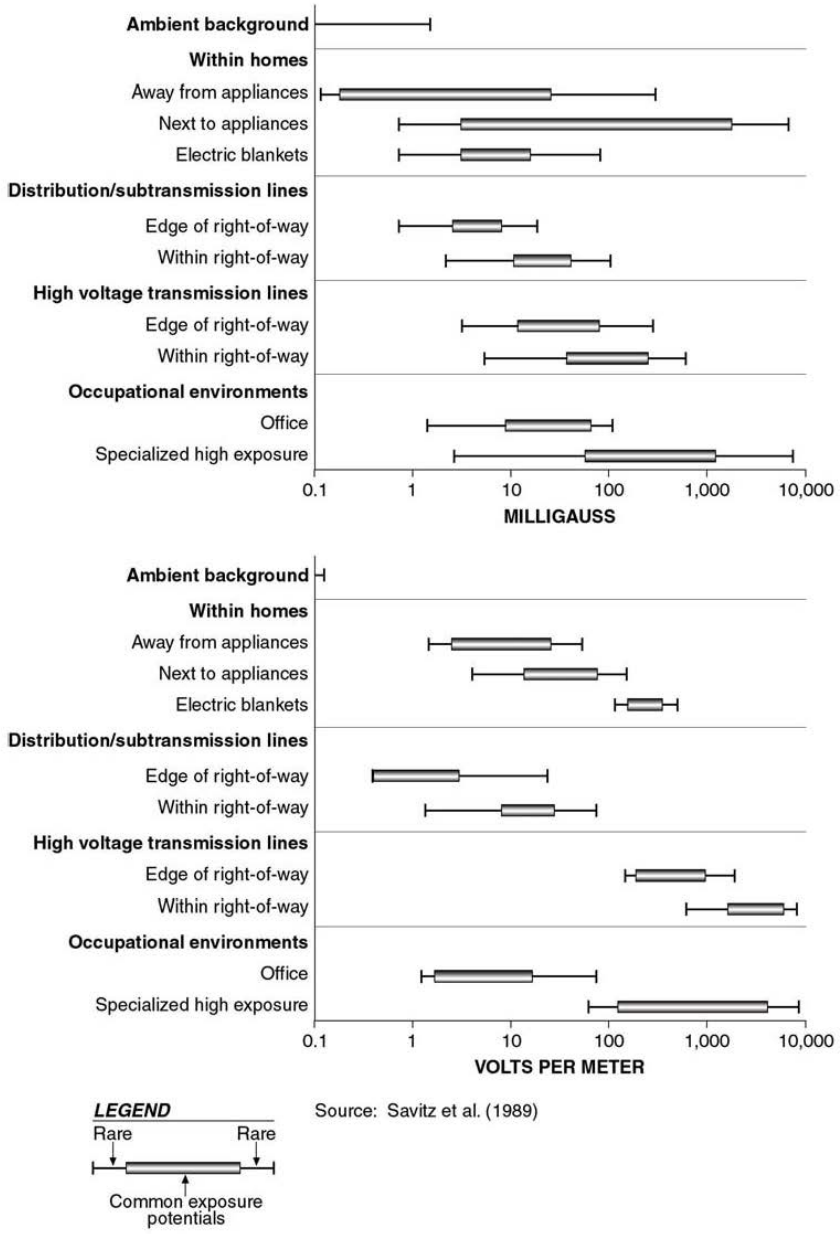


Figure M-1 Electric and Magnetic Fields in the Environment

As illustrated in Figure M-2, these activities included a visit to the post office and the library, walking along the street, getting ice cream, browsing in a bicycle shop, stopping in a chocolate shop, going to the bank/ATM, driving along streets, shopping in a supermarket, stopping for gas, and purchasing food at a fast food restaurant.

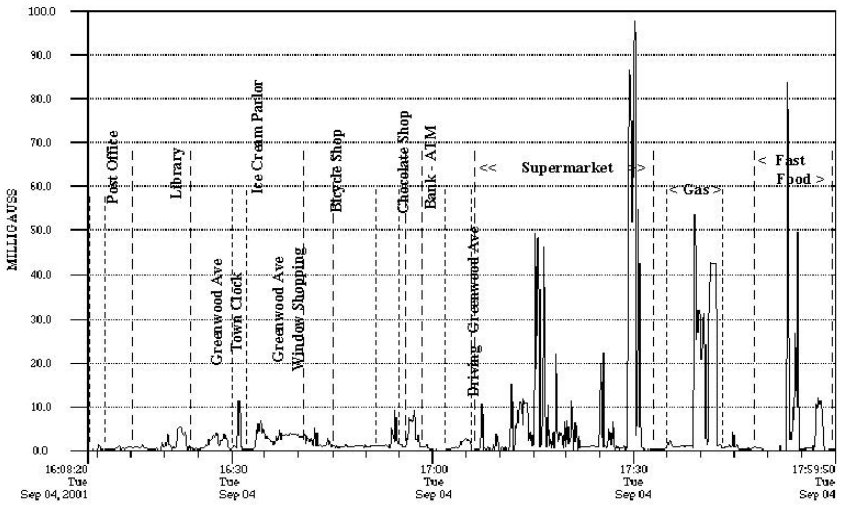


Figure M-2 Typical Magnetic Field Exposures in a Connecticut Town (Bethel)

The maximum, average and median exposures encountered during the course of the two hour measurement period are provided in Table M-1 below. As Figure M-2 shows, from moment-to-moment in everyday life, magnetic fields are encountered that vary in intensity over a wide range. Other individual patterns of exposure to magnetic fields could be very different and reflect the individual's personal activities. For example, a rider on a commuter or long-distance electric train in Connecticut would encounter higher average power-frequency magnetic fields of perhaps 14 to 50 mG during a trip, with potential peak values in the range of 100 to 400 mG (Department of Transportation, Federal Railroad Administration, 2006).

Table M-1 Summary of Magnetic Fields Measured in a Connecticut Town (Bethel)

Magnetic Field Levels (milliGauss, mG)		
Maximum*	Average	Median
97.55	4.57	1.10

*Maximum occurred in the supermarket

M.2 Connecticut Siting Council Requirements

In Section VI.N of the Council's *Application Guide for Electric and Fuel Transmission Line Facility* (dated April 2010) (*"Application Guide"*), the Council requests that applicants provide the following information:

1. Measurements of existing EMF at the boundaries of adjacent schools, daycare facilities, playgrounds, and hospitals (and any other facilities described in CGS § 16-50*l*), with extrapolated calculations of exposure levels during expected normal and peak normal line loading; and

2. Calculations of expected EMF levels at the above listed locations that would occur during normal and peak normal operation of the transmission line.

Further, in February 2014 the Council revised its *"Electric and Magnetic Field Best Management Practices for Transmission Lines in Connecticut"* ("BMP") originally issued in 1993.

In adopting the BMP, the Council recognized "the weight of scientific evidence indicates that exposure to electric fields, beyond levels traditionally established for safety, does not cause adverse health effects" and that scientific literature "reflects the lack of credible scientific evidence for a causal relationship between MF [magnetic field] exposure and adverse health effects" (BMP, pp. 1,3). Still, as part of its statutory duties, including its duty under CGS §16-50j *et seq*. to address public health and safety, the Council follows procedures to ensure a proposed transmission line would not pose an undue safety or health hazard to persons or property. These procedures and the BMP require that an applicant for approval of an electric transmission line provide:

1. Measurements and Calculations. An assessment of the effects of any electromagnetic fields produced by the proposed transmission lines (Connecticut General Statues §16-50*l*(a)(1)(A) including a proposed line adjacent to "residential areas, private or public schools, licensed child day-care facilities, licensed youth camps, and public playgrounds," (BMP, p. 4) and "electromagnetic field effects on public health and safety" (CGS §16-50 p(a)(3)(B)). This is to be met by taking measurements of existing electric and magnetic fields at the boundaries adjacent to the above facilities, with extrapolated calculations of exposure levels during expected normal and peak normal line loading. In particular, "an applicant shall provide design alternatives and calculations of MF for pre-project and post-project conditions, under 1) peak load conditions at the time of the application filing, and 2) projected seasonal maximum 24-hour average current load on the line anticipated within 5 years after the line is placed into operation." (BMP, p. 6)

2. Field Management Design Plan. The Council expects applicants will propose no-cost/low-cost measures to reduce magnetic fields by one or more engineering controls via a Field Management Design Plan. This should depict "the proposed transmission line project designed according to standard good utility practice incorporating "no-cost" MF mitigation design features. The Applicant shall then modify this base design by adding low-cost MF mitigation design features specifically where portions of the project are adjacent to residential areas, public or private schools, licensed child day-care facilities, licensed youth camps or public playgrounds." (BMP, p. 4)

3. Updates on Research. The Council will "consider and review evidence of any new developments in scientific research addressing MF and public health effects or changes in scientific consensus group positions regarding MF." (BMP, p. 5)

4. Statement of Compliance. A statement describing the consistency of the proposed mitigation design with the BMP (p. 6), and buffer zone requirements. (CGS §16-50p(a)(3)(D)

M.2.1 Statement of Compliance with the BMP and Buffer Zone Requirements

Section M.3 provides measurements and calculations, developed pursuant to the Council's *Application Guide* and the BMP, for the proposed transmission supply lines. These measurements and calculations also account for existing overhead distribution lines that are nearby to the route of the proposed lines.

