June 30, 2017

Mr. Robert Stein
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: Docket No. 461A - CSC 461A Greenwich Substation and Line Project - Petition for Reconsideration

Dear Mr. Stein:

This letter provides the response to requests for the information listed below.

Response to CSC-01 Interrogatories dated 06/12/2017
CSC-001, 002, 003, 004, 005, 006, 007, 008, 009, 010, 011, 012, 013, 014, 015, 016, 017, 018, 019, 020, 021, 022, 023, 024, 025, 026, 027, 028, 029, 030, 031, 032, 033, 034, 035, 036, 037, 038, 039, 040, 041, 042, 043, 044, 045, 046, 047, 048, 049, 050, 051, 052, 053, 054, 055, 056, 057, 058, 059, 060, 061

Very truly yours,

Kathleen Shanley
Manager
Transmission, Siting
As Agent for CL&P
dba EversourceEnergy

cc: Service List

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, Pre-filed Testimony p. 4. Is the 130.5 MVA Cos Cob value now the sole indicator of need for the GSLP? If not, what other studies have been conducted to determine the appropriate solution to this summer peak load value and load growth projections?

Response:
The 130.5 MVA load level is not the "sole indicator of need" for the GSLP. It was the base load assumption that was used in contingency testing of the Greenwich distribution system which, like the previous testing reported in Docket 461, revealed multiple criteria violations. Additional load flow analyses were conducted using actual peak load levels observed in 2014-2016, which were lower than the 130.5 MVA load. These analyses also showed criteria violations and confirmed the need for the project. See the attached table.
In addition, as recognized by the Findings and Opinion in Docket 461, there are deficiencies in the Greenwich distribution system that are related to the age and condition of equipment, such as the Prospect Substation transformers, which are not load-dependent.
The appropriate solution was derived by 1) Identifying upgrades that would eliminate the criteria violations seen in the power flows assuming the 130.5 MVA load and also improve the system design and replace obsolete equipment;2) taking into account the commitment of the Town of Greenwich to energy efficiency and conservation; and 3) taking into account the Council's concern that the scope of the original GSLP was too large because it would have satisfied a 30-40 year planning horizon.

Demand 130.5 MVA				
Single Contingency Scenarios - 2013				
Feeders	Load relative to Normal cable ratings			
11R51	O.O.S.	151%	140%	122%
11R52	117%	O.O.S.	109%	95%
11R55	114%	117%	O.O.S.	97%
11R58	73%	73%	69%	O.O.S.

Demand 107.7 MVA				
Single Contingency Scenarios - 2014				
Feeders	Load relative to Normal cable ratings			
11R51	O.O.S.	127%	118%	102%
11R52	98%	O.O.S.	91%	80%
11R55	95%	98%	O.O.S.	82%
11R58	61%	61%	58%	O.O.S.

Demand 114.8 MVA				
Single Contingency Scenarios - 2015				
Feeders	Load relative to Normal cable ratings			
11R51	O.O.S.	135%	125%	109%
11R52	104%	O.O.S.	97%	85%
11R55	101%	104%	O.O.S.	87%
11R58	65%	65%	62%	O.O.S.

Demand 115.6 MVA				
Single Contingency Scenarios - 2016				
Feeders	Load relative to Normal cable ratings			
11R51	O.O.S.	136%	126%	110%
11R52	105%	O.O.S.	98%	86%
11R55	102%	105%	O.O.S.	88%
11R58	65%	65%	62%	O.O.S.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Is the 2013 peak of 130.5 MVA roughly on the order of a 90/10 extreme weather peak? If yes, if Eversource uses this (non-weather-normalized historical "extreme" peak) as a starting point for a forecast, would it be more appropriate to forecast (into the future) using a 90/10 (or extreme weather) forecast instead of a 50/50 or normal weather forecast?

Response:
The 130.5MVA is an actual measured load in 2013. Although that load was used as the starting point for a forecast in Docket 461, it was not used as a starting point in the analysis used to confirm the need in this reopened Docket. In Docket 461, the result of the forecast was a proposed project scope that the Council found to be excessive. Following the guidance of the Council's Opinion, Eversource determined to propose a project of reduced scope. It used the 130.5 MVA historic load as a design load and determined that the equipment needed to address the need would provide approximately an additional 60 MVA growth margin, which Eversource deemed reasonable and responsive to the Council's direction.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
The ISO-NE 2017 Capacity, Energy, Loads and Transmission Forecast (2017 CELT Forecast) shows a compound annual growth rate (CAGR) of about 0.576 percent for Southwest Connecticut for its 90/10 Summer Peak Load Forecast from 2017 to 2026. With the behind the meter solar photovoltaic forecast included, the CAGR decreases to about 0.365 percent. With solar plus passive demand response, the CAGR becomes approximately -0.345 percent. In light of this, what would be an appropriate CAGR to forecast possible load growth (or decline) for the Cos Cob 27.6-kV system from 2017 to 2026?

Response:

The ISO forecast is not sufficiently granular to derive a CAGR that would apply specifically to the load served by a specific substation. Substation load growth is more dependent on local than regional factors, and substations in different locations can have growth rates very different from one another and different from the state and regional growth rates. However, when Eversource made the determination not to increase the actual 2013 Greenwich 27.6 kV load of 130.5 MVA by a CAGR through 2020, it was aware of the pattern of the ISO-NE CAGR decreases identified in the question, which supported that determination.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
What regional planning criteria apply to the GSLP?

Response:
No regional planning criteria apply to the distribution voltage elements of the GSLP or to the related distribution elements of the Greenwich distribution system. The ISO criteria applies to regional network transmission facilities known as Pool Transmission Facilities (PTF) at Cos Cob substation . The GSLP 115 kV lines and the Greenwich Substation are non -PTF, so the criterion are not applicable.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Is the GSLP identified in the ISO-New England Regional System Plan? If so, provide the Project ID number.

Response:
The GSLP is identified in the ISO-NE Regional System Plan as Project ID number 1533.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Do the Proposed Modified Project (PMP) and/or the Alternate Modified Project (AMP) have Project Plan Approval (PPA, Section I.3.9 of the ISO-New England Tariff) and Transmission Cost Allocation (TCA) approval from ISO-New England? If so, provide copies of relevant documents.

Response:
No. As stated in response to Q-OCC-001, question 14, the Project received Proposed Plan Application ("PPA/I.3.9") approval from ISO-New England on February 11, 2014, and a revised version of the Project received PPA/I.3.9 approval from ISO-New England on May 1, 2015. When the Council has determined which project will be approved in this Docket, Eversource will apply for a further revision to the I.3.9 approval for the relevant project.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Is it typical for Eversource to design a bulk power substation solely based on a single peak load value recorded in a 12 year period? Provide examples of similar Eversource projects that were designed under similar circumstances.

Response:
Currently, Eversource planners design distribution substation improvements by first identifying the largest actual load in the past 5 years, and then consider whether load growth at that substation beyond that level should be projected on the basis of new customer applications, the recent trend of growth at that substation, and other anticipated system developments including consideration of energy efficiency and distributed resources. Eversource's use of the actual 2013 Greenwich peak load as the design load in this case is consistent with that approach.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, Pre-filed Testimony p. 15, Line 456. What type of forecasting was used to determine the project would provide "some margin for growth"?

Response:
Forecasting was not used to determine this margin. The substation design was an iterative process. A review of the tentative design that was ultimately selected showed that because of the "step" change of transformer and transmission capacities, a margin of 60 MVA above the 130 MVA design target would be achieved. This margin is a benefit of the proposed project design (See PFT on page 9).

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Has Eversource revised the Cos Cob 27.6-kV system Peak Demand load forecast (refer to Council Docket 461 Findings of Fact #97, May 12, 2016 [FOF])? If so, please provide.

Response:
Eversource has not revised the Cos Cob 27.6 kV system Peak Demand load forecast that was developed for the previous proceeding. Rather, it has used the actual 2013 peak load as the design load for the revised projects. See the responses to Interrogatories 3 and 7, above.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Council FOF #81. Has Eversource revised load growth projections for the Prospect Substation? If so, please provide.

Response:
No. There has been no formal revision of the forecast reflected in table E-2. However, Eversource Distribution is not currently using such forecasts for design purposes. See the responses to Interrogatories 3,7, and 10 above.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Council FOF #83. Revise the table to include the 2016 value.

Response:
The referenced table is revised below:

Cos Cob 27.6-kV System Peak - actual values												
2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
96.8	117.9	125	116.1	112.1	107.7	119.7	121.8	128.2	130.5	107.7	114.8	115.6

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Council FOF #83 and #84. Was weather the primary cause of the 128.2 MVA value recorded in Year 2012?

Response:
Weather was an important contributing factor. There were two days of temperature above 90 degrees leading up to the peak day.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Response to Office of Consumer Counsel Interrogatory #065, January 5, 2016 (OCC-065). Revise the table to account for Year 2016.

