STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

The Connecticut Light & Power Company Application for a Certificate of Environmental Compatibility and Public Need for the Stamford Reliability Cable Project, which consists of construction, maintenance, and operation of a new 115-kV underground transmission circuit extending approximately 1.5 miles between Glenbrook and South End Substations, Stamford, Connecticut and related substation improvements.	DOCKET NO. 435 July 2, 2013

PROPOSED FINDINGS OF FACT
SUBMITTED BY
THE CONNECTICUT LIGHT AND POWER COMPANY

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I. INTRODUCTION

Proceedings

1. Pursuant to Connecticut General Statutes (CGS) § 16-50g et seq., on January 18, 2013, Northeast Utilities Service Company (NUSCO) as agent for The Connecticut Light and Power Company (CL&P) applied to the Connecticut Siting Council (Council) for a Certificate of Environmental Compatibility and Public Need (Certificate) for the construction, operation and maintenance of the Stamford Reliability Cable Project (the Project). (CL&P 1, p. ES-1)

2. The Project involves the siting of transmission facilities in southwest Connecticut. The proposed new underground circuit would extend 1.5 miles between CL&P's Glenbrook and South End Substations in Stamford, primarily within roadways. . (Related improvements would be made within fenced in areas to both substations. (CL&P 1, pp. ES-1, ES-3, Section D)

3. NUSCO and CL&P are wholly-owned subsidiaries of Northeast Utilities (NU). (CL&P 1, pp. ES-1, 2-16)

4. Parties to these proceedings include CL&P (the Applicant) and the Office of Consumer Counsel. (Record)

5. Pursuant to CGS § 16-50*l*(b), CL&P provided service and legal notice of the application. This included notice to the City of Stamford, federal, state, local and regional agencies, and elected officials; and published notice in The Advocate and the The Connecticut Post on January 7 and 14, 2013. CL&P sent its Stamford customers bill inserts entitled "Notice of Proposed Construction of a High-Voltage Electric Transmission Line" which were included in one or more monthly bills on or after November 18, 2012. There are no other municipalities within 2,500 feet of the proposed transmission facilities. (CL&P 1, p. A-13; CL&P 2; CL&P 6, p. 37)

6. Pursuant to CGS § 16-50*l*(b), CL&P provided notice of its filing of the Application to owners of property abutting the substations, as well as water companies and community organizations. (CL&P 1, pp. A-12 to A-13; CL&P 2; CL&P 6, p. 37)

7. Pursuant to CGS § 16-50*l*(e), CL&P began the municipal consultation process by meeting with representatives of the City of Stamford. Prior to filing the application for the Project with the Council, CL&P held twenty briefings with municipal officials, local/regional boards or commissions, and/or business groups. (CL&P 1, pp. J-1 to J-3; CL&P 6, p. 36)

8. On September 7, 2012, CL&P submitted its Municipal Consultation Filing for the Project to the City of Stamford Chief Elected Official, Mayor Michael A. Pavia and provided a copy to the Connecticut Energy Advisory Board (CEAB). Copies were placed in the local library and on CL&P's project website. (CL&P 1, including Bulk Filing 2; CL&P 6, pp. 36, 37)

9. CL&P developed a project website, e-mail address and hotline through which residents and stakeholders could communicate with project representatives. (CL&P 6, p. 37)

10. CL&P distributed brochures to City of Stamford residents who reside proximate to the proposed Project. (CL&P 1, p. J-3, Appendix E.1)

11. On January 8, 2013, CL&P held an open house in Stamford at the Government Center. (CL&P 6, p. 37)

12. At the open house, CL&P presented information using a series of informational kiosks. CL&P's subject matter experts from the Project team were present to answer questions from attendees about the Project. (CL&P 6, p. 38)

13. On February 1, 2013, the CEAB met to consider CL&P's request for an exemption from the CEAB's request for proposal (RFP) process. The CEAB, by a vote of two-thirds of the members present and voting, approved CL&P's request for an exemption from its RFP process. (Connecticut Energy Advisory Board Letter to CL&P, dated March 1, 2013)

14. On March 18, 2013, CL&P posted seven four-foot by six-foot signs at various locations along the proposed route, including at the Glenbrook and South End Substations, to notify the public of the public hearing. (CL&P 6, p. 38, Attachment 3; Tr. 2, p. 5)

15. The Council published legal notice of the time and place of the public hearing in The Advocate and Connecticut Post on February 27, 2013. (Tr. 2, pp. 4-5)

16. The Council and its staff conducted a public field review of the Project on March 28, 2013 at 1:00 p.m. (Council Hearing Notice)

17. The Council held a public evidentiary hearing on March 28, 2013 at 3:00 p.m. at the NEON Stamford Gymnasium at 34 Woodland Avenue, Stamford. (Transcript, March 28, 2013, 3:00 p.m. [Tr. 1], p. 3)

18. Pursuant to CGS § 16-50m, the Council held a public hearing for citizen comment at 7:00 p.m. on March 28, 2013 at the NEON Stamford Gymnasium. (Transcript, March 28, 2013, 7:00 p.m. [Tr. 2], p. 3)

19. The Council, on its own motion, voted to reopen the evidentiary record on April 18, 2013. (Council Notice of April 19, 2013)

20. The Council held a public evidentiary hearing on June 20, 2013, at 1:00 p.m. at the Council's Offices at 10 Franklin Square, New Britain. (Transcript, June 20, 2013 [Tr. 3, p. __]

State Agency Permits and Comments

21. Pursuant to CGS § 16-50j(h), on February 22, 2013, the following state agencies were requested to submit written comments regarding the Project: Department of Energy and Environmental Protection (DEEP); Department of Agriculture; Department of Public Health; Council on Environmental Quality; Public Utilities Regulatory Authority; Office of Policy and Management; Department of Economic and Community Development; Department of Emergency Services and Public Protection; and the Department of Transportation (ConnDOT). (Record)

22. ConnDOT commented on the Application in a letter dated March 15, 2013. ConnDOT will require CL&P to address its concerns relative to the installation of the proposed underground transmission facilities within highway and rail right-of-way. (ConnDOT letter dated March 15, 2013)

23. ConnDOT submitted a further comment in a letter dated April 8, 2013, in which it stated that it had requested that CL&P pursue an option other than the use of Atlantic Street, and that CL&P's use of Canal Street, to avoid Atlantic Street would reduce significant relocation of existing utility facilities within ConnDOT's future project on Atlantic Street. This option was incorporated into CL&P's proposed underground route for this project. (ConnDOT letter dated April 8, 2013; CL&P 4)

24. The proposed project would require permits from ConnDOT. (CL&P 1, p. J-4)

25. CL&P is consulting with the DEEP as to the need for a coastal zone consistency certification. (CL&P 1, p. J-4)

Municipal Comments

26. The City of Stamford submitted comments on December 13, 2012 in support of the project and on March 25, 2013 in support of the Preferred Route With Canal Street Option. (City of Stamford Comments dated December 13, 2012 and March 25, 2013)

Public Comments

27. The East Side Partnership submitted comments dated May 24, 2013 in support of the underground route for the Project. (East Side Partnership Comments dated May 24, 2013)

II. NEED

Overview

28. The need for the Project was identified by a working group led by Independent System Operator-New England (ISO-NE), which consisted of members from ISO-NE, NU and The United Illuminating Company (UI). (CL&P 1, p. B-6; CL&P 6, p. 16)

29. Since 2002, several major improvements to the transmission system in Southwest Connecticut (SWCT) were completed by CL&P to improve system reliability including Bethel-Norwalk (Docket No. 217), Long Island Cables (Docket No. 224), Middletown to Norwalk (Docket No. 272) [CL&P and UI] and Glenbrook Cables (Docket No. 292). (CL&P 1, pp. B-1, B-2; CL&P 6, p. 14)

30. The risks of a constrained system could lead to equipment damage and/or loss of service to customers. In a constrained system, very high power flows on a normal basis across transmission lines, and the addition of a contingency results in more current and creates the higher risk for an overload. (Tr. 1, pp. 28-29)

31. The Project would create a more reliable electric transmission system serving the Stamford-Greenwich Sub-area and eliminate violations of national reliability standards that occur today in this Sub-area. The Project would also address increasing demand for electricity from robust economic development efforts in Stamford. (CL&P 1, pp. B-4, B-13; CL&P 6, p. 14)

32. The Project would build off of the strong power source at the Norwalk Substation and extend the benefits of (a) the SWCT 345-kV loop that resulted from the Bethel to Norwalk and Middletown to Norwalk Projects and (b) the 115-kV Glenbrook Cables farther west into the Stamford-Greenwich Sub-area. (CL&P 1, pp. B-1, B-3; CL&P 6, p. 15; CL&P 3, Q-CSC-006)

33. The Project would extend these benefits by providing a new source of electric supply directly to the South End Substation and by allowing the redistribution of power flows on the transmission lines that presently serve Stamford, including those serving the Tomac, Waterside and Cos Cob Substations. In so doing, the Project would relieve post-contingency event overloads on the 115-kV transmission lines serving these substations and increase system voltage levels, thereby creating more reliable power supplies to meet area customer demands. (CL&P 1, p. B-3; CL&P 6, p. 15)