Per the BMP, "*…MF is reduced by the underground cable design (refer to page 9 [of the BMP] for further information). However, special circumstances may warrant some additional cost in order to achieve further MF mitigation for underground lines. The utilities are encouraged, prior to submitting their application to the Council, to determine whether a project involves such special circumstances.*" Because Eversource proposes the transmission supply lines to be constructed with HPFF technology (also referred to as "pipe-type cable"), the fields are reduced with cable proximity and the material characteristics of the steel pipe. Calculated MF levels would be less than 0.5 mG (refer to section M.3.2.2) for average annual load conditions. According to a survey done by the Electric Power Research Institute (EPRI) in 1993, "*the average of measurements from all the rooms in the house [mean for the houses measured in the study] was calculated (the all-room mean magnetic field). The all-room mean magnetic field for all houses studied was 0.9*

mG." Based on the magnetic field level anticipated from the proposed transmission supply lines, Eversource concluded that the Project does not create any special circumstances that require Eversource to achieve further magnetic field mitigation.

M.3 EMF Measurements and Calculations

The major sources of EMF associated with the Project are the proposed underground transmission supply lines and existing overhead and underground distribution lines nearby. Transformers and other equipment within the Cos Cob and the proposed Greenwich Substations are also potential EMF sources, but they would cause little or no exposure to the general public. The strength of fields from equipment inside a typical substation decreases rapidly with distance, reaching very low levels at relatively short distances beyond substation perimeter fences, if at all. EMF levels from all sources decrease sharply with distance. EMF levels from substations were found to "attenuate sharply with distance and will often be reduced to a general ambient level at the substation property lines. The exception is where transmission and distribution lines enter the substation" (IEEE Standard 1127-1998). Because the fields outside the perimeter fence of a substation are highest directly above or below where transmission and distribution lines enter and leave the substation, measuring and calculating the EMF levels associated with transmission lines effectively addresses potential EMF exposures close to substations.

M.3.1 Field Measurements of MF from Existing Sources

On March 3, 2015, Eversource took spot measurements of existing magnetic fields at selected locations along the Preferred Route. The measurements were taken at a height of 1 meter (3.28 feet) above ground, in accordance with the industry standard protocol for taking measurements of EMF near power lines (IEEE Standard. 644-1994, R2008). The meters were calibrated on December 18, 2013.

Measurements of the MF present a "snapshot" of the conditions at a point in time. Within a day, and over the course of days, months, and even seasons, magnetic field levels change at any given location, depending on the amount and the patterns of power supply and demand within the state and surrounding region.

M.3.1.1 Magnetic Field Measurements at Cos Cob Substation

Measurements of the MF were taken on a horizontal transect of the proposed route across the access road at Cos Cob Substation. A depiction of the measurement area is shown in Figure M-

3. The orange line represents the proposed route. The cyan line represents the measurement path. The results of the measurements are depicted in Figure M-4 and tabulated in Table M-2. These measurements were taken on March 3, 2015 at approximately 4:05 PM. Nearby sources of magnetic fields include not only the existing overhead transmission lines, but also overhead and underground distribution lines entering and exiting the substation.

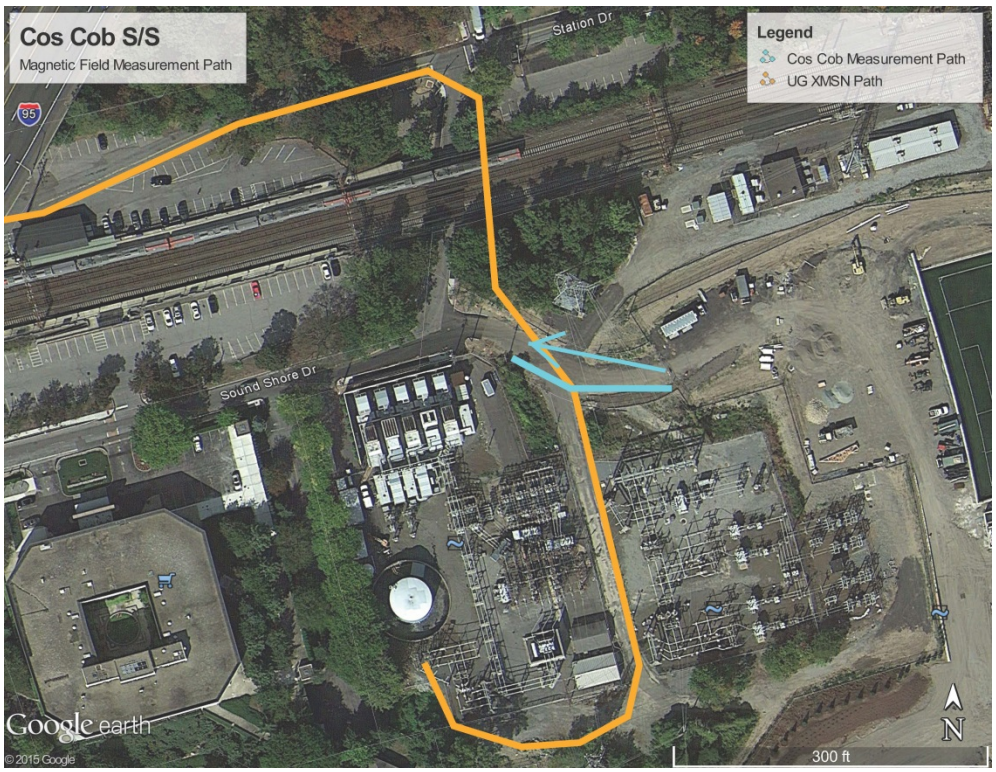


Figure M-3 GoogleEarth™ View of MF Measurement Path Across Cos Cob Substation Access Road

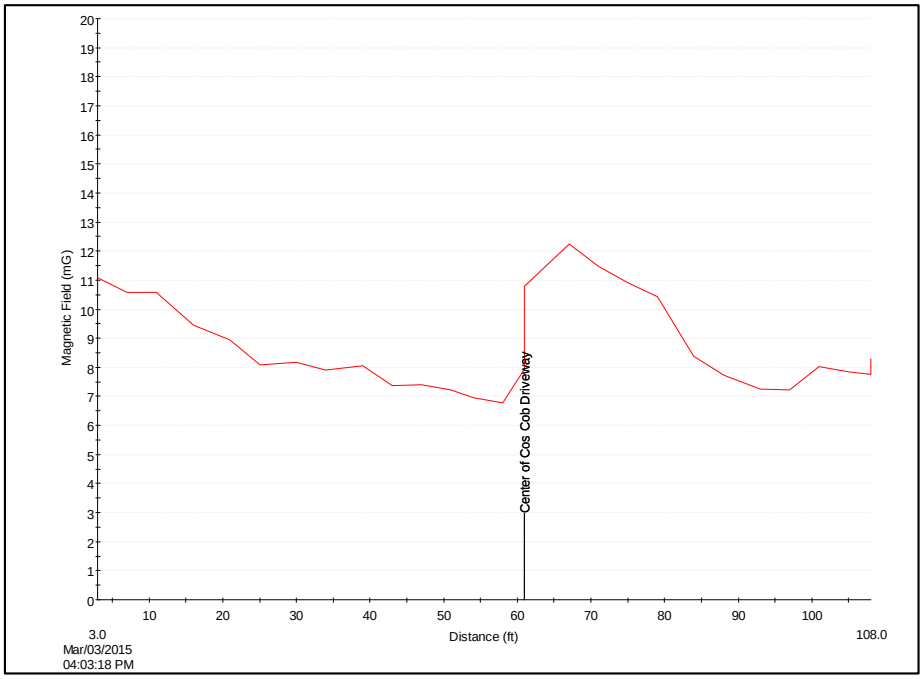


Figure M-4 Electric and Magnetic Fields Measured Across Cos Cob Substation Access Road

Table M-2 Cos Cob Substation MF Measurement Summary

MF Levels - Cos Cob S/S (milliGauss, mG)		
Maximum	Average	Median
12.24	8.74	8.06

M.3.1.2 Magnetic Field Measurements Across Arch Street

Eversource personnel performed measurements walking across Arch Street near the proposed route. Two paths were recorded. The location of this path is shown in Figure M-5. The orange path represents the proposed route, and the green path represents the measurement path. The results of the measurements are depicted in Figure M-6 and tabulated in Table M-3. The measurements were performed at approximately 4:15 P.M. on March 3, 2015.