Response:
The referenced table is revised below:

		Data in MVA						
Substation	**Data**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Cos Cob 27.6kV	Incoming Feeder Capacity	Transmission						
	Substation Permissible Load	135*	135*	135*	135*	135*	135*	135*
	Actual Peak	119.7	121.8	128.2	130.5	107.7	114.8	115.6
Tomac	Incoming Feeder Capacity	Transmission						
	Substation Permissible Load	53**	53**	53**	53**	53**	53**	53**
	Actual Peak	46.6	48.9	49	43~	35~	37	39.1
Mianus	Incoming Feeder Capacity	25.5	25.5	25.5	25.5	25.5	25.5	25.5
	Transformer Capacity	25	25	25	25	25	25	25
	Actual Peak	20.8	22.4	20.3	23.7	17.8	18.5	19
Greenwich Secondary Network	Incoming Feeder Capacity	129***	129***	129***	129***	129***	129***	129***
	Transformer Capacity	17	17	17	17	17	17	17
	Actual Peak	8.5****	8.6****	9.1****	9.3****	7.7****	8.2****	8.2****
Prospect	Incoming Feeder Capacity	116	116	116	116	116	116	116
	Transformer Capacity	55	55	55	55	55	55	55
	Actual Peak	51	55	49	51.2	44	47	45.4
North Greenwich	Incoming Feeder Capacity	68	68	68	68	68	68	68
	Transformer Capacity	35.65	48.15	48.15	75	75	75	75
	Actual Peak	27.2	15.8`	24.6`	31	34.1"	36"	28.8
Byram	Incoming Feeder Capacity	30	30	30	30	30	30	30
	Transformer Capacity	25	25	25	25	25	25	25
	Actual Peak	28.1	24.1	27.6	15.9	18.6"	18.4"	14.4

*Bulk Substation Permissible Load of 135MVA is a 2 hour rating, after 2 hours the load must be reduced to 124MVA.

**Bulk Substation Permissible Load of 53MVA is based on a 23 MVA of backup from Cos Cob.

***Rating based on five 27.6kV feeders. These feeders also supply the 27.6kV customers, Prospect, Byram and one transformer in North Greenwich

**** There are no meters on the secondary Network. Load is estimated to be 7.12 percentage of the total 27.6kV system load.

~ Load transferred to Waterside.

` Reading from 2 of the 3 substation transformers. 1 of the meters was not unavailable at this time

"Reading included temporary switching load

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, Pre-filed Testimony p. 7, Line 190. What was the cause of the multiple faults/overloads recorded in July 2016?

Response:
There were electrical faults on the cables, probably as the result of a failure of the insulation that caused them to become overheated. Those faults cause overloads on other equipment.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Council FOF #66e. Provide more information as to the extent of the feeder replacements.

Response:
The Cos Cob 11R51 and 11R52 556kcmil Spacer Cables located in the ROW between Cos Cob and Prospect substation were replaced with 750kcmil Aerial Cables during 2012.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, Pre-filed Testimony p. 5, Line 153. Describe any measures performed to alleviate feeder overloads occurring at 82 MVA under contingent conditions given that the lowest peak load recorded from 2004 to 2015 was 96.8 MVA.

Response:
The referenced testimony refers to feeder overloads that were seen in power flow simulations when contingencies were applied. It does not refer to actual overloads that were experienced.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Council FOF #74. Provide customer outage information related to the pole-mounted transformer fire.

Response:
At approximately 6:30 pm on 6/16/15, a small transformer used for providing power to substation auxiliary equipment faulted internally. There were no customer outages as a result of the incident.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Council FOF #91. What is the lead time on a 27.6-kV transformer replacement at Cos Cob?

Response:
Eversource has a 115- to 27.6-kV system spare transformer that can be used as a replacement for a 115- to 27.6kV transformer at Cos Cob. If needed to replace a transformer in an emergency, the replacement could be accomplished in a month or two. The typical lead time to rewind and reinstall a failed transformer is about 18 months.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Council FOF Attachment 1. Revise table to account for project changes.

Response:
Refer to the table below which indicates the revisions to the Council FOF Attachment 1 in the original proceeding.

Existing Substations

Existing Substation Transformer	**Transformer nameplate rating (MVA)**	**Transformer Voltage**	**Disposition of existing transformer if Greenwich Substation is built**
Cos Cob 1X	50.4	115-27.6kV	Continue to supply customer load at 27.6kV
Cos Cob 2X	46.7	115-27.6kV	Continue to supply customer load at 27.6kV
Cos Cob 3X	46.7	115-27.6kV	Continue to supply customer load at 27.6kV
Cos Cob 5X	25	115-13.2kV	Continue to supply customer load at 13.2kV
Cos Cob 6X	30	115-13.2kV	Continue to supply customer load at 13.2kV
North Greenwich 1X	25	27.6-13.2kV	Continue to supply customer load at 13.2kV
North Greenwich 2X	25	27.6-13.2kV	Continue to supply customer load at 13.2kV
North Greenwich 3X	25	27.6-13.2kV	Continue to supply customer load at 13.2kV
Prospect 1X	15	27.6-13.2kV	Transformer removed
Prospect 2X	12.5	27.6-13.2kV	Transformer removed
Prospect 3X	12.5	27.6-13.2kV	Transformer removed
Prospect 4X	15	27.6-13.2kV	Transformer removed
Byram 1X	12.5	27.6-13.2kV	~~Transformer removed~~ Continue to supply customer load at 13.2kV
Byram2X	12.5	27.6-13.2kV	~~Transformer removed~~ Continue to supply customer load at 13.2kV

Proposed Substation

Proposed Substation Transformer	**Transformer nameplate rating (MVA)**	**Transformer Voltage**	**Existing transformer(s) being replaced**
Greenwich 1X	60	115-13.2kV	Various transformers at Prospect ~~and Byram~~ Substation~~s~~
Greenwich 2X	60	115-13.2kV	Various transformers at Prospect ~~and Byram~~ Substation~~s~~
~~Greenwich 3X~~	~~60~~	~~115-13.2kV~~	~~Various transformers at Prospect and Byram Substations~~

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, Pre-filed Testimony p. 9, Line 274. For the remaining 27.6-kV feeders serving "certain large customers and the 27.6-kV network", what would be the percentage of each feeder's normal ratings under peak 2013 load conditions?

Response:
Using 2013 peak demand, the load that each feeder will carry as percentage of normal ratings under normal configuration is represented in the attached table. It excludes the 11R53 and 11R54 feeders that serve North Greenwich.

Feeders	%
11R51	49%
11R52	39%
11R55	32%
11R58	25%
11R56	81%

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, Pre-filed Testimony p. 7, Line 220 and FOF #88. Clarify the load transfer ability from Cos Cob Substation to the 13.2-kV network (6 MVA and 11 MVA values are given).

Response:
Both statements are correct. FOF #88 correctly states that under the conditions described there 11 MVA of power would be "shifted to the 13.2-kV system originating out of Cos Cob Substation". Of this 11 MVA, 6 MVA would be transferred to the 115/13.2kV transformers located at the Cos Cob Substation (as stated in the PFT, p. 7 line 220) and the remaining 5 MVA would be transferred to the Cedar Heights transformer (via the North Greenwich 13.2kV system).

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, Pre-filed Testimony p. 8, Line 241. Does the PMP and/or AMP address the reliability issue of two transformers served by a single circuit breaker?

Response:
Neither project will, by itself, address the reliability issue of the common 27.6kV bus at Cos Cob. Either project, when completed, would reduce load on the Cos Cob 27.6kV buses so that they could be reconfigured such that each 115-27.6kV transformer at Cos Cob would serve an individual bus. This revised configuration would improve restoration of load following a single contingency event. This improvement would be done as a separate distribution project.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, Pre-filed Testimony p. 9, Line 257. Explain how the PMP and/or AMP can supply peak load up to 190 MVA when the new substation would have two 60-MVA transformers. How would load transfers allow Eversource to handle peak loads up to 190 MVA?

Response:
The 190 MVA value is an approximation derived by adding the permissible load at Cos Cob for the 27.6 kV system (135 MVA) and the permissible load of the proposed Greenwich Substation (60 MVA). Since these values are approximate the total is conservatively stated as 190 MVA rather than 195 MVA.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Eversource Response to OCC – 058, 11/30/15. Revise the information in the response based on the new Greenwich Substation configuration.

Response:
The revised responses to OCC-058 are provided below. Deletions are indicated by brackets, additions are underlined.