34. The Project was listed in CL&P's *2012 Forecast of Loads and Resources For the Period 2012-2021*, dated March 1, 2012 and in CL&P's *2013 Forecast of Loads and Resources For the Period 2013-2022*, dated March 1, 2013. (CL&P 1, p. B-4; CL&P Admin. Notice 1)

35. The Project is part of a long range plan for expansion of Connecticut's power grid that serves the public need for adequate, reliable and economic service. The long range plan currently includes a new substation located in Greenwich and additional transmission connections to that substation. (CL&P 6, p. 15; CL&P 3, Q-CSC-004)

36. Stamford officials have undertaken efforts to encourage robust economic development and urban redevelopment, especially within the City's South End area. (CL&P 1. p. B-10; CL&P 1, Bulk Filing #1)

37. Current economic development projects in Stamford, including the Stamford Hospital expansion; 4,000 apartments and 1 million square feet of office space; and 8 corporate

headquarter relocations, as well as approved but not yet constructed projects, would require a significant commitment of electricity. (Tr. 2, pp. 12-13)

Schedule of Need

38. The year of need is immediately because the transmission system could experience voltage collapse and thermal overload conditions in violation of national and regional reliability standards. (CL&P 1, pp. B-3, B-4, CEII Appendix)

39. The Project would address the potential voltage collapse and thermal overload conditions beginning in 2015 summer peak load when the Project would be available to provide the reliability benefits. (CL&P 1, p. B-4)

Planning Criteria and Reliability Standards

40. CL&P is required to meet mandatory reliability standards pursuant to the authority of the Federal Energy Regulatory Commission (FERC), the North American Electric Reliability Corporation (NERC), the Northeast Power Coordinating Council (NPCC) and the Independent System Operator – New England (ISO-NE). (CL&P 1, p. B-9; Tr. 1, p. 81)

41. The mandatory reliability standards are designed to ensure that the electric power system serving New England, including the CL&P electric service territory, will provide an adequate and reliable electric power delivery system. (CL&P 1, p. B-9)

42. CL&P is obliged by binding tariff provisions to design and propose transmission improvements that will assure the bulk power supply system complies with applicable reliability standards. (Council Admin. Notice 32, FOF # 53)

43. ISO-NE's reliability standards are designed to assure consistent system planning throughout New England. (Council Admin. Notice 32, FOF # 55)

44. ISO-NE's definition of reliability is governed by NERC. NERC's definition of reliability encompasses two concepts: adequacy and security. Adequacy is defined as the "ability of the system to supply the aggregate electric power and energy requirements of the consumers at all times." Security is defined as "the ability of the system to withstand sudden disturbances." (Council Admin. Notice 32, FOF # 56)

45. A key element in planning for and testing transmission reliability (in the sense of transmission security) is the concept of "contingency" events, wherein certain generation and/or transmission facilities are modeled to be out of service or otherwise unavailable. Potential causes of contingency events are weather; substation, transmission line or generator failure; contingencies occurring elsewhere on the electric system; other factors; or a combination of factors. (Council Admin. Notice 32, FOF # 58)

46. Planners use the terms "N-1" and "N-1-1" to designate the contingency conditions in which the transmission system must be capable of reliable operation. N-1 designates the state of the transmission system following the occurrence of a single contingency event. N-1-1 designates the condition of the transmission system following the occurrence of a

second contingency event, assuming that one element is already out of service. (Council Admin. Notice 32, FOF # 59)

47. Contingencies are simulated in models for normal loads forecast for the future, extreme weather peak loads, inter-regional power transfers, and "reasonably stressed" conditions, which are generally considered to be the unavailability of generation proximate to load – often with multiple units being unavailable. (Council Admin. Notice 32, FOF # 60)

48. If a simulation shows that transmission lines will overload and/or voltage will not be maintained within specified limits under one or more contingencies, the electric system is judged to be unreliable, and the system must be brought back into compliance within 30 minutes of a first contingency, so that it will be able to operate reliably in the event of a second contingency. (Council Admin. Notice 32, FOF # 63)

49. Requiring the transmission system to operate effectively under such "reasonable stress" recognizes that generation units may be unavailable for many reasons. Events represented in the simulations serve as proxies for potential future events that cannot be defined or predicted, but that the system should be able to survive. (Council Admin. Notice 32, FOF # 64)

50. Contingency modeling under "reasonably stressed" conditions is meant to test the strength of the system in general. Under ISO-NE Planning Procedure 5-3 section 5.2, "Reasonably stressed conditions are those severe load and generation system conditions which have a reasonable probability of actually occurring." (Council Admin. Notice 14; Council Admin. Notice 32, FOF # 65)

51. Planners design improvements to the system that address more than just the specific conditions and contingencies tested in power-flow simulations. (Council Admin. Notice 32, FOF # 66)

52. The Project is designed to prevent reliability criteria violations and provide more reliable electric transmission service for at least twenty years. (CL&P 1, p. B-4)

53. The SWCT Working Group evaluated the system's performance under project operating conditions over a 10-year period. (CL&P 1, p. B-7)

54. On November 16, 2011, the SWCT Working Group identified the Project as the proposed solution to ISO-NE. (CL&P 1, pp. B-6, B-7)

55. The Project was listed in the ISO-NE's Regional Service Plan in 2011 and 2012. (CL&P 6, p. 16)

56. CL&P's studies analyze the impact of contingency events on the transmission system and test the effect of various adjustments that could be implemented to address any inadequacies discovered as a result of the contingency analysis. (CL&P 1, p. B-8)

57. CL&P's studies include various changes in conditions that affect the reliability of the system, such as the implementation of new demand resources or the announced retirement or new construction of generating units. (CL&P 1, p. B-8)

58. The contingency event analyses indicated reliability criteria violations in the Stamford-Greenwich Sub-area. (CL&P 1, p. B-13)

59. With the Project in service, reliability criteria violations will be eliminated for the 115-kV transmission system in the Stamford-Greenwich Sub-area. (CL&P 1, p. B-13)

60. Specifically, the Project (a) increases the transmission transfer capability between the Glenbrook and South End Substations to reliably serve customer demands in the Stamford-Greenwich Sub-area under contingency events, and (b) provides a new and alternate path to relieve power flows in the vicinity of the Waterside, Cos Cob and Tomac Substations to below Long-Term Emergency ratings under contingency events. (CL&P 1, p. B-14)

61. The cost consequences of an outage are significant as compared to the costs of infrastructure improvements to protect and ensure the reliability of electric services to customers in a service area. (Tr. 1, pp. 51-52)

Project Alternatives

62. CL&P considered and rejected a "no action" alternative because doing nothing to eliminate violations of national and regional reliability standards and criteria would be inconsistent with CL&P's obligation to provide reliable electric service. (CL&P 6, p. 16)

63. There are no non-transmission system alternatives to the Project. (CL&P 6, p. 16)

64. CL&P considered central generation, energy efficiency and load curtailment as part of its analysis of non-transmission alternatives. None of these alternatives are currently available to meet the immediate reliability needs that the Project would address. Such alternatives do not present a practical alternative in sufficient amounts to displace the pressing need for the Project. (CL&P 1, pp. B-14 to B-15 and CEII Appendix [subject to the Council's protective order]; CL&P 6, p. 16)

65. As part of the ISO-NE planning process, market participants are allowed to participate in an open forum. As part of such process, no generation proposals were proposed as alternatives to the Project. (Tr. 1, p. 62)

66. A 2006 generation project at Waterside was withdrawn from the ISO-NE queue by its proponent in 2010. (Tr. 1, p. 63)

III. ROUTE ANALYSIS

Overhead Route Evaluation

67. Because of the existing urban infrastructure between the Glenbrook and South End Substations, the only potential corridors for overhead line construction are, the elevated Metro-North Railroad ("MNRR") corridor and the elevated Interstate 95 ("I-95") corridor. Both of these corridors have significant impediments to the development of an overhead transmission line route. (CL&P 1, p. D-1)

I-95 Corridor

68. CL&P rejected a route along I-95 because ConnDOT policies limit the longitudinal occupation of interstate corridors and the I-95 corridor is raised above grade for most of the Project area. (CL&P 6, p. 7)

Metro-North Railroad Corridor

69. Any overhead route along the railroad corridor presents severe practical challenges because MNRR policies limit colocations, and potential conflicts arise with developments abutting the railroad as well as construction obstacles with above- and below-grade railroad crossings. Additionally, the MNRR corridor is already occupied with multiple overhead transmission lines and therefore is significantly congested. (CL&P 6, p. 7)

Separation of 1440 and 1450 Line Structures

70. CL&P considered an overhead route that would invoive separating the 1440 and 1450 Line structures currently located in the MNRR corridor onto separate structures, which was rejected due to its higher cost than the proposed underground circuit. (CL&P 9, Q-CSC-004)

Use of Unoccupied Side of Existing 1977 Line Structures

71. CL&P considered an overhead route of adding a fourth circuit on the unoccupied side of the 1977 Line structures currently within the MNRR ROW. However, due to CL&P's limited easement rights, CL&P would have to remove all the structures in the MNRR, at CL&P's cost, if the MNRR decided to expand its rail system in that location. (Tr. 1, p. 45)

72. ConnDOT plans to expand Route 1 and the I- 95 exit ramp and MNRR is planning several bridge replacements projects. (Tr. 1, p. 45)