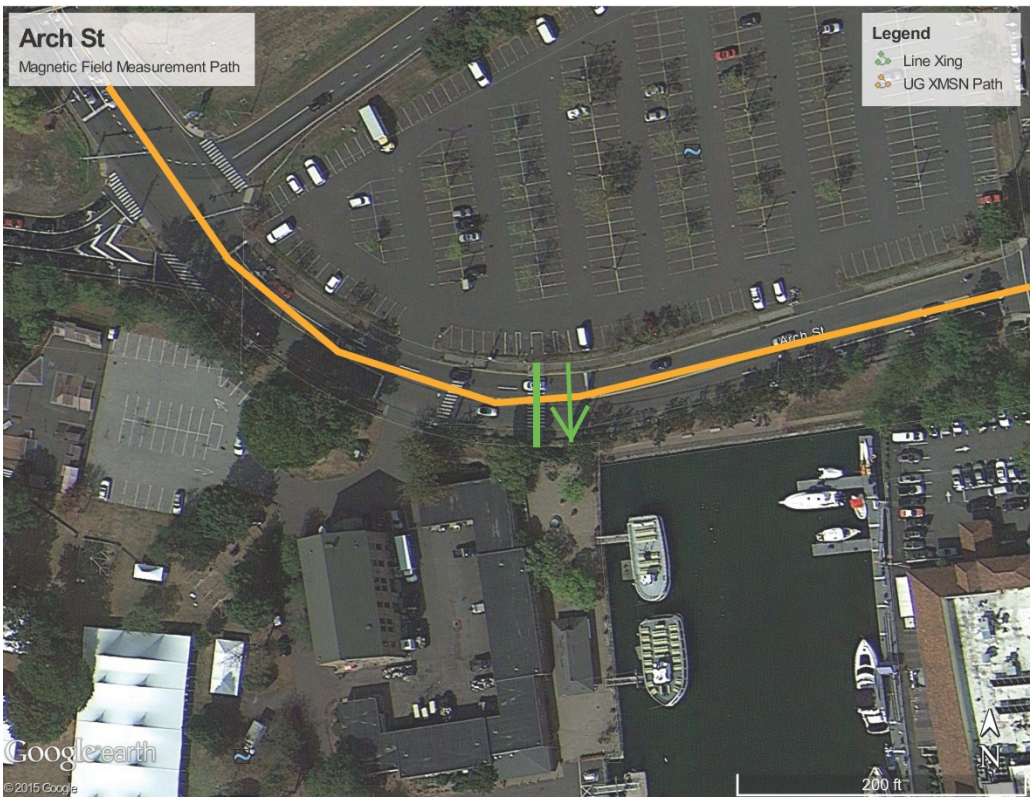


Figure M-5 GoogleEarth™ View of MF Measurement Path Across Arch Street Along Preferred Route

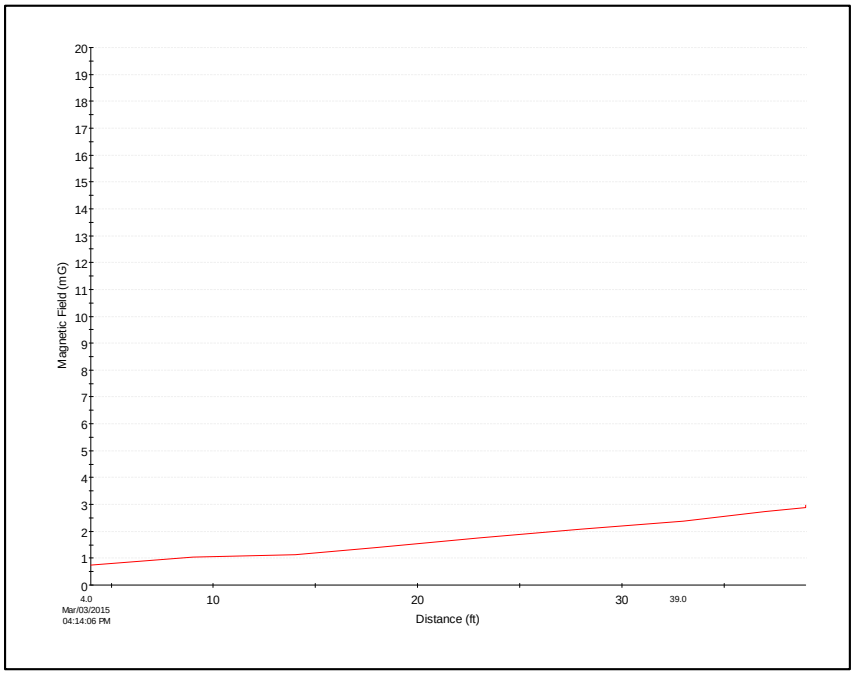


Figure M-6 MF Measurement Results Across Arch Street

Table M-3 Arch Street MF Measurement Summary

MF Levels - Arch Street (milliGauss, mG)		
Maximum	Average	Median
2.96	1.91	1.92

M.3.1.3 Magnetic Field Measurements at the Proposed Greenwich Substation

Measurements of electric and magnetic fields were taken on along a perimeter path of the proposed Greenwich Substation. A depiction of the measurement area is shown in Figure M-7 below. The orange line represents the Preferred Route. The pink line represents the measurement path. Results of the measurements are depicted in Figure M-8. The results are also summarized in Table M-4. These measurements were taken on March 3, 2015 at approximately 4:25 PM. Nearby sources of magnetic fields include overhead and underground distribution lines entering and exiting the substation.

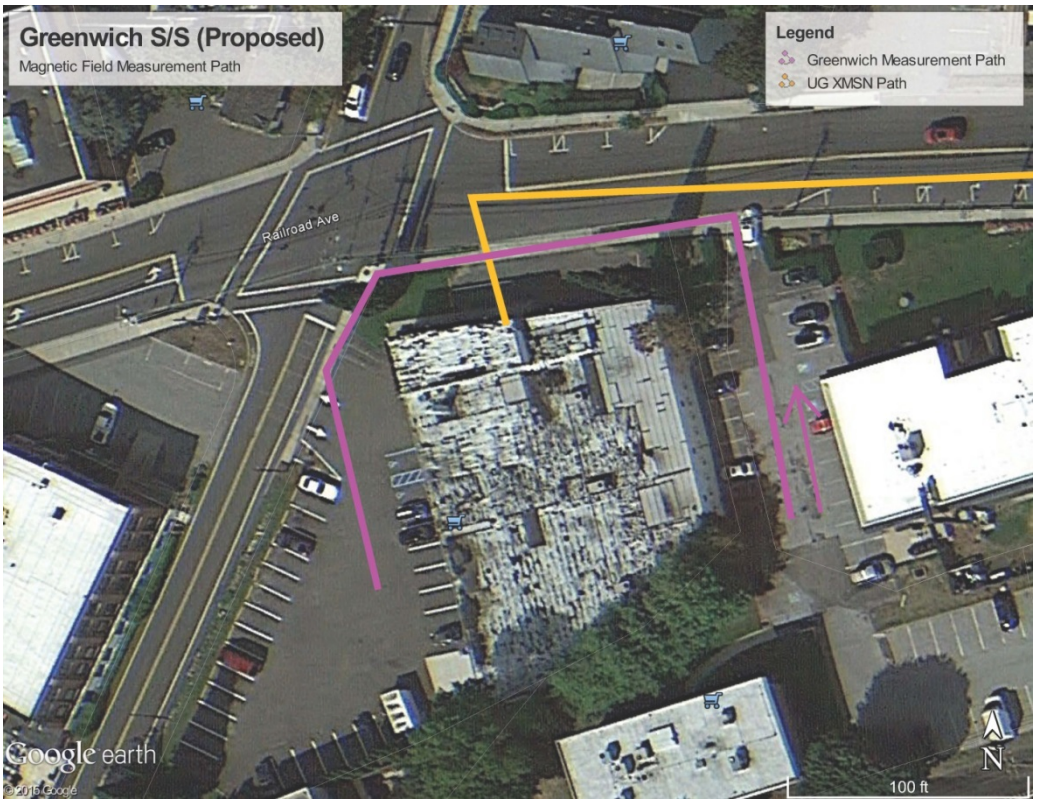


Figure M-7 GoogleEarth™ View of MF Measurement at Proposed Greenwich Substation Site