OCC – 058, 11/30/15**:**

Regarding connections between the proposed substation and the Cos Cob substation and contingencies:

A. Define/describe planned feeder ties between the two substations.
    a. Please refer to the Simplified Greenwich 13.2 kV System Proposed Design attached. The Proposed Greenwich Substation would have [six] <u>two</u> automatic loop scheme ties between feeders emanating from different buses at the proposed Greenwich Substation, four automatic loop scheme ties with Cos Cob Substation, [and] three automatic loop schemes with North Greenwich Substation, <u>and three automatic loop schemes with Byram Substation.</u>

B. Describe the impact on the Cos Cob substation and the proposed substation in the event that one or both of the 115kV circuits from Stamford failed at a location east of the Cos Cob substation.
    a. If one of the two 115-kV transmission lines that feed Cos Cob Substation were to fail, there would be no impact to any of the customers fed by Cos Cob or Greenwich substations. If both of these 115-kV transmission lines were to fail, all of the customers fed by Cos Cob and Greenwich substations would be impacted.

C. In the hypothetical scenario where the proposed substation is in operation and there is a failure of the remaining 27.6 kV feeders originating from the Cos Cob substation, how would the Cos Cob loads be re-fed from the proposed substation? Detail a scenario whereby the North Greenwich substation would be energized to handle contingencies from the proposed substation.
    a. Under the proposed design, Cos Cob Substation would feed the Greenwich secondary network (five 27.6 kV feeders), the North Greenwich Substation (two Cos Cob Substation 27.6 kV feeders and one Prospect 27.6 kV feeder),

[and] several Prospect commercial customers at 27.6 kV, and both Byram transformers.

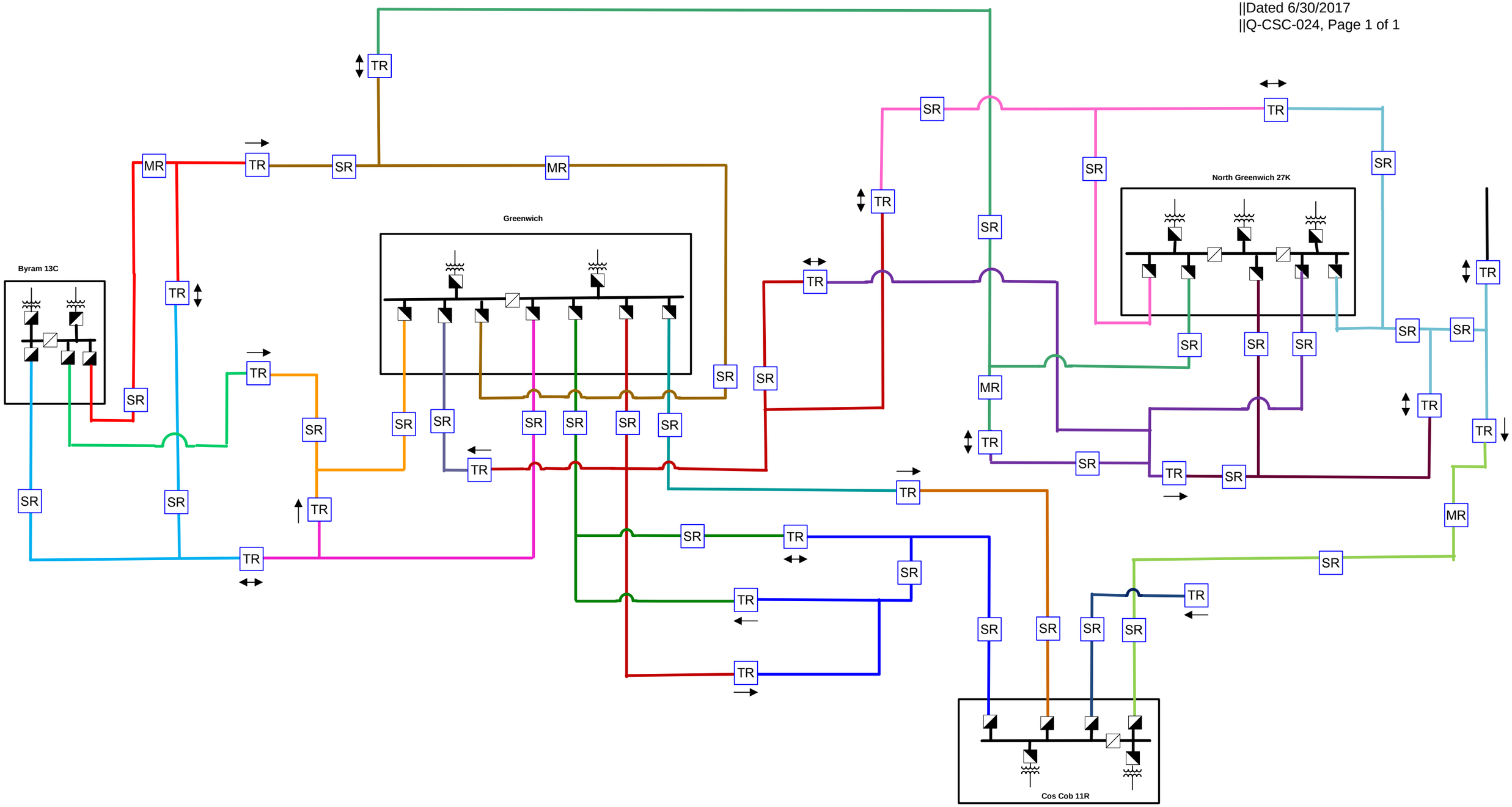
i. For failure of the two 27.6 kV Cos Cob feeders to North Greenwich, the proposed Greenwich Substation would back up the entire North Greenwich load through automatic 13.2 kV loop schemes in conjunction with the Prospect 27.6-kV feeder. No customers would be impacted

ii. For loss of three of four Cos Cob Substation 27.6 kV feeders that feed Prospect, North Greenwich Substation would feed the commercial customers via the 27.6 kV Prospect feeder. North Greenwich Substation transformers would be off loaded via the proposed Greenwich Substation's 13.2 kV feeder loop schemes. Byram transformers would be fed by the Cos Cob 27.6 kV feeder. Byram Substation transformer would be off loaded via the proposed Greenwich Substation's 13.2 kV feeder loop schemes. [No customers would be impacted].

iii. The proposed Greenwich Substation would have automatic loop schemes ties with North Greenwich feeders and automatic loop scheme ties between proposed Greenwich feeders that would be fed by different substation buses, different substations' transformers and different substation transmission lines. The proposed Greenwich Substation feeders will have redundant backup between themselves. The only vulnerability would be if both transmission lines from Cos Cob Substation to the proposed Greenwich Substation were lost. In this situation. North Greenwich Substation would back up most of the load of Greenwich Substation feeders via the 13.2 kV system.

Simplified 13.2kV Proposal

||Docket No. 461a
||Data Request CSC-01
||Dated 6/30/2017
||Q-CSC-024, Page 1 of 1



Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, Pre-filed Testimony p. 11, Line 343. At what point would modifications at Byram Substation be necessary? Would future modifications comport with Eversource's goal of phasing out the 27.6-kV system?

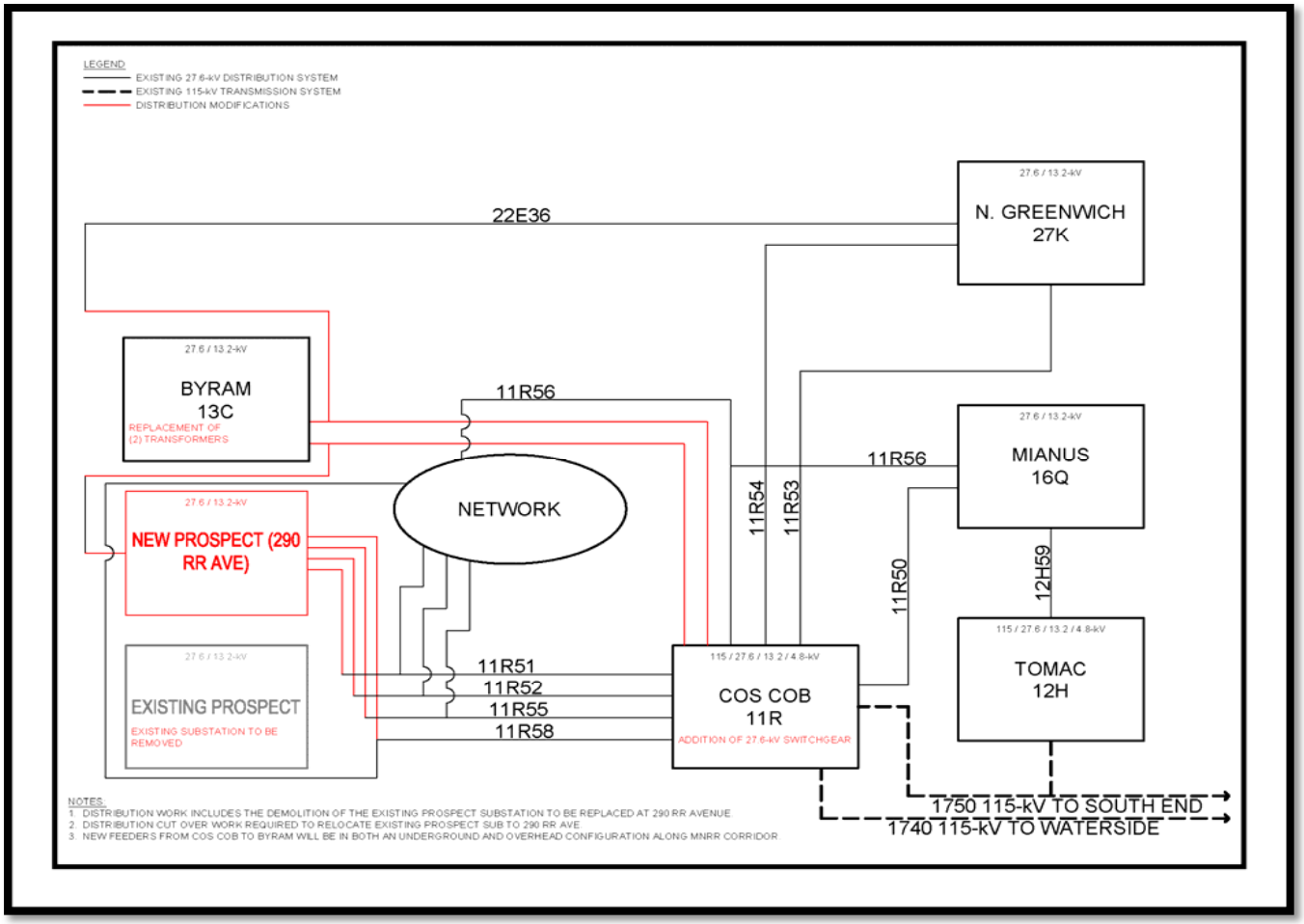
Response:
Modifications or repairs would be needed in the event of equipment failures. No upgrades at Byram Substation that would defer the phasing-out of the Greenwich 27.6 kV system are planned.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