73. MNRR is also planning an expansion of approximately 15 feet to the west to accommodate an additional rail in that area. (Tr. 1, pp. 46, 47; CL&P 13, p. 10)

74. In the future, ConnDOT plans to expand the wing-wall for Atlantic Street and to move the wall along South State Street approximately 15 feet, thereby eliminating one of the South State Street lanes. (Tr. 1, p. 46; CL&P 13, p. 10)

75. ConnDOT's expansion for an additional rail would force relocation of 17 of the 24 structures comprising the 1977 Line. (Tr. 1, p. 47; CL&P 13, p. 10)

76. If CL&P were required to relocate the 1977 Line structures, CL&P would have to locate the 1977 Line underground. (CL&P 13, p. 10)

Use of New Structures for the 1977 Line and the New 1151 Line

77. An overhead route that would add a fourth circuit, to be known as the 1151 Line if constructed, onto the existing 1977 Line structures within the MNRR ROW was dismissed by CL&P at an early stage. (CL&P 13, p. 2)

78. After the March 28, 2013 hearings, CL&P further investigated the use of the 1977 Line structures for the 1151 Line as an alternative to an underground route for the Project. (CL&P 13)

79. The 1977 Line structures are capable of supporting one circuit, i.e. the existing 1977 Line. (Tr. 3, p. __)

80. The 1151 Line could not be installed on the existing 1977 Line structures because the substantial majority of the structures have insufficient load bearing capabilities to support the second circuit. Therefore, all but one of the structures would need to be replaced to support the 1977 Line and the 1151 line. (CL&P 13, p. 2)

81. CL&P intended that the 1977 Line structures be designed to accommodate two circuits. However, in 1977, CL&P learned that a portion of the 1977 Line structures, including four of the seven structures analyzed between the Glenbrook and South End Substations (the Project area), did not meet the then applicable 1960 National Electrical Safety Code requirements ("1960 NESC"). (CL&P 8, Q-CSC-008; CL&P 13, p. 3)

82. In the course of this proceeding, CL&P performed a detailed analysis of all but one of the 1977 Line structures between the Glenbrook and South End Substations for compliance with the 1960 NESC. At a minimum, replacement of 14 of the 23 (61%) structures would be required due to one or more element failures including base plate, anchor bolt embedment length or pole section. (CL&P 13, p. 4)

83. CL&P conducted a review of these 23 structures under the 2012 NESC because good utility practice calls for such an evaluation when more than 50% of the structures fail under the then applicable NESC. Under the 2012 NESC, 91% of these 23 structures failed to meet the requirements for a second circuit. Therefore, all 23 structures would have to be replaced if a second circuit were to be added. (CL&P 13, p. 4)

84. CL&P's analysis was based on the use of a 1272 kcmil ACSS (Aluminum Conductor, Steel Supported) conductor for the 1151 Line. (Tr. 3, p. __)

85. CL&P also tested the 1977 Line structures using a lighter ACCR (Aluminum Conductor Composite Reinforced) conductor and found that over 50% of the structures failed. (Tr. 3, p. __)

86. Replacement of the 1977 Line structures with new structures for the 1977 Line and the 1151 Line, constructed along the MNRR ROW, would entail severe administrative and construction challenges including:

(a) CL&P would be required to comply with Federal Railroad Administration criteria including worker safety requirements;
(b) Extensive coordination efforts between CL&P, MNRR and ConnDOT would be required;
(c) Because a track must be taken out of service for construction activities to take place, MNRR would limit CL&P to a construction window of only 2.75 hours per day between 2:00 AM and 4:45 AM, which allows a very narrow time period for mobilization, performance of work and demobilization. However, the construction crews would need to be paid for a full day of work each day (likely for a minimum of 10 hours);
(d) During such night-time hours, the work site, which abuts the rear of approximately 32 residential properties, would be brightly illuminated for the safety of construction crews;
(e) Even with the track out of service, the space available for the construction effort is constrained, so that the amount of work that can be safely accomplished in 2.75 hours is much less than can be accomplished in an equivalent period of time on a typical, unconstrained ROW;
(f) Because of limited space, the contractor would be building the new overhead line in essentially the same location as the existing line that was being dismantled. This type of construction is expected to proceed more slowly than a replacement line that can be built in a ROW alongside the line that is being replaced.
(g) Even though the track nearest the line under construction would be taken out of service, there may be trains on other tracks for MNRR testing or maintenance purposes. Certain types of work must be suspended when MNRR decides to operate a train on any of the other tracks and could not be resumed until it has passed;
(h) MNRR may cancel the scheduled track outages on short notice due to their own overriding priorities;
(i) The equipment, construction procedures and protection measures employed by CL&P's contractor would be subject to approval by MNRR, and the approval process is time-consuming and can cause construction delays; and
(j) In addition to paying for the construction personnel to build the line, CL&P must pay for MNRR safety personnel such as signalmen or watchmen. Nevertheless, the work would be subject to the limited availability of MNRR personnel (i.e. groundmen, flagmen, etc.) to implement track outages and the personnel (i.e. conductor, breakman, engineer, pilot) needed to remove the track from service to track outages.

(CL&P 13, pp. 4-6)

87. CL&P identified site-specific challenges with replacing the 1977 Line structures including:

(a) Twenty-four drill rig platforms would be required primarily along South State Street and the railroad corridor. For the platforms in South State Street, two lanes would need to be closed. For the platforms in the railroad corridor, the drill rigs must be elevated to the same ground level as the finished foundation;
(b) A high stone wall supports the railroad on South State Street near Atlantic Street, requiring a very high drill rig platform to be erected; and
(c) Access to structures would be difficult from the rear yards of homes along Culloden Road. All of these properties have very small lots.

(CL&P 13, p. 7)

88. Other challenges associated with work within the MNRR ROW identified by CL&P include:

(a) temporary relocation of MNRR railroad supply circuits located on 10 of CL&P's 1977 Line structures, at CL&P's sole cost; and
(b) greater danger for construction activities near an active railroad.

(CL&P 13, p. 8)

89. CL&P noted that ConnDOT Office of Rails would not support the installation of new 1977 Line structures because of concerns about its long range plans for increasing ridership and reliability and increased costs and time for the construction of ConnDOT's projects within an already highly congested railroad corridor. (CL&P 13, p. 9)

90. CL&P reported that ConnDOT would not allow the use of the railroad catenary structures for utilities. (CL&P 13, pp. 9-10)

91. An underground route for the Project would reduce potential risks to customers losing service during construction. An outage of the 1977 Line during construction of the new overhead line structures followed by a single contingency event (i.e. one involving the 1440 and 1450 Lines that are located on double circuit towers), could cause a blackout of customers served by the Cos Cob, Waterside, Tomac and South End Substations. Such a blackout could affect approximately 47,500 CL&P customers. (CL&P 13, p. 11)

92. CL&P experienced a loss of double circuit towers supporting the 1740 and 1750 Lines in Greenwich in early August of 2012. The outage of the 1750 Line lasted for 20 hours; the outage of the 1740 Line lasted for four hours. These outages affected approximately 37,000 customers. (CL&P 13, p. 12)

Underground Routes

93. In its Application, CL&P evaluated three potential underground routes designated the Preferred Route, the Preferred Route With Variation and the Alternate Route. After filing the application, CL&P developed a variation of the Preferred Route, which was

designated the Preferred Route With Canal Street Option. That variation was later refined to the Preferred Route With Canal Street Option (Updated), which CL&P supports as the Project Route. (CL&P 1, p. D-1; CL&P 6, p. 6) **Refer to Figure 1**

94. The Preferred Route is approximately 8000 feet in length, the shortest of the three routes originally considered by CL&P, and consists of seven underground segments. The Preferred Route requires a jack and bore crossing of the Metro North Railroad (MNRR) corridor and two property easements associated with that crossing. (CL&P 1, pp. C-10, D-1, D-2; CL&P 6, p. 6)

95. The Preferred Route With Variation, which is slightly longer than the Preferred Route, consists of five underground segments and avoids the MNRR crossing and associated easements but overlaps a portion of East Main Street/Route 1 that is included in the City's Stamford Urban Transitway (SUT) Phase II Project. (CL&P 1, pp. C-10, D-3, D-4; CL&P 6, p. 6)

96. The Alternate Route is the longest of the three routes originally considered by CL&P, consists of seven underground segments, includes the MNRR crossing and requires three property easements. (CL&P 1, pp. C-10, D-4, D-5; CL&P 6, p. 6)

97. Stamford recently completed SUT Phase I, an extensive roadway improvement project. Phase I primarily involved Jefferson Street and Dock Street. Phase II, which the City plans to commence this year, involves substantial improvements along Myrtle Avenue and East Main Street (Route 1). (CL&P 1, p. C-6; CL&P 6, pp. 6, 7)

98. After the filing of its Application, at ConnDOT's request, CL&P evaluated an alternative to avoid the use of Atlantic Street because of ConnDOT's plans to lower Atlantic Street by approximately 5.5 feet as part of the MNRR Bridge Replacement Project. CL&P developed a route known as the Preferred Route With Canal Street Option, which consists of nine underground segments, is shorter than the Preferred Route, the Preferred Route With Variation and the Alternate Route, includes the MNRR crossing and requires the two associated easements as well as two additional easements. (CL&P 4; CL&P 6, pp. 8, 13) **Refer to Figure 2**