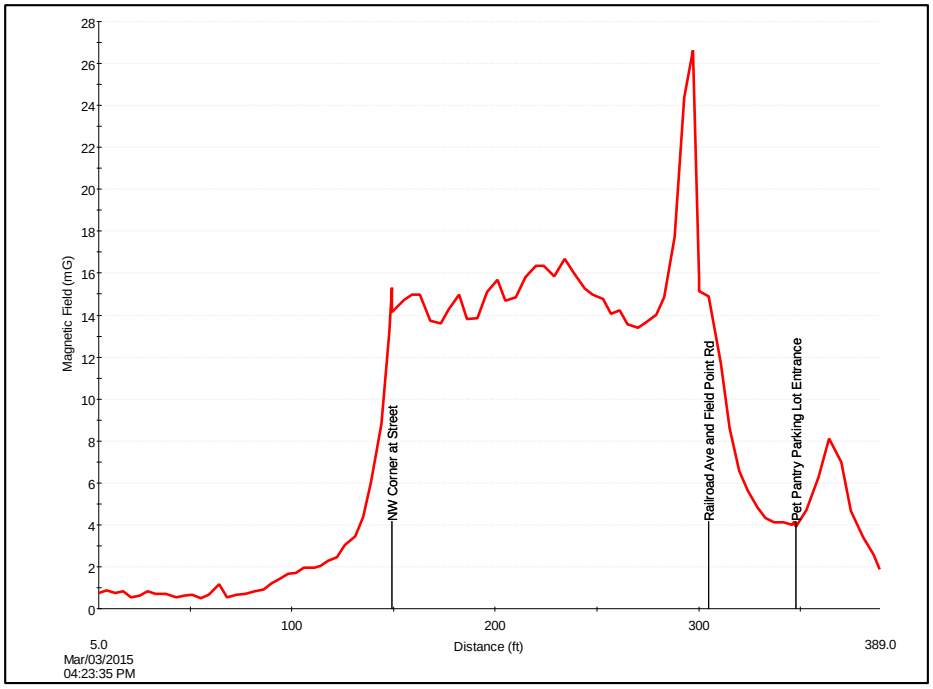


Figure M-8 MF Measurement Results at the Proposed Greenwich Substation Site

Table M-4 Proposed Greenwich Substation MF Measurement Summary

MF Levels - Greenwich S/S (milliGauss, mG)		
Maximum	Average	Median
26.64	8.17	6.03

M.3.2 Calculations of MF from Transmission Lines

Eversource calculated pre- and post-construction magnetic field levels using methods described in the Electric Power Research Institute's *Underground Transmission Systems Reference Book, 2006 Edition*. With accurate input data, the equations in these references will accurately predict magnetic fields measured near power lines. The inputs to the calculation are data regarding voltage, current flow, circuit phasing, conductor and cable sizes, pipe dimensions and locations. The fields associated with power lines were estimated along profiles drawn perpendicular to the lines assuming flat terrain, at a point of shallowest depth for the underground transmission lines (42 inches to the center of the pipe). All calculations were made for a height of 1 meter (3.28 feet) above ground, in accordance with standard practice (IEEE Std, 644-1994, R2008).

A calculation of magnetic fields first requires determining the currents that will flow on the affected lines under each set of conditions to be studied. For these transmission lines, because there are no large generators on the Greenwich side of the proposed transmission lines, generator dispatch will have almost no impact on the current flow of the transmission lines. As such, different generator dispatches were not evaluated and current flows were determined based on the load assumed at the proposed Greenwich Substation. Eversource calculated magnetic fields for the proposed lines under post-Project conditions in 2023 for three system loading conditions, Annual Peak Load ("APL"), Peak-Day Average Load ("PDAL"), and Annual Average Load ("AAL"). The calculations for Average Annual Load are the most useful for comparing before and after field levels for any 'typical' day, so these results are presented below in profiles and tables. Additionally, magnetic field levels at 25-foot intervals are also presented for the base design at AAL, APL and PDAL can be found in Appendix G.2.

M.3.2.1 System Load at the Proposed Greenwich Substation

Per the Council's BMP, Eversource analyzed the system under varying load conditions. All transmission lines were assumed in service. There are no system topology changes that are relevant to this study area when considering the 2023 system model. Loads assumed on the transmission system for New England are summarized in Table M-5 below. Because this would be essentially a radial transmission feed to the proposed Greenwich Substation, generator dispatch would not affect the power flows.

Table M-5 New England System Loads

Load Case	Description	2023 Load (MW)	Current Per Cable (Amps)
Annual Peak Load ("APL")	90/10 Summer Peak ISO-NE L+L	33746	221
Peak Day Average Load ("PDAL")	85% of 90/10 Peak	28684	186
Average Annual Load ("AAL")	Annual Hourly Average	15000	101

M.3.2.2 Calculated Magnetic Fields from the Proposed Transmission Lines

Figure M-9 is a summary graph depicting the magnetic fields from the proposed transmission lines. This highest field would occur directly above the center of the trench and would have a value of 0.47 mG during average annual loads. The minimum measured magnetic field from the field visits on March 3, 2015 was 0.52 mG in the vicinity of the Proposed Site.