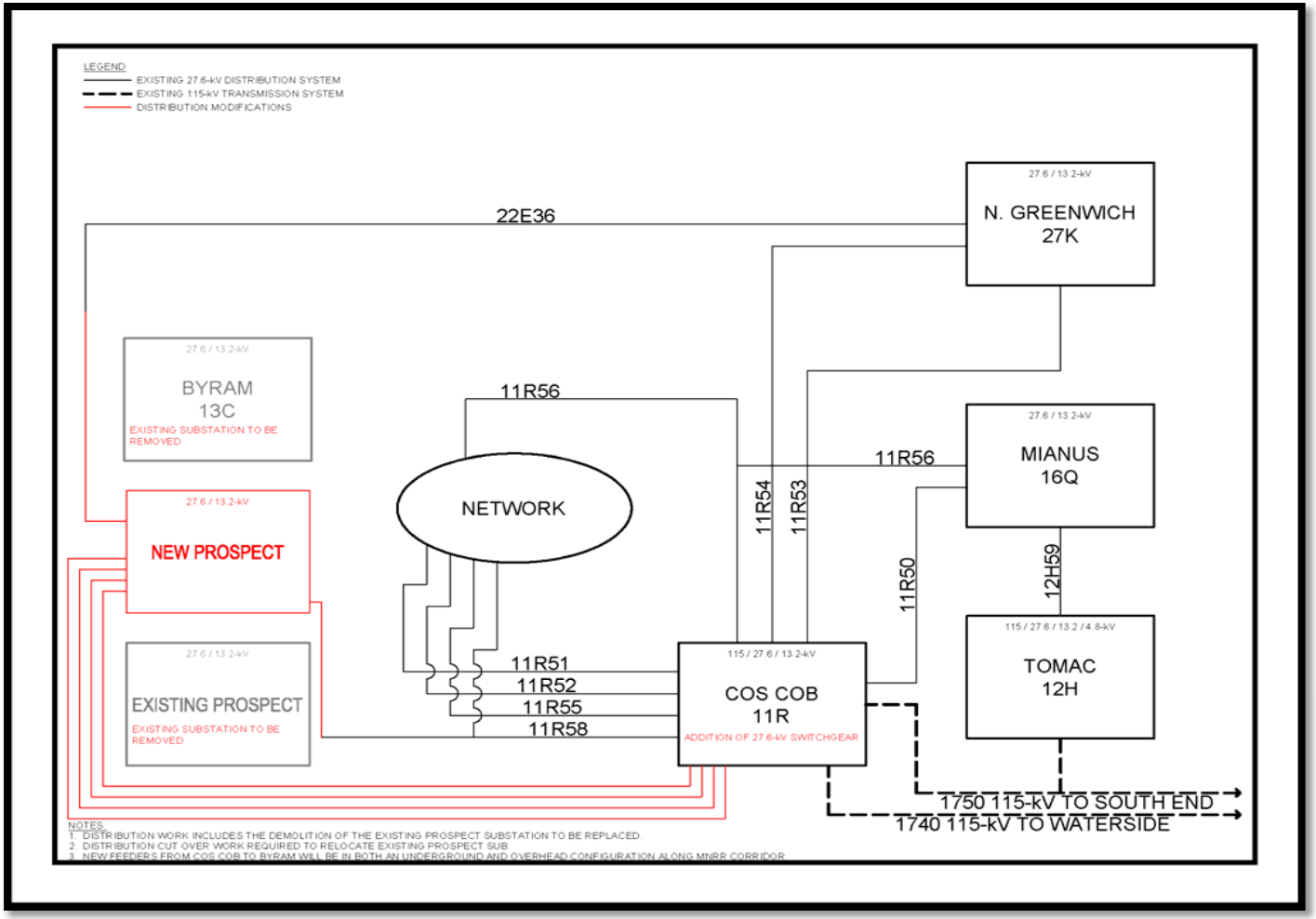
Question:
Reference Reopened Application Vol. 1, Pre-filed Testimony p. 17, Line 526. Provide design and associated costs for each of the eight distribution alternatives that were examined and ultimately rejected.

Response:
The attached pdf "IR 26 Distribution Alternatives Cost_Description" provides a description of each of the eight distribution alternatives along with their associated conceptual costs. Also attached are conceptual one line diagrams for options 3 through 7A.

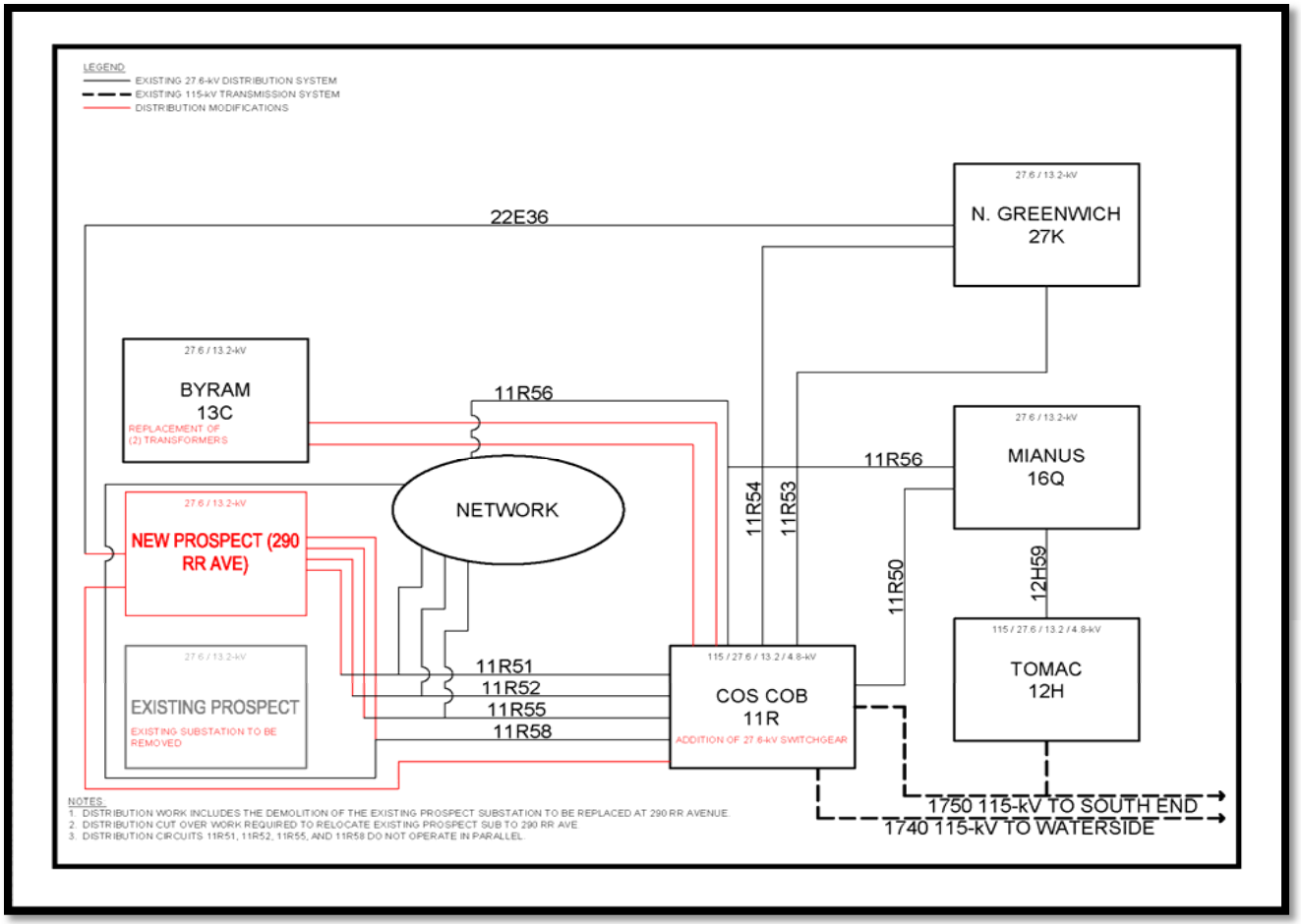
Option 3: Two feeders from Cos Cob to Byram and New Prospect