99. CL&P initially favored the Preferred Route With Canal Street Option due to its shorter length, fewer construction complexities, less coordination with ConnDOT and design changes, reduced traffic, less cable and less disturbance and a shorter construction period. (CL&P 4, p. 62; CL&P 6, p. 13)

100. The City initially favored the Preferred Route With Canal Street Option. (City of Stamford Letter dated March 25, 2013)

101. ConnDOT initially favored the Preferred Route With Canal Street Option. (ConnDOT Letter dated April 8, 2013)

102. On May 23, 2013, CL&P filed with the Council a refinement of the Preferred Route With Canal Street Option known as the Preferred Route With Canal Street Option (Updated). (CL&P 10) **Refer to Figure 3**

103. The Preferred Route With Canal Street Option (Updated) avoids the use of Manhattan Street and decreases the use of Pacific Street by installing the underground circuit on CL&P-owned land directly beneath the South End Substation along the northwest property line. The Preferred Route With Canal Street Option (Updated) (Project Route) continues to incorporate all of the features of the initial Preferred Route With Canal Street Option that were cited by the City of Stamford and ConnDOT in their comments as the basis of their preferences for that route. (CL&P 10)

104. CL&P notified the Council that the City of Stamford and ConnDOT were informed of the Preferred Route With Canal Street Option (Updated) and supported it. (CL&P 10; Tr. 3, p. __)

105. The five routes are compared in Table CS-1-Updated: Route Analysis Summary

Table CS-1-Updated: Route Analysis Summary

Key Factors	Preferred Route	Preferred Route With Variation	Alternate Route	Preferred Route With Canal Street Option	Preferred Route With Canal Street Option (Updated)
Route Length	8,000 feet	8,080 feet	8,800 feet	7,565 feet	7,410 feet
Impact to ConnDOT Property - Route 1 - Atlantic Street	275 Feet 175 feet 100 feet	1,150 feet 1,050 feet 100 feet	395 feet 45 feet 350 feet	175 Feet 175 feet 0 feet	175 Feet 175 feet 0 feet
ConnDOT Encroachment Agreement Required	No	Yes	No	No	No
Railroad Crossing Agreement Required	Yes	No	Yes	Yes	Yes
Impact to City Projects (SUT)	0 feet	700 feet	0 feet	130 feet	130 feet
Underground Utilities Congestion	Least	Greatest	Moderate	Least	Least
Property Easement Required	2	0	3	4	4
Schools/Day cares within 600 feet	0	0	2 (Day cares)	0	0

(CL&P 10, p. 2)

106. CL&P proposes the Preferred Route With Canal Street Option (Updated) as the Project Route, due to its shorter length (the shortest of all routes considered), fewer construction complexities and reduced use of local streets. This route also avoids the two abutters on Manhattan Street that were part of the Preferred Route With Canal Street Option. (CL&P 10, p. 4)

Project Route

107. CL&P project designers divided the Project Route for the underground transmission circuit into nine segments. Segments 1-8 are the same as the Preferred Route With Canal Street Option. (CL&P 4, p. 4; CL&P 10, p. 2)

108. Segment 1: Originating at the CL&P Glenbrook Substation, the route first extends southerly down Lincoln Avenue to a location past Sheridan Street where it turns westerly onto private property (735 feet). Lincoln Avenue is a lightly traveled street that is zoned residential to the east and light industrial to the west. (CL&P 4, p. 5)

109. Segment 2: The route continues westerly across the MNRR corridor, using a 140-foot jack and bore crossing, connecting to Scott Place and extending westerly to the Culloden Road intersection (480 feet). This route segment passes from an industrial area through private property, railroad property, and a narrow City of Stamford Greenway that borders the railroad until it reaches the dead end of eastern Scott Place, which is zoned residential with residences located on both sides of the street. (CL&P 4, p. 5)

110. Segment 3: The route then turns southerly down Culloden Road, which becomes Crystal Street, to the East Main Street/Route 1 intersection (1,230 feet). Culloden Road is a lightly traveled street, with residences on both sides, that extends to the intersection with Crystal Street where commercial zoning begins to the east. (CL&P 4, p. 5)

111. Segment 4: A short route segment is required to cross East Main Street/Route 1 as the route continues southwesterly, connecting into North State Street (175 feet). East Main Street/Route 1 is a heavily traveled ConnDOT corridor bordered by a commercial area north and south of the crossing. (CL&P 4, p. 5)

112. Segment 5: The route continues southwesterly along North State Street and then bears left onto South State Street crossing under the elevated I-95 roadway (975 feet). North State Street is a highly traveled two lane road bordered to the west by a commercial area and to the east by the light industrial area occupied by the MNRR. (CL&P 4, p. 5)

113. Segment 6: The route continues southwesterly on South State Street to Canal Street (2,750 feet). South State Street is a moderate to heavily traveled one-way road with three to four traffic lanes through this segment located between I-95 and the MNRR corridor, which services northbound I-95 with on-ramps near Canal Street and Elm Street. (CL&P 4, p. 5)

114. Segment 7: The route turns south onto Canal Street, continues south before turning west and entering MNRR property (250 feet). With moderate traffic throughout the day, Canal Street serves as an alternative access route to downtown Stamford. (CL&P 4, p. 6)

115. Segment 8: The route then extends westerly through the corner of MNRR property and into private property (parking lot) crossing into the back of another private property and then connecting into the dead end of Pacific Street (440 feet). (CL&P 4, p. 6)

116. Segment 9: The route runs straight across Pacific Street to the entrance point at CL&P's South End Substation property and extends 375 feet along such property. Pacific Street is a lightly travelled road within a generally industrial area. (CL&P 10, p. 2)

117. The general land uses in the vicinity of Segment 9 include commercial and industrial uses, specifically a CL&P substation, MNRR, and commercial buildings. (CL&P 4, p. 6)

118. Canal Street was recently paved as part of SUT Phase I; however, the City would allow CL&P to excavate and re-pave a short portion of Canal Street. (CL&P 4, p. 7, Drawing CS-1)

119. The portion of this route located within the coastal boundary would be about 400 to 450 feet less than the portion of the Preferred Route located within the coastal boundary. (CL&P 4, p. 8)

120. Electric fields would be essentially unchanged as a result of the Preferred Route With Canal Street Option and Preferred Route With Canal Street Option (Updated). Magnetic fields would be different than those identified in the Application only for the area between Canal Street and the South End Substation. (CL&P 4, p. 8; CL&P 10)

121. CL&P conducted outreach to City officials, ConnDOT officials and the two private property owners from whom CL&P would require temporary and permanent easements. (CL&P 4, pp. 9-10; CL&P 10)

IV. SUBSTATIONS

South End Substation

122. The South End Substation is located on CL&P-owned property on Manhattan Street, which property consists of 0.8 acre. (CL&P 1, p. D-17; CL&P 6, p. 9)

123. The proposed modifications within the fenced-in area at the South End Substation include installation of:

(a) a riser pole on which the cable termination bushing would be installed;
(b) a motor operated disconnect ("MOD") switch with ground switch to serve as the line MOD for the cable line on a structure with the height matching the cable termination and ring bus heights;
(c) lightning arresters on the riser pole structure; and
(d) the control cables for the MOD in the existing conduits already installed.

In addition, substation protection and control work would also be performed.(CL&P 1, pp. D-17, D-18 and Appendix C; CL&P 6, pp. 9, 10)

124. The tallest proposed structure, a riser pole with lightning arresters, to be installed within the fenced-in substation would be approximately 37 feet in height. This structure would

be substantially lower than the height of the existing tallest structure, which has a total height of approximately 100 feet. (CL&P 6, p. 10)

Glenbrook Substation

125. The Glenbrook Substation is located on CL&P-owned property on Hamilton Avenue, which property consists of 4.9 acres with a back entrance located on Lincoln Avenue. (CL&P 1, p. D-18; CL&P 6, p. 11)

126. The proposed modifications within the fenced-in area at the Glenbrook Substation include installation of:

(a) a 115-kV circuit breaker;
(b) a cable termination;
(c) a MOD switch with motor operated ground switch to act as the line MOD for the cable line;
(d) lightning arresters on the termination structure;
(e) 3 potential transformers (PT) for relaying; and
(f) the control cables for the breaker, PTs and MOD in the existing trench.