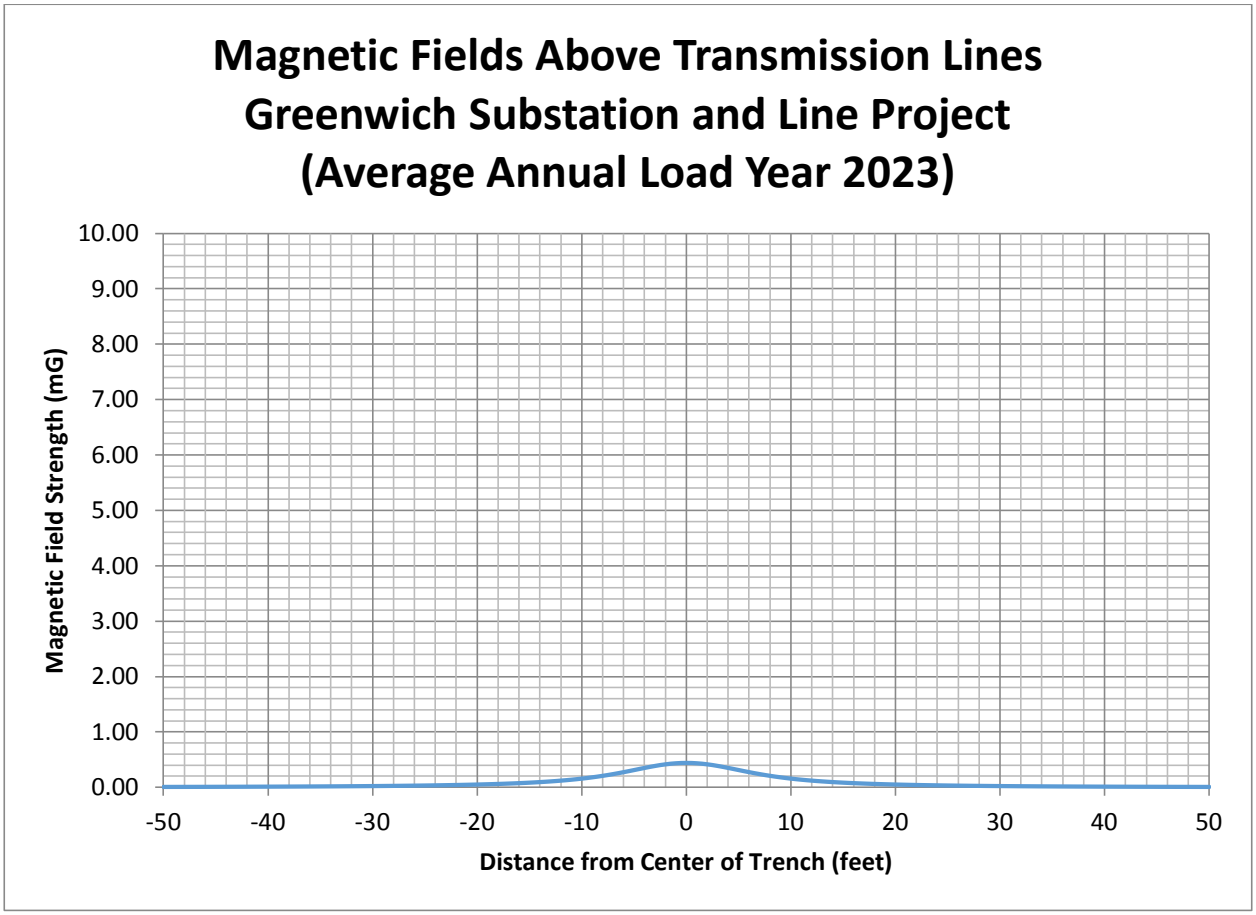


Figure M-9 Calculated Magnetic Fields Above Transmission Lines

M.4 Update on EMF Health Research

In the BMP, the Council recognized the consistent conclusions of "a wide range of public health consensus groups," as well as their own commissioned weight-of-evidence review. The Council summarized the current scientific consensus by noting the conclusions of these public health groups, including a review by the World Health Organization ("WHO") in 2007 and previously published reviews by the National Institute for Environmental and Health Sciences (1999), the International Agency for Research on Cancer (2002), the Australian Radiation Protection and Nuclear Safety Agency (2003),[50] the National Radiological Protection Board of Great Britain (2004), and the Health Council of the Netherlands (2005). The Council summarized the current scientific consensus as follows: there is limited evidence from epidemiology studies of a statistical

[50] The Australian Radiation Protection and Nuclear Safety Agency released an updated evaluation of EMF research and a draft standard in 2006, which is largely consistent with those of WHO and other national and international health agencies.

association between estimated, average exposures greater than 3-4 mG and childhood leukemia; the cumulative research, however, does not indicate that magnetic fields are a cause of childhood leukemia, as animal and other experimental studies do not suggest that magnetic fields are carcinogenic. The Council also noted the WHO's conclusion with respect to other diseases: "the scientific evidence supporting an association between ELF [extremely low frequency] magnetic field exposure and all of these health effects is much weaker than for childhood leukemia". (BMP, pp. 2-4)

Based on this scientific consensus, the Council concluded that precautionary measures for the siting of new transmission lines include "the use of effective no-cost and low-cost technologies and management techniques on a project-specific basis to reduce MF exposure to the public while allowing for the development of efficient and cost-effective electrical transmission projects." The BMP also stated that the Council will "consider and review evidence of any new developments in scientific research addressing MF and public health effects or changes in scientific consensus group positions regarding MF." (BMP, pp. 4-5)

Accordingly, in its March 16, 2010 decision approving the Greater Springfield Reliability Project, the Council evaluated extensive evidence concerning recent developments in EMF health effects research, including commentary from the Connecticut DEEP's Radiation Division, and concluded that: "There is no new evidence that might alter the scientific consensus articulated in the Council's 2007 EMF BMP document." (Docket 370, Opinion at 12; *and see* Findings of Fact par. 284-286)

To assist the Council in evaluating the most up-to-date research, the Exponent report, which is provided in Appendix G.3 includes a review of recently published scientific research and reviews. Significantly, Exponent's report summarizes:

> *In conclusion, no recent studies provide evidence to alter the conclusion that the scientific evidence does not confirm that EMF exposure is the cause of cancer or any other disease process at the levels we encounter in our everyday environment.* (Appendix G.3, p. 49)

M.5 Summary of Actions Demonstrating of Consistency with Council Guidelines

Eversource has provided EMF measurements and calculations and an update of EMF research in accordance with the Council's Application Guide and the BMP for the proposed transmission supply lines from the Cos Cob Substation to the proposed Greenwich Substation.

M.6 References

- Connecticut Siting Council Electric and Magnetic Field Best Management Practices for the Construction of Electric Transmission Lines in Connecticut. Rev. February 20, 2014. http://www.ct.gov/csc/lib/csc/emf_bmp/revisions_updates/754bmpfinal.pdf
- Institute of Electrical and Electronics Engineer. 1990. IEEE guide for the design, construction, and operation of safe and reliable substations for environmental acceptance. IEEE Standard 1127-1998.
- Department of Transportation, Federal Railroad Administration (DOT/FRA). EMF Monitoring on Amtrak's Northeast Corridor: Post-Electrification Measurements and Analysis. Final Report DOT/FRA/RDV-06/01, October, 2006.
- Electric Power Research Institute. Survey of residential magnetic field sources. Volume 1: Goals, Results and Conclusions. 1993. L. Zaffanella, Principal Investigator. EPRI Report #TR-102759
- Institute of Electrical and Electronics Engineer. IEEE recommended practice for instrumentation: specifications for magnetic flux density and electric field strength meters - 10 Hz to 3 kHz. IEEE Standard 1308-1994, R2001.
- Electric Power Research Institute. EPRI Underground Transmission Reference Book, 2006 Edition. Final Report March 2007. S. Eckroad, Principal Investigator. EPRI Project #1014840.
- Institute of Electrical and Electronics Engineers. IEEE standard procedures for measurement of power frequency electric and magnetic fields from AC power lines (Revision of IEEE Standard 644- 1987) IEEE Standard 644-1994, R2008.
- Savitz DA, Pearce NE, Poole C. Methodological issues in the epidemiology of electromagnetic fields and cancer. Epidemiology Rev, 11:59-78, 1989.
- CL&P Application to the Connecticut Siting Council for a Certificate of Environmental Compatibility and Public Need for the Stamford Reliability Cable Project (Docket 435).
- Regulations of Connecticut State Agencies, Section 16-50j-59(18).

N. Municipal and Community Outreach

Table N-1 Municipal Consultations

Meeting Date	Purpose of Meeting	Attendees
June 11, 2011	The Company's Executives met with First Selectman and other elected officials to announce plans for a new substation to address distribution system reliability issues. A press conference was held at the same time.	First Selectman, Greenwich's General Assembly delegation
January 17, 2012	Project team members provided a Project update	First Selectman, Department Heads
March 21, 2012	Project team members provided a Project update	First Selectman, Department Heads
September 18, 2012	Project team members provided a Project update	First Selectman, Department Heads
October 30, 2013	Project team members provided a Project update	Department Heads
January 28, 2014	Project team members provided a Project update	Department Heads
February 26, 2014	Project team members provided a Project update	First Selectman
May 13, 2014	Project team members provided a Project update	First Selectman
December 1, 2014	Project team members provided a Project update	Department Heads
December 17, 2014	Project team members provided a Project update	First Selectman
January 7, 2015	Project team members discussed the Location Review process	Director of Planning
February 23, 2015	Municipal Consultation	Inland Wetlands & Watercourses Agency
March 3, 2015	Open House to present Project information	Public
March 4, 2015	Municipal Consultation	Architectural Review Committee

Meeting Date	Purpose of Meeting	Attendees
March 10, 2015	Municipal Consultation	Planning & Zoning Commission
March 23, 2015	Municipal Consultation	Inland Wetlands & Watercourses Agency
March 24, 2015	Municipal Consultation	Planning & Zoning Commission
June 19, 2015	Project team members provided a Project update	First Selectman

O. Permits, Approvals and Consultations

Table O-1 identifies the permits and approvals that would be required for the construction and operation of the Project and summarizes the federal and state agency consultations that Eversource has conducted to date.