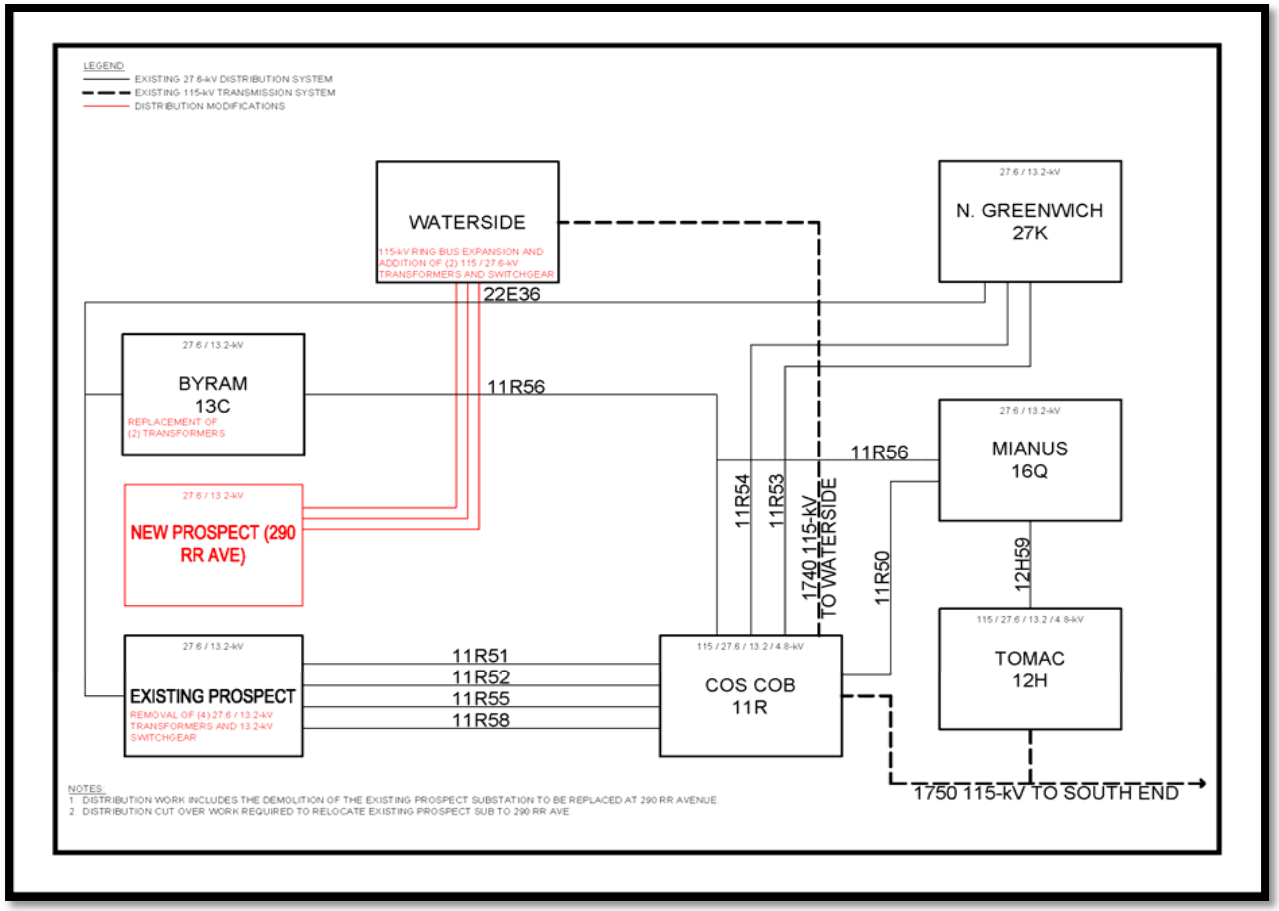
Option 4: Four feeders from Cos Cob to Prospect



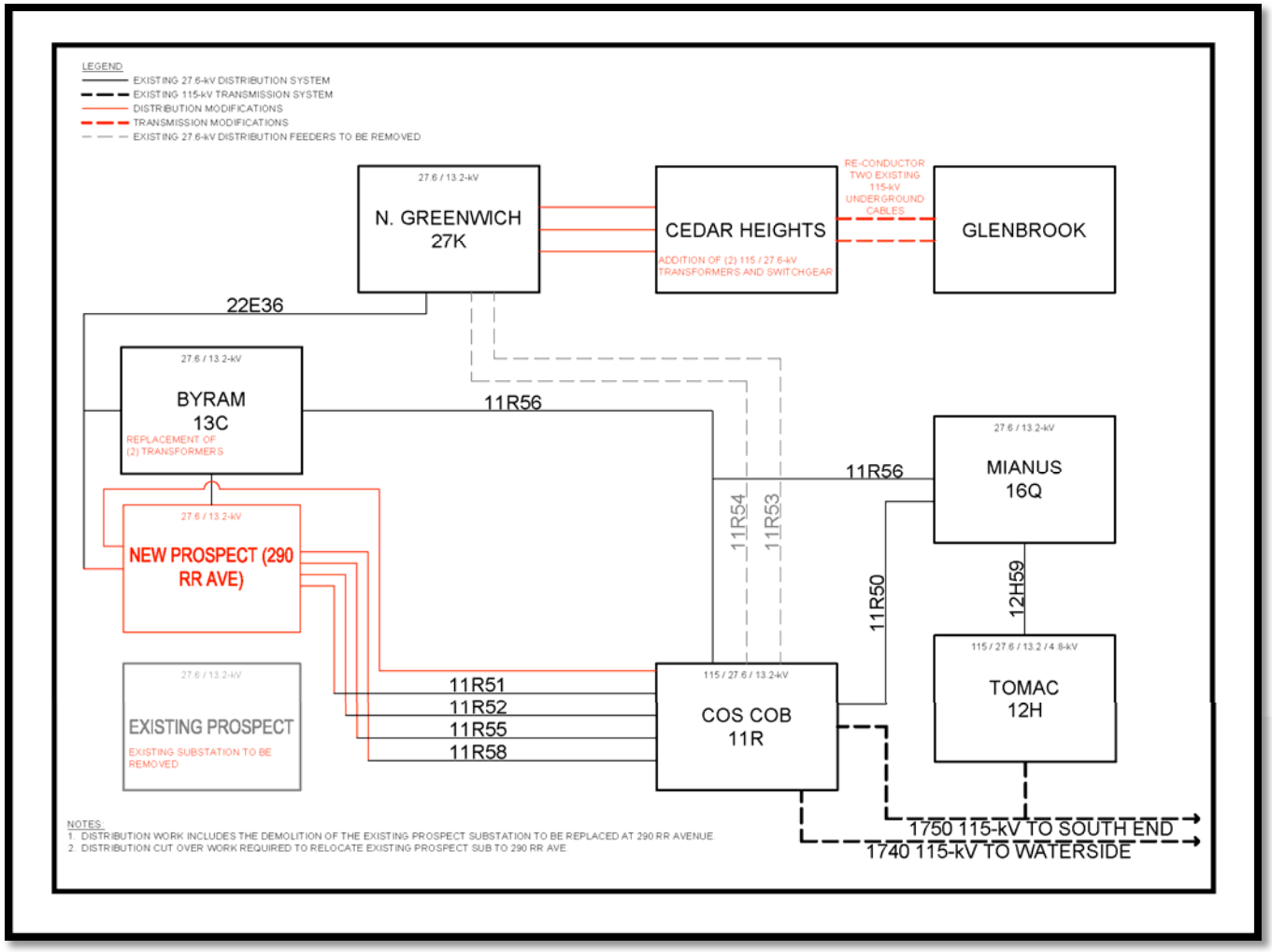
Option 5: Two feeders from Cos Cob to Byram. One Feeder from Cos Cob to New Prospect