In addition, substation protection and control work would also be performed. (CL&P 1, p. D-18 and Appendix C; CL&P 6, p. 11)

127. The tallest proposed structure, a termination structure with lightning arresters, to be installed within the fenced-in substation would be approximately 22 feet in height. This structure would be substantially lower than the height of the existing tallest structure, which has a total height of approximately 65 feet. (CL&P 6, pp. 11-12)

V. PROJECT DESIGN

128. CL&P considered the two standard design technologies used by CL&P for underground transmission lines: high pressure fluid filled (HPFF) pipe type cable and cross-linked polyethylene (XLPE) cable. (CL&P 1, p. D-6)

129. The use of a single circuit XLPE system design with a 3500 kcmil copper conductor size would satisfy the Project's thermal rating requirements. (CL&P 1, p. D-6)

130. The expected service life of XLPE transmission cable is approximately 40 years. (CL&P 3, Q-CSC-010)

131. An HPFF cable installation would require a double circuit system to meet the Project's required ratings. However, the HPFF design would not be feasible due to the limited space within the fenced in area at South End Substation to terminate two new transmission lines; the double circuit design would require expansion of South End Substation. (CL&P 1, p. D-6)

132. The electric cables would be installed in a duct bank encased in concrete. Smaller conduits would also be installed for the relaying, communications, temperature monitoring, and ground continuity cables. The cables would be installed one cable per duct. (CL&P 1, p. D-6)

133. The proposed cables for the Project would be designed to withstand water penetration and have a lead sheath which functions as a moisture barrier. The cables and splices would be capable of continuous long-term operation under a 30-foot head of water with no water ingress. The capacity to prevent water penetration is tested in accordance with International Electrotechnical Commission standard *IEC 60840*. (CL&P 1, p. D-6)

134. If sand and/or salt water were to enter into the splice vaults during a flooding event, thermal problems would be unlikely to occur because water, seabed, and sand each have a much lower thermal resistivity than air. If vaults were to fill with sand and/or salt water, vacuum trucks would be used to remove the sand and dewater the vaults. After removing sand and water, the vaults would be washed to remove any remaining salt. The clamps and the racking system used to support the cables in the vaults would be specified to be non-magnetic and non-corrosive, which reduces the risk of corrosion in the vaults. (CL&P 1, pp. D-6, D-7)

135. A single circuit of an underground 115-kV transmission system would consist of three cables, or phases. Each phase of the circuit would consist of one 3500 kcmil copper conductor cable insulated to 115-kV with 690 mils of XLPE insulation. Each cable would be approximately 4.5 inches in diameter. (CL&P 1, p. D-7)

136. Splice vaults would be required whenever the maximum installable length of cable is reached, as determined by maximum allowed pulling tension, maximum allowed side wall pressure, and maximum length of cable that can be transported on a cable reel. Reinforced concrete splice vaults would be spaced approximately every 2,000 feet along the route. (CL&P 1, p. D-8)

137. CL&P anticipates installation of 3 splice vaults. (Tr. 1, p. 56)

138. The splice vault size and layout is determined by the space required for cable pulling, cable splicing, and supporting the cable in the vault. The outside dimensions of the splice vaults are expected to be 24 feet long by 9 feet wide and 9 feet high. The top of the splice vault would be installed a minimum of 3 feet below grade with two access holes, or manhole covers, each approximately 36 inches in diameter. (CL&P 1, p. D-8)

139. Each splice vault would have two entry points to the surface for access to the splice vaults for maintenance by CL&P. After backfilling, these entry points would be identifiable as manhole covers, which would be set flush with the ground or road surface. (CL&P 6, p. 20)

140. The underground 115-kV transmission cable would be installed in a concrete encased duct bank for the entire length of the underground route, except for any trenchless installation section. The duct bank would consist of four six-inch, two four-inch, and two two-inch Schedule 40 PVC conduits. The conductor cables would be installed in three of

the six-inch conduits, and the remaining six-inch conduit would be used for a spare. Fiber optic cables used for communications, relaying, temperature monitoring, and the ground continuity conductor would be installed in the smaller conduits. (CL&P 1, p. D-10)

141. Where third party utilities constrain the available space, the duct bank configuration would be flattened with four six-inch conduits being installed horizontally with the smaller four-inch and two-inch conduits interspersed creating a lower profile, but wider duct bank. (CL&P 1, p. D-10)

142. The Preferred Route, the Alternate Route, the Preferred Route With Canal Street Option and the Preferred Route With Canal Street Option (Updated) would require the use of a trenchless installation to cross the MNRR corridor. That installation would consist of a jack and bore, an auguring operation that simultaneously jacks or pushes a casing pipe into the excavated cavity. (CL&P 1, p. D-11; CL&P 4; CL&P 10)

143. To avoid de-rating of the circuit, a centrifugally cast fiberglass-reinforced polymer-mortar pipe (trade-name: HOBAS) would be used in place of the standard steel casing. Upon completing the casing installation, the duct system would be positioned inside the HOBAS casing pipe using specially designed spacers. The entire casing would be backfilled with thermally designed grout to solidify the casing installation from any movement and to help dissipate heat away from the cable system. (CL&P 1, p. D-11)

144. A horizontal directional drill (HDD) technique was considered as an alternative to the trenchless installation. The HDD installation was dismissed because it would be significantly longer than the jack and bore installation, resulting in higher costs and a greater time commitment. (CL&P 1, p. D-13)

145. Pre-fabricated or pre-molded compression splices would be used to splice the XLPE 115-kV cables. The conductor ends would be joined together by a compression splice. The splicing of the high-voltage transmission cables would be performed inside the splice vault and within a controlled atmosphere. (CL&P 1, p. D-13)

146. Synthetic rubber stress cones known as terminations that "transition" the solid dielectric cable to overhead lines, substation buswork or above ground equipment would be mounted on a substation termination structure or to an overhead-to-underground transition structure (riser pole). The cone would be placed over the cable insulation to control electrical and mechanical stress. (CL&P 1, p. D-14)

147. Riser pole and termination structures would be installed within the South End and Glenbrook Substations, respectively, for the transition of the 115-kV circuit from underground cables to the overhead substation bus. (CL&P 1, p. D-15)

148. At the City of Stamford's request, CL&P plans to install a four-inch duct parallel to and within the same trench excavation as the main duct bank installation for the City's future use for traffic signaling cable installation, consistent with the practice of other utilities conducting work in City streets. (CL&P 6, p. 40; CL&P 1, Bulk Filing #2)

VI. CONSTRUCTION

General

149. CL&P would deploy appropriate erosion and sedimentation controls (i.e., catch basin protection, silt fence or straw bales) at locations where pavement or soils would be disturbed. These controls would be inspected and maintained throughout construction until all disturbed soils are stabilized. (CL&P 1, pp. E-5, G-2; CL&P 6, p. 18)

150. To the extent possible, potential storage and staging areas would include CL&P property, previously developed sites (such as paved parking lots), vacant land or properties previously used for construction support, depending on the parcel size requirements and location in relation to the Project route. Final locations would be identified in the Development and Management (D&M) Plan. (CL&P 6, p. 18)

151. No blasting is expected. If bedrock is encountered, mechanical methods would be used if possible. Otherwise, CL&P would follow controlled blasting techniques. (CL&P 1, p. G-3)

Procedures

152. The proposed Project would be designed, constructed, and maintained in compliance with the standards of the National Electrical Safety Code and other applicable electrical safety codes and designed in accordance with sound engineering practices using established design codes and guides published by, among others, the Institute of Electrical and Electronic Engineers, the American Society of Civil Engineers, the American Corporate Institute, and the American National Standards Institute. (CL&P 1, pp. E-1, G-13)

153. Two fiber optic cables for remote protection and control of the cable system and associated equipment, and one fiber optic cable for monitoring the operating temperature of the cable would be installed in the duct bank. A ground continuity conductor would also be installed for grounding the cable sheaths and equipment within the proposed splice vaults. (CL&P 1, p. E-1)

154. The underground cable system would be installed principally within or adjacent to public roads in Stamford. A duct bank within a public road usually requires a minimum width of 30 feet to accommodate the excavation of the cable trench, equipment, and temporary storage of equipment. (CL&P 1, p. E-2)

155. The outside dimensions of splice vaults for 115-kV XLPE cables are approximately 9 feet wide by 9 feet high and up to 24 feet long. The installation of each splice vault therefore typically requires an excavation area approximately 13 feet wide, 13 feet deep, and 30 feet long. (CL&P 1, p. E-2)

156. During construction, areas for temporarily storing and staging construction materials and equipment would be required in the vicinity of the transmission route. Restoration would occur after completion of construction. (CL&P 1, p. E-3)

157. The cable system construction would be divided into multiple components so that the actual work at any one location would be periodic and would involve various discrete tasks. (CL&P 1, p. E-4)

158. Trenching, conduit 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. (CL&P 1, p. E-5)

159. 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. Splice vault excavation areas would be shored and fenced. (CL&P 1, p. E-6)

160. Because of the time-consuming precise nature of splicing high-voltage transmission cables, the sensitivity of the cables to moisture and the need to maintain a clean working environment, splicing XLPE cables would involve a complex procedure requiring a controlled atmosphere. This "clean room" atmosphere would be provided by an enclosure or vehicle that must be located over the manhole access points during the splicing process. (CL&P 1, p. E-7)

Substation Modifications

161. CL&P would follow a sequential construction approach for the substation modifications that includes site preparation, with installation of temporary soil erosion and sedimentation controls that would be maintained and replaced as necessary throughout construction; foundation construction; installation of equipment; testing and interconnections; final clean-up, site security and restoration. (CL&P 1, pp. E-8, E-9)

162. Landscaping for the South End Substation would be coordinated with City of Stamford officials as part of Petition No. 999. At Glenbrook Substation, CL&P would replace any vegetation that required removal for the Project. (CL&P 1, p. E-9; CL&P 6, p. 10)

VII. ENVIRONMENTAL

163. The topography along the project route is generally characterized by flat and gently sloping areas with elevations ranging between 10 and 20 feet above sea level. Except for the area of about 350 feet between Lincoln Avenue and Scott Place, vegetation is extremely limited and almost exclusively located along the road shoulder, adjacent to the route. (CL&P 1, p. F-2; CL&P 6, p. 22)

164. The principal types of land use along the project route are commercial/industrial, retail and residential. Some neighborhoods are located along the northern portion of the Preferred Route, namely on Lincoln Avenue, Scott Place, Culloden Road and Crystal Street. (CL&P 1, pp. F-7, F-8; CL&P 6, p. 23)

165. The Project is consistent with local, state and federal land use plans. (CL&P 1, pp. F-7, F-8, F-9, G-8)

166. The Project is consistent with the *Conservation and Development Policies Plan for Connecticut 2005-2010* and serves a public need for a reliable source of electricity, which such plan recognizes as necessary for development in Connecticut's Regional Centers. (CL&P 1, pp. G-8, G-9).