Table O-1 Permits, Approvals and Consultations

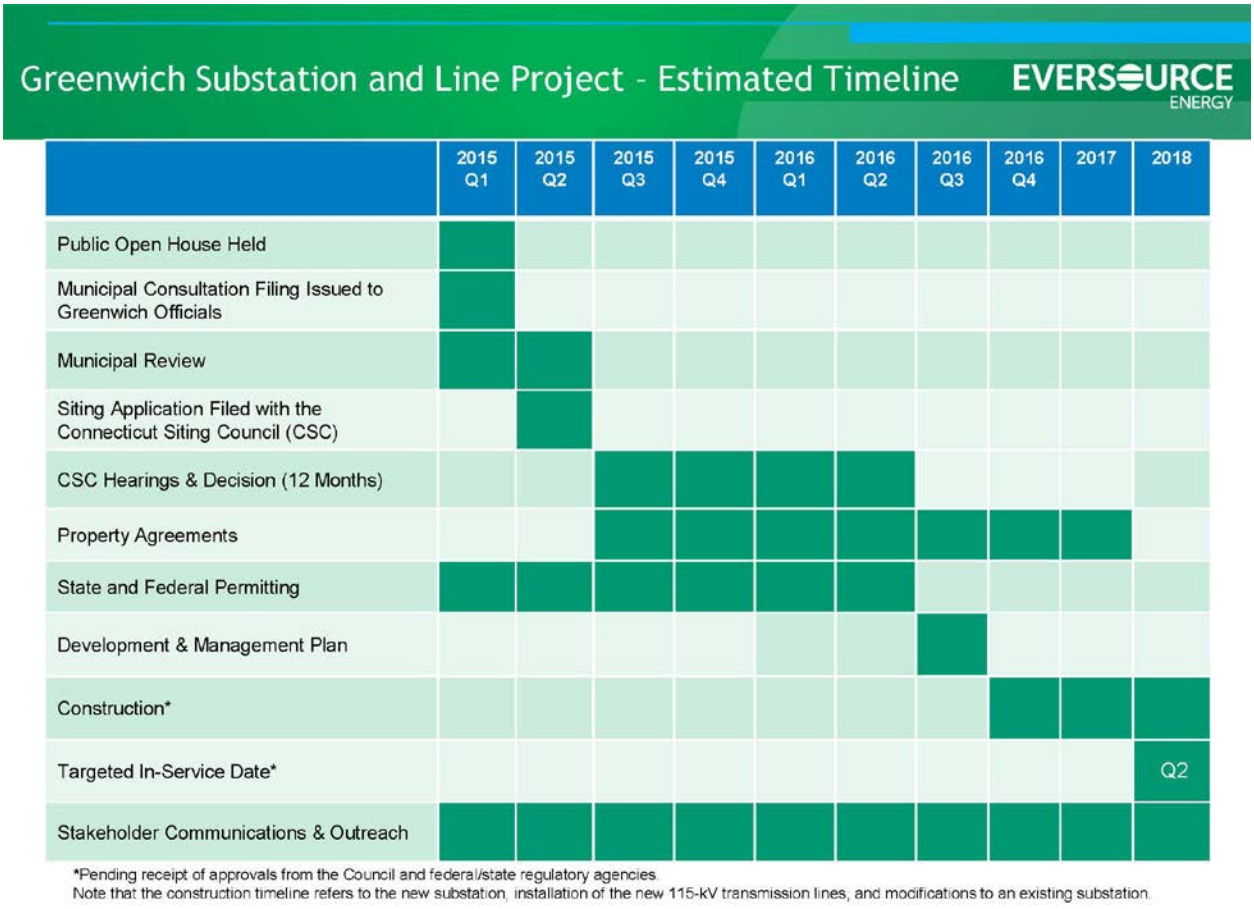
Agency	Permit/Consultation	Date Submitted/ Anticipated Submittal	Date Received/ Anticipated Receipt	CSC Application Location
Federal				
U.S. Fish and Wildlife Service	Clearance - Endangered Species Act (7 U.S.C. §136, 16 U.S.C. §460 et seq.)	Consultation initiated March 20, 2015	March 20, 2015	Appendix E, Agency Correspondence
U.S. Army Corps of Engineers	Section 10 Rivers and Harbors Act - Category 2 Permit	Third Quarter, 2015	Second Quarter 2016	Not Included
Connecticut				
Connecticut Siting Council	Certificate of Environmental Compatibility and Public Need - CGS §16-50/(a)(1)	Second Quarter, 2015	Second Quarter, 2016	Not Applicable
CT DEEP, NDDB	Clearance - Endangered Species Act (CGS §26-303 to §26-315)	Consultation initiated July 11, 2014	August 1, 2014	Appendix E, Agency Correspondence
Connecticut Historic Preservation Office	Cultural Resource Consultation - Section 106 of the National Historic Preservation Act	Consultation initiated April 20, 2015	June 12, 2015	Appendix E, Agency Correspondence
CT Department of Transportation	Department's Utility Accommodation Manual	Consultations throughout 2014	January 23, 2015	Appendix E, Agency Correspondence
CT DEEP, Office of Long Island Sound Programs	Individual Permit Tidal Wetlands and Structures Dredging and Fill - 22a-361 of the CGS	Third Quarter, 2015	Second Quarter 2016	Not Included
CT DEEP, Office of Long Island Sound Programs	401 Water Quality Certification – CGS § 22a-6g of the	Third Quarter, 2015	Second Quarter 2016	Not Included

Agency	Permit/Consultation	Date Submitted/ Anticipated Submittal	Date Received/ Anticipated Receipt	CSC Application Location
CT DEEP	General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities ("Construction General Permit")	First Quarter 2016	Second Quarter 2016	Not Included
CT DEEP	Groundwater Remediation Wastewater Directly to Surface Water (DEP-PERD-GP-020) or Sanitary Sewer (DEP-WD-GP-007)	First Quarter, 2016	Second Quarter 2016	Not Included
Local				
Town of Greenwich	Municipal Consultation Filing under CGS §16-50/(e)	First Quarter, 2015	2/6/15	Bulk Filing
Town of Greenwich IWWA	Green Sheet Questionnaire	02/23/2015	IWWA Meeting Minutes - Approval 02/23/2015	Appendix E, Agency Correspondence

P. General Project Schedule

The estimated timeline and major milestones established for the Project are provided in Figure P-1, *Project Estimated Timeline*.

Figure P-1 Project Estimated Timeline



Q. Formal Requirements

Q.1 Quantity, Form and Administrative Notice

Pursuant to Connecticut General Statues § 16-50j-12, Eversource is furnishing to the Council an original and 20 paper copies of the Application, as well as electronic copies of the Application.

Eversource requests administrative notice of the following Council docket records, generic hearings, or statements prepared by the Council as a result of generic hearings, and other pertinent documents.

FEDERAL

1. NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES, NATIONAL INSTITUTES OF HEALTH, EMF, ELECTRIC AND MAGNETIC FIELDS ASSOCIATED WITH THE USE OF ELECTRIC POWER (June 2002), *available at* http://www.niehs.nih.gov/health/assets/docs_p_z/results_of_emf_research_emf_questions_answers_booklet.pdf

2. NATIONAL RESEARCH COUNCIL, RESEARCH ON POWER-FREQUENCY FIELDS COMPLETED UNDER THE ENERGY POLICY ACT OF 1992 (National Academy of Sciences, 1999), *available at* http://books.nap.edu/openbook.php?isbn=0309065437

3. Proclamation No. 8460, 74 Fed. Reg. 234 (December 8, 2009), *available at* http://www.presidency.ucsb.edu/ws/index.php?pid=86954

4. National Park Service, U.S. Department of the Interior, *National Register of Historic Places* (September 2014), *available at* http://www.nps.gov/history/nr/research/index.htm

5. FEDERAL ENERGY REGULATORY COMMISSION, GUIDELINES FOR THE PROTECTION OF NATURAL, HISTORIC, SCENIC AND RECREATIONAL VALUES IN THE DESIGN AND LOCATION OF RIGHTS-OF-WAY AND TRANSMISSION FACILITIES (November 27, 1970)

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25. **DOCKET NO. 272** - THE CONNECTICUT LIGHT AND POWER COMPANY AND THE UNITED ILLUMINATING COMPANY CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED FOR THE CONSTRUCTION OF A NEW 345-KV ELECTRIC TRANSMISSION LINE AND ASSOCIATED FACILITIES BETWEEN THE SCOVILL ROCK SWITCHING STATION IN MIDDLETOWN AND THE NORWALK SUBSTATION IN NORWALK, CONNECTICUT. THIS INCLUDES CONSTRUCTION OF THE BESECK SWITCHING STATION IN WALLINGFORD, EAST DEVON SUBSTATION IN MILFORD, AND SINGER SUBSTATION IN BRIDGEPORT AND MODIFICATIONS TO THE SCOVILL ROCK SWITCHING STATION AND THE NORWALK SUBSTATION AND CERTAIN INTERCONNECTIONS.