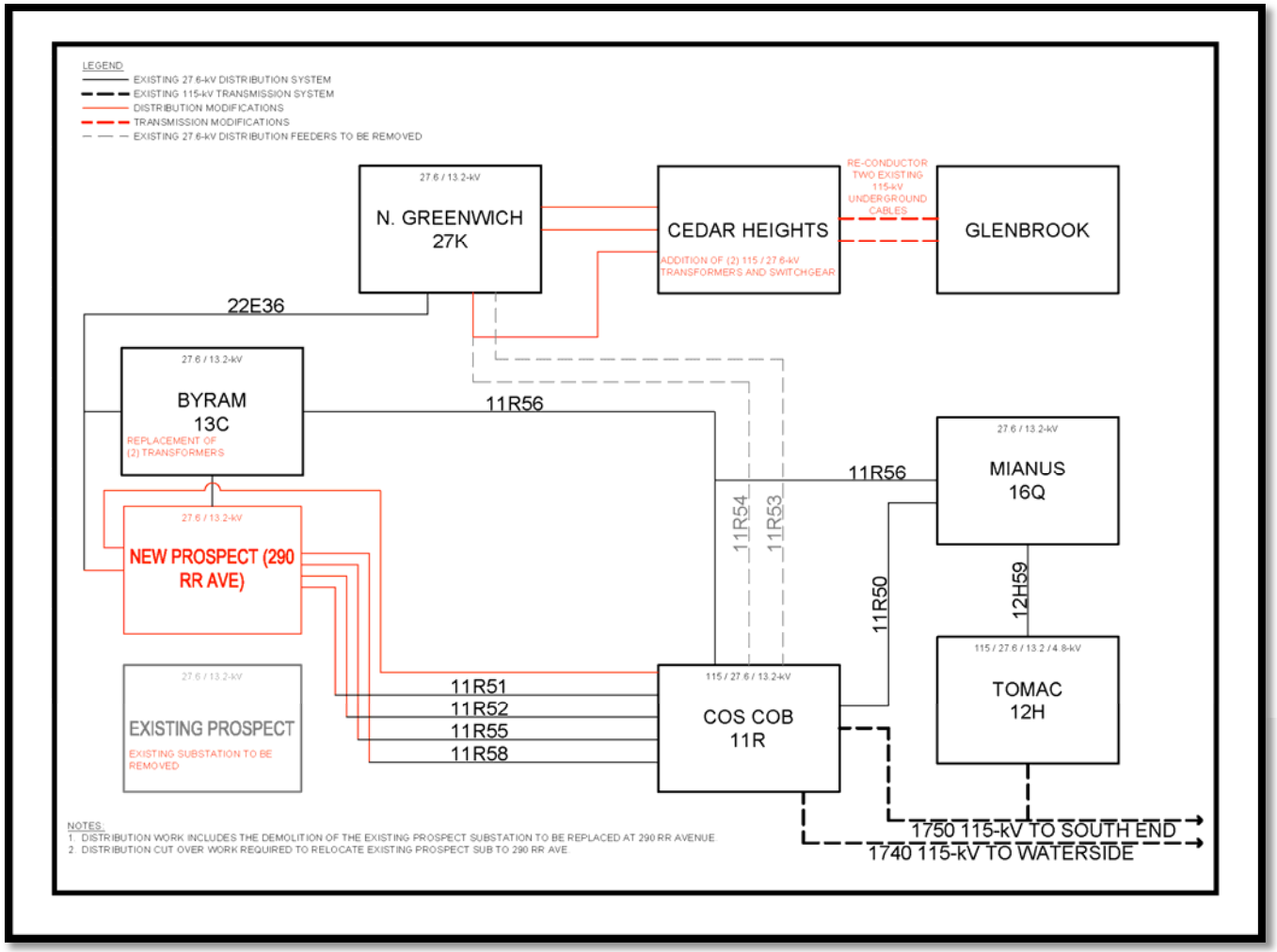
Option 6: Three feeders from Waterside to New Prospect



Option 7: Fifth feeder from Cos Cob to New Prospect SS and Three feeders from Cedar Heights to North Greenwich



Option 7A: Fifth feeder from Cos Cob to New Prospect SS and Three feeders from Cedar Heights to North Greenwich



Distribution Alternatives Analyzed

Distribution Alternatives	Scope	Explanation for Dismissal	Cost[1]
Distribution Option 1: Reconductoring of existing feeders from Cos Cob to Existing Prospect SS	*Reconductor four (4) existing underground feeders from Cos Cob to Existing Prospect SS *Feeders would be reconductored from 500 kcmil Cu to 750 kcmil Cu	*Due to the length and impedance differences of the parallel feeders, the upgraded feeders continue to be overloaded. To avoid overload in contingency, the normal load on the feeders must be reduced. Because of this fatal flaw, no cost estimate for this option was developed	N/A
Distribution Option 2: Addition of fifth feeder from Cos Cob to Existing Prospect SS	*Addition of fifth feeder from Cos Cob to Existing Prospect SS in an underground configuration utilizing 1000 kcmil Cu conductor	*Addition of a fifth feeder did not alleviate overloads on other feeders due to the length and impedance differences of the parallel feeders. Because of this fatal flaw, no cost estimate for this option was developed	N/A
Distribution Option 3: Two Feeders from Cos Cob to Byram & New Prospect S/S	*Install (2) 27.6-kV feeders from Cos Cob Substation to Byram Substation in an underground/overhead configuration. The overhead portion would utilize 750 AL aerial insulated cable for 3.5 miles, while the underground portion would utilize 1000 kcmil Cu conductor for 0.7 miles *Add 27.6-kV switchgear at Cos Cob Substation to accommodate new feeders. *Reconfigure existing feeders *Build new 27.6/13.2-kV Substation on Railroad Ave; Install two 80 MVA 27.6/13.2-kV transformers *Remove existing Prospect Substation *Upgrade two transformers at Byram Substation from 12.5 MVA to 25 MVA.	*This configuration does not avoid loss of load in the event of loss of two or more transformers at Cos Cob. The loss of load in that event could be up to 92% of the Cos Cob 27.6 kV system *In addition, in order to reconfigure the 27.6 kV design at Cos Cob, a new bulk substation is needed	$102M
Distribution Option 4: Four feeders from Cos Cob SS to Prospect SS	*Install (4) 27.6-kV feeders from Cos Cob SS to New Prospect SS in an underground configuration utilizing 1000 kcmil Cu Conductor for approximately 3 miles *Build new 27.6/13.2-kV indoor substation on Railroad Ave with two 80 MVA transformers *Reconfigure existing 2-27.6-kV feeders and 7-13.2kV feeders from Prospect to the new substation *Reconfigure and up-grade the existing 13.2-kV feeders that currently initiate at Byram SS and existing Prospect SS to initiate at the new Prospect SS *Re-route and up-grade existing 11R58 27.6-kV feeder to new Prospect SS *Remove existing Prospect *Remove existing Byram	*This configuration does not avoid loss of load in the event of loss of two or more transformers at Cos Cob. The loss of load in that event could be up to 92% of the Cos Cob 27.6 kV system *In addition, in order to reconfigure the 27.6 kV design at Cos Cob, a new bulk substation is needed	$122M
Distribution Option 5: Two Feeders from Cos Cob to Byram, One Feeder from Cos Cob to New Prospect S/S	*Install (2) 27.6-kV feeders from Cos Cob to Substation to Byram Substation and install (1) 27.6-kV feeder from Cos Cob Substation to New Prospect Substation in an underground configuration utilizing 1000 kcmil Cu conductor for 4.6 miles. All feeders would utilize the same ductbank *Add 27.6-kV switchgear at Cos Cob Substation to accommodate new feeders. *Reconfigure existing feeders *Build a new 27.6/13.2-kV Substation on Railroad Ave; Install two 80 MVA 27.6/13.2-kV transformers *Remove existing Prospect *Upgrade two transformers at Byram Substation from 12.5 MVA to 25 MVA.	*This configuration does not avoid loss of load in the event of loss of two or more transformers at Cos Cob. The loss of load in that event could be up to 92% of the Cos Cob 27.6 kV system *In addition, in order to reconfigure the 27.6 kV design at Cos Cob, a new bulk substation is needed	$109M
Distribution Option 6: Three Feeders from Waterside to New Prospect S/S	*Install (3) 27.6-kV feeders from Waterside Substation to New Prospect Substation in an underground configuration utilizing 1000 kcmil Cu conductor for 6.2 miles *Waterside Substation Modifications; expand 115-kV ring bus and add two 115/27.6-kV transformers and switchgear *Build a new 27.6/13.2-kV Substation on Railroad Ave; Install three 25 MVA 27.6/13.2-kV transformers *Remove four 27.6/13.2-kV transformers and 13.2-kV switchgear at Existing Prospect *Upgrade two transformers at Byram Substation from 12.5 MVA to 25 MVA.	*This option was dismissed for the following reasons: **Significantly higher cost compared to other alternatives **This configuration does not avoid loss of load in the event of loss of two or more transformers at Cos Cob. The loss of load in that event could be up to 39% of the Cos Cob 27.6 kV system	$163M
Distribution Option 7: Fifth Feeder from Cos Cob to New Prospect S/S & Three Feeders from Cedar Heights to North Greenwich	*Add a fifth 27.6-kV feeder from Cos Cob Substation to New Prospect Substation in an underground configuration utilizing 1000 kcmil Cu conductor for 3.1 miles *Install (3) 27.6-kV feeders from Cedar Heights Substation to North Greenwich Substation in an underground configuration utilizing 1000 kcmil Cu conductor for 10.3 miles *Install one 115/27.6-kV transformer and switchgear at Cedar Heights Substation *Build new 27.6/13.2-kV Substation on Railroad Ave; Install three 25 MVA 27.6/13.2-kV transformers *Remove existing Prospect Substation *Upgrade two transformers at Byram Substation from 12.5 MVA to 25 MVA *Rebuild two 115-kV circuits from Cedar Heights Substation to Glenbrook Substation in an underground configuration utilizing 1000 kcmil Cu conductor for 4.9 miles	*This option was dismissed for the following reasons: **Significantly higher cost compared to other alternatives **This configuration does not avoid loss of load in the event of loss of two or more transformers at Cos Cob. The loss of load in that event could be up to 38% of the Cos Cob 27.6 kV system ** Community impact, which includes acquiring multiple easements, expansion of Cedar Heights Substation	$303M
Distribution Option 7A Variation: Fifth Feeder from Cos Cob to New Prospect S/S & Three Aerial Feeders from Cedar Heights to North Greenwich	*Addition of a fifth 27.6-kV feeder from Cos Cob Substation to New Prospect Substation in an underground configuration utilizing 1000 kcmil Cu for 3.1 miles *Install (3) 27.6-kV feeders from Cedar Heights Substation to North Greenwich Substation in an underground/overhead configuration. The underground portion would utilize 1000 kcmil Cu conductor for 3.1 miles, while the overhead portion would utilize 750 AL aerial insulated cable for 7.2 miles *Rebuild two 115-kV circuits from Cedar Heights Substation to Glenbrook Substation in an underground configuration utilizing 1000 kcmil Cu conductor for 4.9 miles *Expand Cedar Heights Substation, install two 115kV-27.6kV transformers and add two (2) 13.2-kV Feeder Positions *Build new 27.6/13.2-kV Substation on Railroad Ave; Install three 25 MVA 27.6/13.2-kV transformers *Upgrade two transformers at Byram Substation from 12.5 MVA to 25 MVA *Remove existing Prospect Substation	*This option was dismissed for the following reasons: **Significantly higher cost compared to other alternatives **This configuration does not avoid loss of load in the event of loss of two or more transformers at Cos Cob. The loss of load in that event could be up to 38% of the Cos Cob 27.6 kV system ** Community impact, which includes acquiring multiple easements, expansion of Cedar Heights Substation	$253M