167. The Project is consistent with the future land-use and planning objectives of the Southwestern Regional Planning Agency's *2006-2015 Regional Plan of Conservation and Development.* (CL&P 1, P. G-9)

168. The Project does not affect any federal properties or federally-designated areas. (CL&P 1, P. G-9)

169. The Project advances the goals of the Stamford Master Plan by providing an underground electric cable, in areas such as downtown, neighborhood business districts and on major corridors. The Project also encourages economic development by providing electric power. (CL&P 1, p. F-9; Tr. 1, p. 32)

170. Grading would not be required to install the circuit within existing road ROWs. However, some grading may occur in off-road ROW areas to create a level work area. (CL&P 1, p. G-2; CL&P 6, p. 24)

171. The Project area is within densely developed urban areas where groundwater is not used for direct potable water supply. (CL&P 1, pp. F-4, G-3; CL&P 6, p. 24)

172. There are no aquifer protection areas in the vicinity of the Project. (CL&P 1, p. F-4)

173. There are no wetlands, vernal pools or watercourses proximate to the Preferred Route. The Preferred Route, the Preferred Route With Canal Street Option and the Preferred Route With Canal Street Option (Updated) would cross the East Branch of the Rippowam River, a tidal watercourse that is contained in an underground culvert. The crossing would occur over the top of that underground culvert. (CL&P 1, pp. F-4, F-7, G-3; CL&P 6, p. 24; CL&P 10)

174. The Project routes are not within any 100 year flood hazard areas. (CL&P 1, pp. F-5, G-4)

175. No portion of the Project routes are within a 500 year flood hazard area. (Tr. 1, p. 30; Tr. 3, p. __)

176. Project construction activities would occur in previously developed commercial/industrial areas and neighborhoods and would have no effect on access to the shoreline. (CL&P 6, p. 25)

177. A portion of the Preferred Route, the Preferred Route With Canal Street Option and the Preferred Route With Canal Street Option (Updated) are within a Coastal Area Management Boundary; however, the Project would not adversely affect the resources that the Connecticut Coastal Management Act protects. (CL&P 1, pp. F-5, F-6, G-4 to G-6; CL&P 4, p. 8; CL&P 6, p. 25; Tr. 1, p. 17; CL&P 10)

178. There are no state or federal listed plant or animal species in the Project vicinity. (CL&P 1, pp. F-4, G-8; CL&P 6, p. 25)

179. No significant areas of vegetation exist within the Project area. Any areas where vegetation exists would be revegetated with seed mixtures, where necessary. (CL&P 1, pp. G-6, G-7)

180. There are no areas of municipal land, scenic areas, open space, recreational areas or parks immediately adjacent to the Project. The nearest open space is Dasham Park located approximately 1,000 feet away. (CL&P 1, p. F-9)

181. Due to its location in a highly urbanized area of Stamford and the underground installation, there are no adverse visual effects. (CL&P 1, p. G-9)

182. The Project is not likely to result in any adverse impacts to historic or archeological resources. The State Historic Preservation Office concurs that the Project has a low potential for intact and significant archeological resources. (CL&P 1, p. G-9 and Appendix B)

183. The environment surrounding the existing substations consists of busy urban road ROWs, where the existing noise environment is influenced by traffic noise, including I-95, as well as the MNRR corridor. (CL&P 1, p. F-10)

184. The cable and termination equipment would not emit noise. A customary "instant pop" sound would occur if the new breaker at Glenbrook Substation operates. (Tr. 1, p. 30)

185. CL&P expects only short-term and highly localized construction-related noise effects from the Project. (CL&P 1, p. G-10; CL&P 6, p. 25)

186. CL&P would employ the following procedures during construction to minimize noise effects at these sites:

- Engine-powered construction equipment would be properly muffled and maintained to minimize excessive noise to the extent possible;
- In areas where rock removal is required, efforts would be made to schedule work to minimize noise and vibration disturbances;
- To the extent feasible, construction work would be scheduled to minimize disruptions to traffic and to residential and business uses; and
- Sound pressure levels at all points along the property lines of both substations would continue to meet state regulations as specified in Regulations of Connecticut State Agencies. § 22a-69-3.3,-3.5(a),-3.7,-4(g).

(CL&P 1, p. G-11; CL&P 6, pp. 25-26)

187. CL&P expects highly localized effects on air quality during construction, primarily from fugitive dust and vehicular emissions. To minimize the amount of dust generated by construction activities, the extent of exposed/disturbed areas along the Project route at any one time would be minimized. Temporary gravel pads/stone construction entrances would be installed at points of ingress/egress at any off road construction work areas as necessary to minimize the potential for equipment to track dirt onto roads. Roadways within the construction zone would be regularly inspected and swept to remove any excess accumulation of dirt. In addition, to minimize dust, water may be used to wet down disturbed soils along the Project route, as needed. (CL&P 1, pp. G-11, G-12; CL&P 6, p. 26)

VIII. ELECTRIC AND MAGNETIC FIELDS

General

188. Electric fields (EF) and magnetic field (MF) are two forms of energy that surround an electrical device. Transmission lines are a source of both EF and MF. (Council Admin. Notice 31, FOF # 281; CL&P 1, p. I-7)

189. EF is produced whenever voltage is applied to electrical conductors and equipment. Electric fields are typically measured in units of kilovolts/meter. As the weight of scientific evidence indicates that exposure to electric fields, beyond levels traditionally established for safety, does not cause adverse health effects, and as safety concerns for electric fields are sufficiently addressed by adherence to the National Electrical Safety Code, as amended, health concerns regarding Electric and Magnetic Fields (EMF) focus on MF rather than EF. (Council Admin. Notice 31, FOF # 282; CL&P 1, p. I-1)

190. MF is produced by the flow of electric currents. The magnetic field at any point depends on the characteristics of the source, including the arrangement of conductors, the amount of current flow through the source, and the distance between the source and the point of measurement. Magnetic fields are typically measured in units of milligauss (mG). (Council Admin. Notice 31, FOF # 282; CL&P 1, p. I-2)

191. The Council has developed its *"Electric and Magnetic Field Best Management Practices for the Construction of Electric Transmission Lines in Connecticut"* (EMF BMP) to address concerns regarding potential health risks from exposure to EMF from transmission lines. The document presents scientific knowledge about health risks, outlines the Council's policy of prudent avoidance, and describes a wide range of best-practice MF management designs. (Council Admin. Notice 17; CL&P 1, Appendix D.1)

192. International health and safety agencies, including the World Health Organization (WHO), the International Agency for Research on Cancer (IARC), the IEEE International Committee for Electromagnetic Safety (ICES), and the International Commission on Non-Ionizing Radiation Protection (ICNIRP), have studied the scientific evidence regarding possible health effect from MF produced by non-ionizing, low-frequency (60-

Hertz (Hz)) alternating currents in transmission lines. (Council Admin. Notice 31, FOF # 284; CL&P 1, Appendix D.4)

193. Both the ICNIRP and ICES have attempted to advise on quantitative guidelines for mG limits protective of health, but have been able to do so only by extrapolation from research not directly related to health: by this method, the maximum exposure advised by ICES is 9,040 mG, and the maximum exposure advised by the ICNIRP has been increased to 2,000 mG in its most recent guidelines. Otherwise, no quantitative exposure standards based on demonstrated health effects have been set world-wide for 60-Hz MF, nor are there any such state or federal standards in the U.S. (Council Admin. Notice 31, FOF # 284; CL&P 1, Appendix D.4, pp. 7-8).