26. **DOCKET NO. 292 -** THE CONNECTICUT LIGHT & POWER COMPANY CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED FOR THE CONSTRUCTION AND OPERATION OF 8.7 MILES OF NEW UNDERGROUND 115-KILOVOLT ELECTRIC TRANSMISSION CABLES EXTENDING FROM CL&P'S EXISTING GLENBROOK SUBSTATION IN THE CITY OF STAMFORD, THROUGH THE TOWN OF DARIEN, TO CL&P'S EXISTING NORWALK SUBSTATION IN THE CITY OF NORWALK.

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Q.2 Application of Filing Fees

Pursuant to CGS §16-50v(a); Application Guide §IV; CGS §16-50*l*(a), CL&P is submitting the filing fee for this Application as determined by the following schedule:

Table Q-1: Application Fees

Estimated Construction Cost	Fee
Up to $5,000,000	0.05% or $1,250.00, whichever is greater
Above $5,000,000	0.1% or $25,250.00, whichever is less

Based on this filing fee schedule and the estimated construction cost for the Project presented in Section D.3, a check for the Council's Application Fee in the amount of $25,250.00 payable to the Connecticut Siting Council accompanies this Application. Eversource understands that additional assessments may be made for expenses in excess of the filing fee, and that fees in excess of the Council's actual costs will be refunded to Eversource.

Pursuant to CGS §16-50*l*(a)(1), Eversource also encloses a separate check in the amount of $25,000.00 payable to the State of Connecticut Treasurer for the Municipal Participation Fee.

Q.3 Proof of Service

Pursuant to CGS §16-50*l*(b)), this Application was served on the following:

- The chief elected official, the planning and zoning commission, and the conservation and wetlands commissions of the site municipality (Town of Greenwich);[51]
- The South Western Regional Planning Agency;
- The State Attorney General;
- Each member of the Legislature in whose district the facility is proposed;
- Any federal agency which has jurisdiction over the proposed facility;
- The Department of Emergency Management and Homeland Security now known as the Department of Emergency Services and Public Protection;
- The state Departments of Energy and Environmental Protection; Economic and Community Development; and Transportation;
- The state Council on Environmental Quality;
- The Office of Policy and Management; and,
- Other state and municipal bodies as the Council may by regulation designate, including but not limited to, the State Historic Preservation Officer of the Commission on Culture and Tourism (consolidated with Economic and Community Development).

Q.4 Notice to Community Organizations

In accordance with the directions provided in the Application Guide (§VIII), the Applicant made reasonable efforts to provide notice of this Application on the following:

- Affected community groups including Chambers of Commerce, land trusts, trail organizations, environmental groups, historic preservation groups, advocacy groups for the protection of Long Island Sound, and river protection organizations within the watershed affected by the proposed facility that have been identified by the Town of Greenwich, or those that have registered with the Council to be provided notice, as follows:

  – Farmington River Watershed Association
  – Farmington River Coordinating Committee

[51] There are no other municipalities within 2,500 feet of the proposed facility.

- Any affected water company within the watershed affected by the proposed facility, in this case:
  - Aquarion Water Company
- The names of community organizations provided with notice of the Application filing will be provided to the Council under separate cover.

Q.5 Public Notice

Pursuant to CGS §16-50*l*(b), public notice of this Application (the "Public Notice") was published at least twice prior to the filing of the Application in newspapers having general circulation in the site municipality. The notice included the name of the applicant, the date of filing, and a summary of the Application. The notice was published in not less than ten point type. The Public Notice was published in The Greenwich Time and The Stamford Advocate on June 24, 2015 and June 25, 2015 respectively. A copy of the public notice is provided in Appendix H, *Formal Requirements*. Copies of the Public Notice Affidavits will be provided to the Council under separate cover upon receipt.

Q.6 Notice in Utility Bills

Pursuant to CGS §16-50*l*(b), notice of the proposed Project was provided to each Eversource customer located within the vicinity of the Preferred Route, Preferred Route With Variation, and Alternate Route on a separate enclosure with each customer's monthly bill for one or more months not earlier than 60 days prior to the filing of this Application with the Council. This included all Eversource customers in the Town of Greenwich. A copy of the Project bill insert is included in Appendix H, *Formal Requirements*.

Q.7 Notice to Owners of Property Abutting the Substation Sites

Pursuant to CGS §16-50*l*(b), notice of the proposed Project was provided to abutters of both the Proposed Site and Alternative Site for the Substation via certified mail, return receipt requested. A map identifying the abutters notified of the Project is provided in Appendix H, *Formal Requirements*. Copies of the certified mail receipts and associated Affidavits will be provided to the Council under separate cover.

Q.8 Pre-Application Process

In accordance with CGS §16-50*l*(e), Eversource had multiple meetings with representatives from the Town of Greenwich prior to distribution of the (MCF). The MCF was a key initial step in the Council's comprehensive regulatory process that governs transmission facility planning and siting. Specifically, the MCF:

- Provided information about the Project to representatives of the potentially affected municipality and the public; and,

- Solicited public participation at an early stage in the development of the Project so that issues of concern to the public could be identified and addressed in the Project planning process.

The MCF also presented technical information concerning Project need, Substation Site and route selection, and potential environmental effects, including the results of studies that Eversource or its consultants had performed to date (e.g., the identification and evaluation of potential site and routes, general environmental characteristics in the Project vicinity, and potential environmental effects and mitigation measures).

On February 6, 2015, the MCF was provided to the Town of Greenwich, the only affected municipality. There is no other municipality located within 2,500 feet of the Project. Through the MCF and other public outreach efforts, Eversource acquired information and recommendations from the Town of Greenwich to assist in designing and constructing transmission improvements that would provide needed system reliability while minimizing the effects of the Project on the community.

R. General Glossary of Terms

(All terms may not be used in this document)

115 kV:	115 kilovolts or 115,000 volts.
AC:	Alternating Current. An electric current which reverses its direction of flow periodically. (In the United States this occurs 60 times a second -60 cycles or 60 Hertz). This is the type of current supplied to homes and businesses.
ACI:	American Concrete Institute.
Alternate Routes:	Underground routes described in Section E.4.
Ampacity:	The maximum amount of electrical current a conductor or device can carry before sustaining immediate or progressive deterioration; a current rating or current-carrying capacity.
Ampere (Amp):	A unit measure for the flow (current) of electricity. A typical home service capability (i.e., size) is 100 amps; 200 amps is required for homes with electric heat.
ANSI:	American National Standards Institute.
Arrester:	Protects lines, transformers and equipment from transient overvoltages due to lightning and switching surges by carrying the charge to ground. Arresters serve the same purpose on a line as a safety valve on a steam boiler.
ASCE:	American Society of Civil Engineers.
BMP:	Best Management Practices.
Bus:	A conductor capable of carrying large amounts of current in a substation.
C&D Plan:	*Conservation and Development Policies Plan for Connecticut 2005 – 2010.*
Cable:	A fully insulated conductor usually installed underground but in some circumstances can be installed overhead.
CCMA:	Connecticut Coastal Management Act.
CCVT:	Capacitor coupling voltage transformer.

Certificate:	Certificate of Environmental Compatibility and Public Need issued by the Connecticut Siting Council.
CGS:	Connecticut General Statutes.
Circuit:	A system of conductors (three conductors or three bundles of conductors) through which an electric current is intended to flow and which may be supported above ground by transmission structures or placed underground.
Circuit Breaker:	A switch that automatically disconnects power to the circuit in the event of a fault condition. Located in substations. Performs the same function as a circuit breaker in a home.
CL&P:	The Connecticut Light and Power Company.
ConnDOT:	Connecticut Department of Transportation.
Conductor:	A metallic wire, busbar, rod, tube or cable which serves as a path for electric current to flow.
Conduit:	Pipes, usually PVC plastic, typically encased in concrete, for underground power cables.
Contingency:	The unexpected failure or outage of a system component, such as a generator, transmission line, circuit breaker, switch or other electrical element
CONVEX:	Connecticut Valley Electric Exchange.
Council:	Connecticut Siting Council.
CT DEEP:	Connecticut Department of Energy and Environmental Protection.
dBA:	Decibel, on the A-weighted scale.
Demand:	The total amount of electric power required at any given time by an electric distribution company's customers.
D&M Plan:	Development and Management Plan (required by the Connecticut Siting Council).
Disconnect Switch:	Equipment installed to isolate circuit breakers, transmission lines or other equipment for maintenance or sectionalizing purposes.
Distribution:	Line, system. The facilities that transport electrical energy from the transmission system to the customer.