Notes

1	The above estimated costs were rough “order of magnitude” costs developed in the fall of 2016 for use in comparing the various conceptual distribution solutions against one another and against the estimated transmission costs. Since these comparisons were made, the estimated costs for the PMP and AMP have been refined

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference OCC Post-Hearing Brief, 04/11/16. a. Section II – Address in detail the issue of transformer sizing and available space for such a retrofit at Cos Cob substation. b. Section III – Address the retrofit of the Prospect Substation in conjunction with switching some load to other substations.

Response:

a. Section II – Address in detail the issue of transformer sizing and available space for such a retrofit at Cos Cob substation.

i. Eversource has investigated the use of 115-27.6kV, 80 MVA transformers as replacements for the existing 46.7 MVA and 50.4 MVA transformers. Four manufacturers provided dimensional information for 80 MVA transformers. All of the responses showed that the 80 MVA transformers would be physically larger than the existing transformers. Eversource used this dimensional information to evaluate the replacement of the existing transformers using scale drawings of the Cos Cob substation and taking into account various considerations such as electrical clearances, maintenance access, clearances to other adjacent equipment, clearance to the adjacent 13.8kV generator bus, clearance to the fence and rigging paths. Due to the tight fit of the existing transformers, the physically larger 80 MVA transformers would present unacceptable compromises to electrical clearances and the ability to maintain and replace the transformers.

ii. The follow tables provide the dimensions of the existing transformers and manufacturers' estimated dimensions of 80 MVA transformers.

Existing Transformers (115-27.6 kV)

	Without Door Swings
11R-1X (50.4 MVA)	14' 2" x 23'
11R-2X (46.7 MVA)	14' 2" x 26' 4"
11R-3X (46.7 MVA)	14' 2" x 26' 4"

80 MVA Transformers (115-27.6 kV)	
	Without Door Swings
ABB *	17' 11" x 26' 5"
HICO *	19' 6" x 30' 10"
SPX/Waukesha *	20' x 27'
Weg *	18' 9" x 22' 9"
* All dimensions for 80 MVA are estimated by the manufacturers	

b. Section III – Address the retrofit of the Prospect Substation in conjunction with switching some load to other substations.

i. It is not possible to install an additional transformer at Prospect Substation due to lack of space for an additional transformer as well as the need for an additional connection point on the 27.6 kV ring bus. (See response to question 28 regarding the ability to add a ring bus position.) Replacing the existing transformers with larger capacity transformers is not practical due to the tight fit of the existing transformers and therefore marginal upgrade capability. See also Pre-filed Testimony page 7, Lines 204-216.

ii. Regarding the transfer of load, the following issues were considered:

1. Any load transfer to another distribution substation supplied from Cos Cob would not reduce the load on the Cos Cob 115-27.6 kV transformers.
2. Transfer of load to the Cos Cob 13.2kV circuits is not feasible due to the existing Cos Cob 13.2 kV source being within 1 MVA of its permissible load limit.
3. Transfer of load to Byram is not practical since it does not relieve load on the 27.6 kV circuits from Cos Cob.
4. Transfer of load to North Greenwich is not practical since it would add load to the North Greenwich 13.2 kV feeders which would reduce the ability to accept load during contingencies. This would compromise reliability and flexibility of operations. In addition, the ability of North Greenwich to accept more load is constrained by the limits of the 27.6 kV feeders that supply it.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, Pre-filed Testimony p. 7, Line 211. Provide detailed information regarding the lack of space for additional 27.6-kV feeders at the Prospect Substation.

Response:
The 27.6kV bus at Prospect Substation is configured as a ring bus with six circuit breakers. This arrangement provides six "positions" on the ring bus between adjacent circuit breakers. Modern design standards require that no more than one "element" (either a transformer or feeder) occupy each ring bus position. At Prospect Substation there are seven feeders and four transformers connected to the ring bus, resulting in five of the six ring bus positions being occupied by two elements. An additional feeder cannot be added to the existing ring bus due to the reliability compromises of doing so. The ring bus cannot be expanded to a seven breaker ring bus due to space limitations. The present arrangement occupies the maximum amount of space available within the fence and property boundaries while providing required electrical clearances and access for maintenance. The only option for adding a new feeder would be to rebuild the substation in a switchgear configuration on an elevated platform. Since the existing outdoor ring bus would need to remain in service during the construction of a new switchgear, additional space would be required for the new switchgear.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, p. F-15 and Vol. 2, App. 6, sheet XSECT 4. Structure 14004 is listed as both 130 and 135 feet tall. Please clarify.