194. The proposed underground circuit and the existing transmission lines on an existing ROW nearby are the major sources of EMF. Transformers and other equipment within the South End and Glenbrook Substations are also potential EMF sources, but would cause little or no exposure to the general public. The strength of fields from equipment inside a typical substation decreases rapidly with distance, and reaching very low levels at relatively short distances beyond substation perimeter fences. The exception is where transmission and distribution lines enter the substation property. (CL&P 6, p. 29)

195. For the SWCT transmission system, CL&P currents are determined by the currents that will flow on the affected lines under each set of conditions to be studied by modeling the transmission system with a specific system load level, generation dispatch, and direction/magnitude of power transfers in or out of Connecticut. Each condition to be studied is selected in a conservative way so as to lead to calculation results that would likely be higher than actual MF values under the assumed loading condition. (CL&P 1, p. I-14)

196. CL&P calculated MF for existing lines under pre-Project conditions in 2014 and for the proposed and existing lines under post-Project conditions in 2019 for three system loading conditions, Annual Peak Load, Peak-Day Average Load, and Annual Average Load. (CL&P 1, p. I-14)

197. In accordance with the EMF BMP, CL&P analyzed the system under varying load conditions with reasonably appropriate generator dispatches, and all transmission lines were assumed in service. (CL&P 1, p. I-15)

198. MF levels directly over the cable and for a distance of 25 feet will be higher than existing fields. At distances of more than 50 feet from the trench, the MF levels on the Project will be lower than existing fields after accounting for interactions between the proposed underground cable and the existing overhead lines. (CL&P 1, pp. I-14 to I-19 Appendix D.3, Table 1; Tr. 1, pp. 74-75)

199. The changes in the MF levels away from the underground cable at residences are very small and not at levels that have been determined to be of a health risk. (Tr. 1, p. 75)

200. Projected MF levels for the Project are well below the guideline levels of the International Commission on Non-Ionizing Radiation Protection and the International

Committee on Electromagnetic Safety. (CL&P 1, pp. I-17, I-19 and Appendix D.3; CL&P 6, p. 35; Tr. 1, p 75)

Statutory Facilities

201. There are no licensed youth camps, licensed child day-care facilities, schools or public playgrounds within 600 feet of the Project routes. (CL&P 1, Table F-3, pp. F-11, F-12; CL&P 6, p. 8; CL&P 10, Table CS-1-Updated)

202. There are two groups of homes on Lincoln Avenue and on Culloden Road. In its Field Management Design Plan (FMDP), CL&P identified these areas as "focus areas" for the purpose of compliance with the Council's EMF BMP. (CL&P 1, Appendix D.2, p. 2; CL&P 6, p. 33)

203. The Lincoln Avenue focus area has 6 residences on the south side along a length of 450 feet. The Culloden Road focus area has a total of 31 residences on both sides along a length of 800 feet. (CL&P 1, Appendix D.2; CL&P 6, p. 34)

204. Consistent with the Council's BMP, CL&P began with a "base" design of the Project that includes "no-cost" options including close phase spacing and best phase arrangement. By minimizing the spacing between the underground cables and arranging the phases, CL&P will achieve better cancellation of the magnetic fields. (CL&P 1, Appendix D.2, pp. 1, 4; CL&P 5, Q-CSC-006)

205. There are no "low cost" magnetic field management measures available that provided significant reduction at or outside the edges of the roadway. (CL&P 6, p. 34)

206. CL&P considered magnetic field methods including high-pressure fluid filled cable systems, "shielding" plates, increased cable depths and cancellation loops but dismissed these methods due to high costs, technical difficulty or limited effectiveness. (CL&P 1, Appendix D.2; CL&P 6, p. 34)

207. Recent studies do not provide evidence to alter the conclusion of the World Health Organization and other health and scientific agencies that the research suggests that EMF exposure is not the cause of cancer or any other disease process at the levels we encounter in our everyday environment. (CL&P 1, Appendix D.4, p. 46)

IX. COST AND SCHEDULE

Summary of Costs

208. The total estimated Project cost is $46.9 million. The underground transmission line costs are approximately $43.9 million and the substation modification costs are approximately $3.0 million. Of that amount, approximately $19.2 million consists of material and labor costs for the civil and site work for the duct bank, splice vaults and the cable, and includes the jack and bore under MNRR. (CL&P 1, p. D-19; CL&P 6, pp. 8-9; CL&P 9, Q-CSC-004)

209. The life-cycle cost of the transmission circuit is $60.97 million. Life-cycle costs include annual carrying charges of the capital cost, annual operation and maintenance costs, cost of energy losses and cost of capacity. For purposes of this calculation, the project's transmission circuit economic life is estimated at 40 years. (CL&P 1, p. D-19 as corrected by CL&P 6, p. 39)

210. The existing ROW has insufficient physical space to accommodate another circuit. CL&P estimated that the cost of an overhead alternative would be approximately $107 million, due partly to the need to acquire extensive rights, including entire parcels, and to demolish existing buildings. (Tr. 1, p. 83)

211. The estimated cost of new overhead 115kV 1440 and 1450 Lines, without any substation upgrades, is $100 million, based on the cost for reconstructing the two circuits on separate structures. (CL&P 9, Q-CSC-004; Tr. 3, p. __)

212. The estimated cost of new overhead 115kV double-circuit steel structures for the 1151 and 1977 Lines, excluding any substation upgrades, is $69.9 million. (CL&P 11, Q-CSC-004-SP01)

Cost Allocation

213. Pursuant to Schedule 12C of the ISO-NE Open Access Transmission Tariff and ISO-NE Planning Procedure No. 4, ISO-NE allocates the cost of virtually all New England transmission projects to load areas within the region. (Council Admin. Notice 32, FOF # 625)

214. When ISO-NE determines that a project is eligible for cost allocation, the project costs are included in New England regional transmission rates and shared by consumers throughout New England. The cost to consumers is based on the electric transmission company's share of the regional electric load. (Council Admin. Notice 32, FOF # 627)

215. CL&P expects the costs of the Project with the underground route to be regionalized unless there are costs to satisfy local requirements; those costs would likely be localized to Connecticut customers only. (CL&P 6, p. 9; Tr. 3, p. __)

216. All of Connecticut's electricity customers would pay approximately 25 percent of the costs of the Project, assuming regionalization. (CL&P 6, p. 9)

217. The Project would have an incremental retail rate impact of 0.05 cents per month/0.60 cents per year for a typical 700 kilowatt-hour CL&P residential customer bill. (Tr. 1, p. 20)

218. The costs of the project would be depreciated over the life of the specific transmission assets, approximately 39-46 years. (CL&P 3, Q-CSC-005)

Schedule

219. CL&P estimates that the construction period would be approximately one year. (CL&P 6, p. 9)

220. The tentative in-service date for the Project is December, 2014. (CL&P 1, p. B-3)

X. SAFETY AND SITE SECURITY

Safety

221. High-speed protective relaying equipment would automatically detect abnormal system conditions (e.g., a faulted overhead transmission line) and would send a protective trip signal to circuit breakers to isolate the faulted section of the transmission system. Protection would also be provided by a Supervisory Control and Data Acquisition system (SCADA). The SCADA system allows for remote control and equipment monitoring by the Connecticut Valley Electric Exchange (CONVEX) System Operator. (CL&P 1, p. H-1; CL&P 6, p. 36)

222. Fire/Smoke detection at Glenbrook Substation and at South End Substation, would automatically activate an alarm at CONVEX and the system operators would then take appropriate action. (CL&P 1, pp. H-1, H-2; CL&P 6, p. 36)

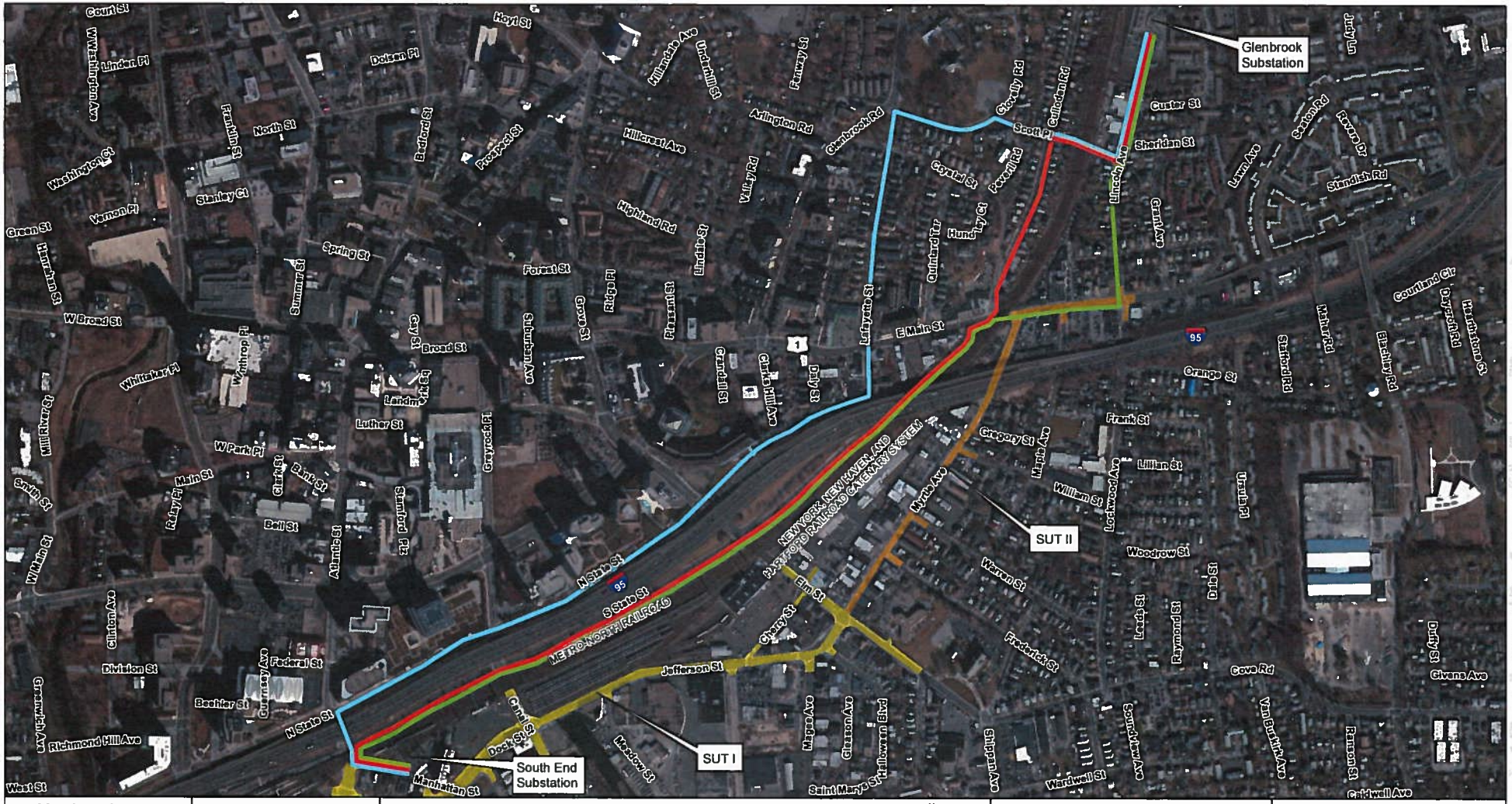
223. South End and Glenbrook Substations are gated and enclosed with a 7-foot high chain-link fence with an additional foot of 3 strands of barbed wire on top. Gates would be padlocked at all times. Signage is posted alerting the public of high voltage facilities. (CL&P 1, p. H-2)