Duct:	Pipe or tubular runway for underground power cables (see also Conduit).
Duct Bank:	A group of ducts or conduit usually encased in concrete in a trench.
Electric Field (EF):	Produced by voltage applied to conductors and equipment. The electric field is expressed in measurement units of volts per meter (V/m) or kilovolts per meter (kV/m); 1 kV/m is equal to 1,000 V/m.
Electric Transmission:	The facilities (69-kV+) that transport electrical energy from generating plants to distribution substations.
EMF:	Electric and magnetic fields.
EPA:	United States Environmental Protection Agency.
E&S:	Erosion and sedimentation.
Eversource:	The Connecticut Light and Power Company doing business as Eversource Energy.
Fault:	A failure (short circuit) or interruption in an electrical circuit.
FEMA:	Federal Emergency Management Agency.
FERC:	Federal Energy Regulatory Commission.
FTB:	Fluidized thermal backfill.
G:	Gauss; 1G = 1000 mG (milliGauss); the unit of measure for magnetic fields.
GIS:	Gas-Insulated Substation; a substation design consisting of 3 phases of electrical bus bar that is contained within sealed piping (about 2 feet in diameter) that is filled with insulating SF6 gas (Sulfur Hexafluoride) to provide the insulation required for the substation buses and conductors. The GIS design reduces the substation foot print significantly when compared to the equivalent sized Air Insulated Design.
Glacial till:	These deposits are predominantly nonsorted, nonstratified sediment and are deposited directly by glaciers. These deposits consist of boulders, gravel, sand, silt, and clay mixed in various proportions.
Ground continuity conductor:	A conductor laid parallel to a cross-bonded or single point bonded cable circuit to provide a continuous metallic ground connection between the grounding systems at the ends of the cable route and along the run.

Ground Wire:	Cable/wire used to connect wires and metallic structure parts to the earth. Sometimes used to describe the lightning shield wire.
HAER:	Historic American Engineering Record.
HDD:	Horizontal Directional Drilling.
HPFF:	High-pressure fluid-filled; a type of underground transmission line.
Hz:	Hertz, a measure of the frequency of alternating current; one cycle/second.
IEEE:	Institute of Electrical and Electronic Engineers.
ISO:	Independent System Operator.
ISO-NE:	ISO New England, Inc.; referred to as New England's Independent System Operator.
kcmil:	1000 circular mils, approximately 0.0008 sq. in.
kV:	kilovolt, equals 1000 volts.
kV/m:	Electric field strength measurement (kilovolts/meter).
Line:	A series of overhead transmission structures which support one or more circuits; or in the case of underground construction, a subsurface installation housing one or more cable circuits.
Load:	Amount of power delivered as required at any point or points in the system. Load is created by the power demands of customers' equipment (residential, commercial, and industrial).
Magnetic Field (MF):	Produced by the flow of electric current; usually measured as magnetic flux density in units called gauss (G) or milliGauss (mG) – 1/1000 Gauss.
Magnetic Flux Density:	Level of magnetic field.
MCF:	Municipal Consultation Filing (Connecticut Siting Council).
mG:	milliGauss (see Magnetic Field) – 1/1000 Gauss.
MOD:	Motor-Operated Disconnect switch.

MVA:	Megavolt Ampere) Measure of electrical capacity equal to the product of the voltage times the current times the square root of 3. Electrical equipment capacities are sometimes stated in MVA.
MW:	Megawatt. Megawatt equals 1 million watts, measure of the work electricity can do.
NAAQS:	National Ambient Air Quality Standards.
NDDB:	Natural Diversity Data Base (CT DEEP).
NERC:	North American Electric Reliability Council, Inc..
NESC:	National Electrical Safety Code.
NPCC:	Northeast Power Coordinating Council.
NRCS:	Natural Resources Conservation Service.
NRHP:	National Register of Historic Places.
NWI:	National Wetlands Inventory.
OECD	The Organization for Economic Co-operation and Development is a forum of 34 countries describing themselves as committed to democracy and the market economy, providing a platform to compare policy experiences, seeking answers to common problems, identify good practices and coordinate domestic and international policies of its members.
OH (Overhead):	Electrical facilities installed above the surface of the earth.
OPGW:	Optical groundwire (a shield wire containing optical glass fibers for communication purposes).
Phases:	Transmission (and some distribution) AC circuits are comprised of three phases that have a voltage differential between them.
PCBs	Polychlorinated biphenyls
Preferred Route:	The underground route described in this document.
PUESA:	Public Utility Environmental Standards Act.
Pump House:	Maintains the required liquid pressure for HPFF cables under all loading conditions.
PURA:	Public Utilities Regulatory Authority.
PVC:	Polyvinyl Chloride.

RCSA: Regulations of Connecticut State Agencies.

RFP: Request for Proposal.

ROW: Rights-of-way; corridor of land within which a utility company holds legal rights necessary to build, operate and maintain power lines.

Riser Pole: Transmission structure, used to transition from underground cable to overhead conductor, consisting of a single tubular steel column with horizontal arms to support cable terminations.

SCADA: Supervisory Control and Data Acquisition.

SF_6: (Sulfur Hexafluoride) A colorless gas soluble in alcohol and ether, slightly soluble in water. A greenhouse gas used primarily in electrical transmission and distribution systems and as a dielectric in electronics.

SHPO: State Historic Preservation Office (State of Connecticut Commission on Culture and Tourism, Historic Preservation and Museum Division).

Splice: A device to connect together the ends of bare conductor or insulated cable.

Splice Vault: A buried concrete enclosure where underground cable ends are spliced and cable-sheath bonding and grounding are installed.

SSURGO: Soil Survey Geographic database.

Substation: A fenced-in yard containing switches, transformers, line-terminal structures, and other equipment enclosures and structures. Adjustments of voltage, monitoring of circuits and other service functions take place in this installation.

SWCT: Southwest quadrant of the State of Connecticut.

SWRPA: South Western Regional Planning Agency.

Terminal: The substation or switching station at which a transmission line terminates.

Terminal Structure: Structure typically within a substation that ends a section of transmission line.

Transformer: A device used to transform voltage levels to facilitate the efficient transfer of power from the generating plant to the customer. A step-up transformer increases the voltage while a stepdown transformer decreases it.

Transmission Line: Any line operating at 69,000 or more volts.

UG (Underground): Electrical facilities installed below the surface of the earth.

USDA: United States Department of Agriculture.

USGS: United States Geological Survey (U.S. Department of the Interior).

UI: The United Illuminating Company

USFWS: United States Fish and Wildlife Service.

Vault: See Splice Vault.

V/m: Volts per meter; kilovolt per meter; 1000 V/m = 1 kVm.

Voltage: A measure of the push or force which transmits electricity. Usually given as the line-to-line root-mean square magnitude for three-phase systems.

Watercourse: Rivers, streams, brooks, waterways, lakes, ponds, marshes, swamps, bogs, and all other bodies of water, natural or artificial, public or private.

Wetland: An area of land consisting of soil that is saturated with moisture, such as a swamp, marsh, or bog.

Wire: See Conductor.

XLPE: Cross-linked polyethylene (solid dielectric) insulation for transmission.

APPENDICES

APPENDIX A

Photolog of Vicinity

APPENDIX B

Greenwich Substation Site Plan Drawings

APPENDIX C

Cos Cob Substation Site Plan Drawings

APPENDIX D

Preferred Route Segment Maps

APPENDIX E

Agency Correspondence

APPENDIX F

Cultural Resources Review of the Project Region Associated with the Proposed Substation and Transmission Line Project in Greenwich, Connecticut

APPENDIX G.1

Connecticut Siting Council

Electric and Magnetic Fields Best Management Practices for the Construction of Electric Transmission Lines in Connecticut

APPENDIX G.2

MF Calculation Tables

APPENDIX G.3

Review of Relevant Scientific Literature

APPENDIX H

Formal Requirements

Bulk Filing of Municipal Documents – Provided Under Separate Cover

A. Abutter Information (Notice and List)

B. Town of Greenwich Inland Wetlands and Watercourses Regulations

C. Town of Greenwich Zoning Regulations and Amendments

D. Town of Greenwich Zoning Map

E. 2006-2015 Regional Plan of Conservation and Development

F. Greenwich Substation Location Review Filing

G. Greenwich Substation and Line Project Municipal Consultation Filing

H. Greenwich Plan of Conservation and Development