Security

224. The physical security of the proposed facilities would be consistent with the Council's *White Paper on the Security of Siting Energy Facilities* (Docket No. 346). (CL&P 1, p. H-2)

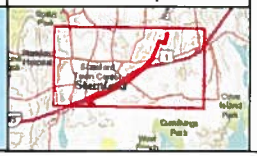
225. The Project will incorporate physical security measures in four areas, including planning, preparedness, response and recovery. (CL&P 1, pp. H-3 to H-10)

Figure 1



Map Location

Index Map



Legend

- PREFERRED ROUTE
- PREFERRED ROUTE WITH VARIATION
- ALTERNATE ROUTE

Stamford Urban Transitway (SUT) Road Improvements

- SUT Phase I (Construction Complete)
- SUT Phase II (Construction to Commence Q1 2013)

N

0 600 1,200 Feet

1:7,200 1" = 600'

Data Souce: ESRI Bing Imagery
AECOM Survey: May 2012

Stamford Reliability Cable Project
115-kV Route Options
Glenbrook to South End Substation
Survey Aerial Map
ALL ROUTES MAP

Connecticut Light & Power
A Northeast Utilities Company

AECOM

Figure 3

Date: January 10 2013

Figure 2

LEGEND

- CL&P PROPERTY
- EASEMENT LINE TO BE ACQUIRED
- CL&P RIGHT OF WAY
- TEMPORARY EASEMENT LINE TO BE ACQUIRED
- PARCEL LINES
- PREFERRED ROUTE
- PREFERRED ROUTE WITH CANAL STREET OPTION
- EASEMENT AREA TO BE ACQUIRED
- TEMPORARY EASEMENT AREA TO BE ACQUIRED

IN FEET
50 0 25 50 100
MAP SCALE

ATTENTION
THIS MAP IS FOR PLANNING PURPOSES ONLY. LINEWORK AND DIMENSIONS SHALL BE CONSIDERED APPROXIMATE.

NOTE:
NUMBER OF AFFECTED PRIVATE PROPERTY OWNERS = 2

TOTAL PERMANENT EASEMENT TO BE ACQUIRED
AREA = 7,925± SQ.FT.
= 0.18± ACRES

TOTAL TEMPORARY EASEMENT TO BE ACQUIRED
AREA = 8,886± SQ.FT.
= 0.20± ACRES

Northeast Utilities Service Co.

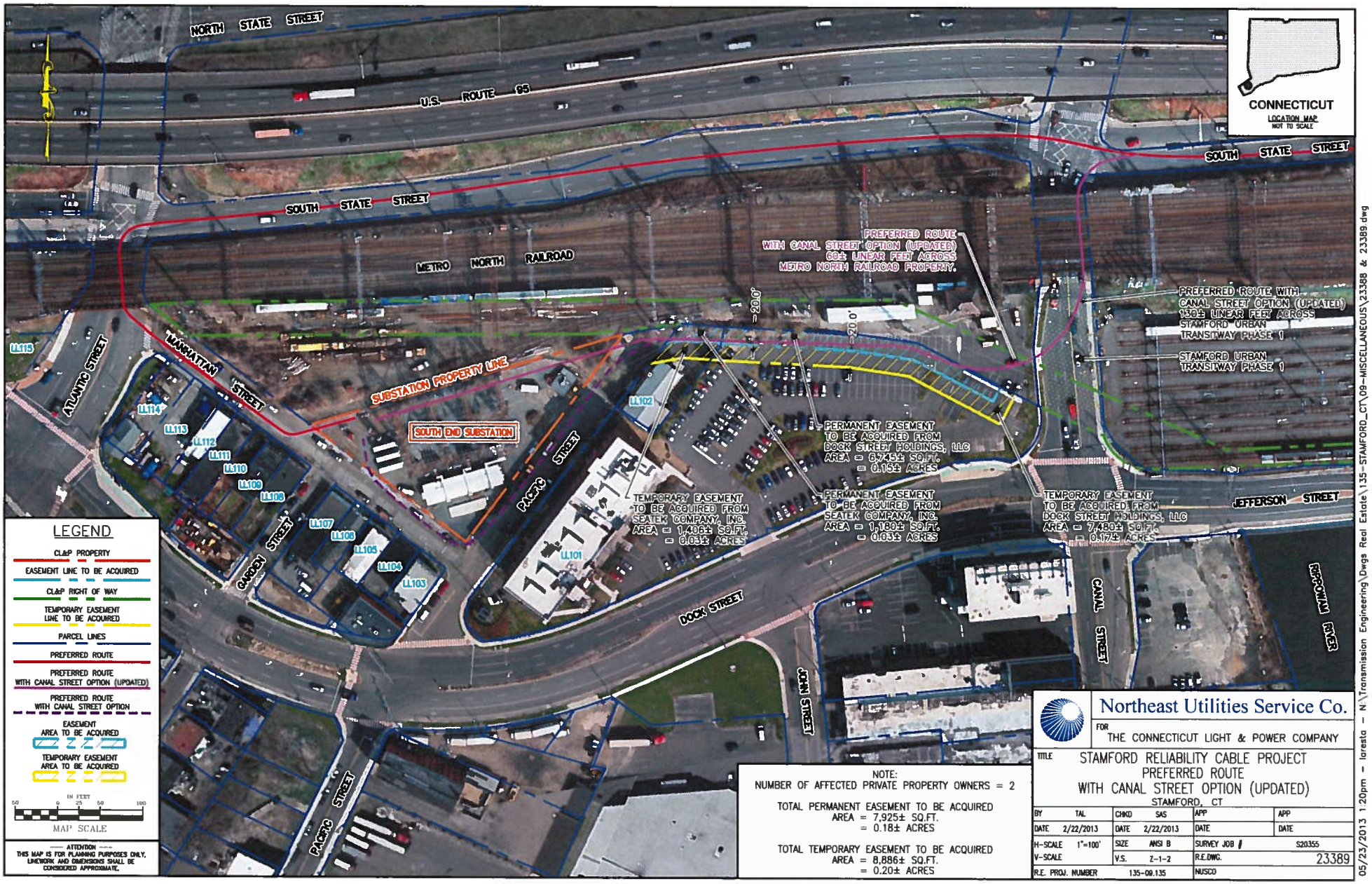
FOR THE CONNECTICUT LIGHT & POWER COMPANY

TITLE: STAMFORD RELIABILITY CABLE PROJECT
PREFERRED ROUTE
WITH CANAL STREET OPTION
STAMFORD, CT

BY	TAL	CHKD	SAS	APP	APP
DATE	2/22/2013	DATE	2/22/2013	DATE	DATE
H-SCALE	1"=100'	SIZE	ANSI B	SURVEY JOB #	S20355
V-SCALE		V.S.	Z-1-2	R.E.DWG.	23389
R.E. PROJ. NUMBER		135-09.135		NUSCO	

03/14/2013 2:19pm - laresta - N:\Transmission Engineering\Dwgs Real Estate\135-STAMFORD_CT\09-MISCELLANEOUS\23388 & 23389.dwg

Figure 3



LEGEND

- CL&P PROPERTY
- EASEMENT LINE TO BE ACQUIRED
- CL&P RIGHT OF WAY
- TEMPORARY EASEMENT LINE TO BE ACQUIRED
- PARCEL LINES
- PREFERRED ROUTE
- PREFERRED ROUTE WITH CANAL STREET OPTION (UPDATED)
- PREFERRED ROUTE WITH CANAL STREET OPTION
- EASEMENT AREA TO BE ACQUIRED
- TEMPORARY EASEMENT AREA TO BE ACQUIRED

IN FEET
50 0 25 50 100
MAP SCALE

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DATE	2/22/2013	DATE	2/22/2013	DATE	DATE
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R.E. PROJ. NUMBER		135-09.135		NUSCO	

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