Response:
The preliminary height of structure 14004 is 135 feet. Volume 2, Appendix 7, sheet XSECT 4 incorrectly inversed the height of structures 14004 and 14005; therefore the height of structure 14005 is 130 feet rather than 135 feet. Updated cross sections reflecting this modification are attached.

||Docket No. 461a
||Data Request CSC-01
||Dated 6/30/2017
||Q-CSC-029, Page 1 of 1

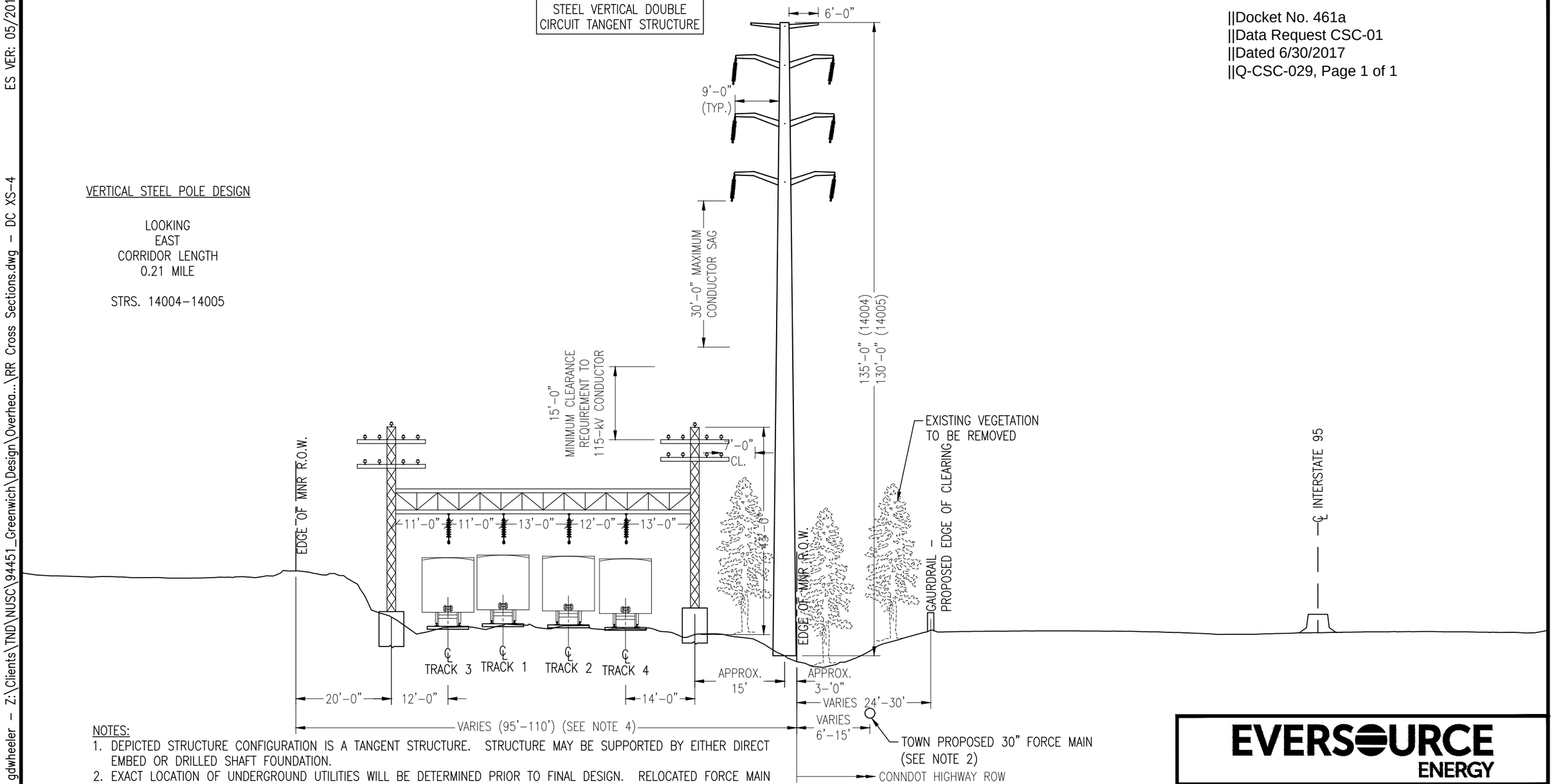
115-kV LINE 1020/1703

STEEL VERTICAL DOUBLE CIRCUIT TANGENT STRUCTURE

VERTICAL STEEL POLE DESIGN

LOOKING
EAST
CORRIDOR LENGTH
0.21 MILE

STRS. 14004-14005



NOTES:
1. DEPICTED STRUCTURE CONFIGURATION IS A TANGENT STRUCTURE. STRUCTURE MAY BE SUPPORTED BY EITHER DIRECT EMBED OR DRILLED SHAFT FOUNDATION.
2. EXACT LOCATION OF UNDERGROUND UTILITIES WILL BE DETERMINED PRIOR TO FINAL DESIGN. RELOCATED FORCE MAIN WITHIN TRANSMISSION LINE CORRIDOR FOR PORTION OF ROUTE.
3. STRUCTURE HEIGHTS CONTROLLED BY MINIMUM CLEARANCE REQUIREMENT TO RAILROAD CATENARY WIRES.
4. MNR ROW WIDTH VARIES ON SOUTH SIDE OF TRACKS DUE TO CONNDOT HIGHWAY ROW.

PRELIMINARY - NOT ISSUED FOR CONSTRUCTION

EVERSOURCE ENERGY

TITLE GREENWICH LINE AND SUBSTATION PROJECT
LINE 1020/1703 CROSS SECTIONS
DOUBLE CIRCUIT STRS. 14004-14005
GREENWICH, CT

BY M. PEPICH	CHKD D. CAMPBELL	APP -	APP -
DATE 01/24/17	DATE 01/24/17	DATE	DATE
H-SCALE 1" = 20'	SIZE B	FIELD BOOK & PAGES	
V-SCALE 1" = 20'	V.S.	R.E. DWG	
R.E. PROJ. NUMBER		DWG NO. XSECT-4 REV 1	

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, p. A-7. Provide additional information as to the location and area (sq. ft.) the Cos Cob substation was expanded beyond the original proposal.

Response:
The Cos Cob Substation was not expanded from the original submittal. The expansion area was reduced by 0.035 acres by pulling the perimeter fence in by 3 feet from the Town Park Fence.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Provide information as to the number of overhead and underground transmission line crossings of limited access highways within Eversource's Connecticut territory.

Response:
In the Connecticut service territory there are 175 overhead transmission line crossings and 11 underground crossings of limited access highways exist.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, Pre-filed Testimony p. 23, Line 746. Explain how the initial proposal did not conflict with the existing Force Main. Did Eversource intend to install the transmission structures after the new force main was in place, assuming the existing Force Main was to be abandoned?

Response:
In the initial proceeding, Eversource concluded that, with the Town's cooperation, it could co-locate the overhead section of the Hybrid Alternative with the force main where both facilities would be in the MNR ROW based on its previous experience with co-location of underground facilities. Eversource could have avoided a conflict with the existing force main, either by shifting the alignment of its transmission structures or by paying for the Town to shift the conflicting section of pipe. At that time, Eversource did not know of the Town's plan to install an additional replacement main in the MNR ROW and to maintain the existing main in place as a "spare". The requirements of avoiding conflict with both the old and new force mains was therefore not considered.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, Pre-filed Testimony p. 12, Line 361. This sentence describes a Force Main variation north of the MNRR; however Section F.4 presents a variation on the south side of the MNRR. Please clarify. Was a Force Main variation examined that used the north side of the MNRR. If so, why was it rejected?

Response:

Pre-filed testimony, line 361 incorrectly referred to the location of the Force Main Variation. As correctly indicated in Vol. 1, Exhibit A, Section F.4, the Force Main Variation would be located on the south side of the railroad tracks.

Eversource did evaluate a variation that relocated the overhead transmission line to the north side of the railroad tracks. However, this option was eliminated due to not being constructible and easement acquisition issues. In addition to the constructability challenges, 55 easements would be required to remove vegetation in order to maintain clearance to the transmission line.

These constructability and easement issues are detailed in Exhibit A, Section F.3 of the Two Single-Circuit Transmission Line Variation, which was also dismissed because of the construction difficulties on the north side of the MNRR tracks.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 2, App. 6, sheets XSECT 5 & 6. What is the width on the south side of the MNRR right-of-way between the 7-foot catenary clearance zone and the Interstate 95 right-of-way boundary, at structure locations 14009, 14008, 14007, 14006?

Response:
The width of the south side of the MNR right-of-way between the 7-foot catenary clearance zone and the I-95 right-of-way boundary is as follows:

Structure Number	**Distance from seven-foot clearance zone to edge of MNRR ROW (feet)**
14006	9
14007	6.5
14008	2.5
14009	6.5

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Have field surveys pertaining to the location of the existing Force Main and any other subsurface utilities been performed in the MNRR corridor? If so, has this data been incorporated onto the cross-sections sheets in Appendix 6? If not, how accurate are the cross-section sheets?

Response:
Eversource has not performed field surveys pertaining to the location of the existing Force Main or any other subsurface utilities. The location of the existing Force Main was provided by the Town and is the basis for the locations depicted in the cross-section sheets in Appendix 6.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Provide a cross section sheet from Force Main Variation structure 14006 shown on Reopened Application Vol. 1 Figure F-3. What type of foundation would be required for this structure? Provide preliminary details as to the size and depth of this foundation.

Response:
An updated cross section that illustrates the foundation type for structure 14006 is attached. For reference, an updated cross section for structure 14005 is also attached. A drilled shaft foundation would be required for both of these structures, which would have an approximate diameter of 9-10 feet and preliminary depth of 20-25 feet.

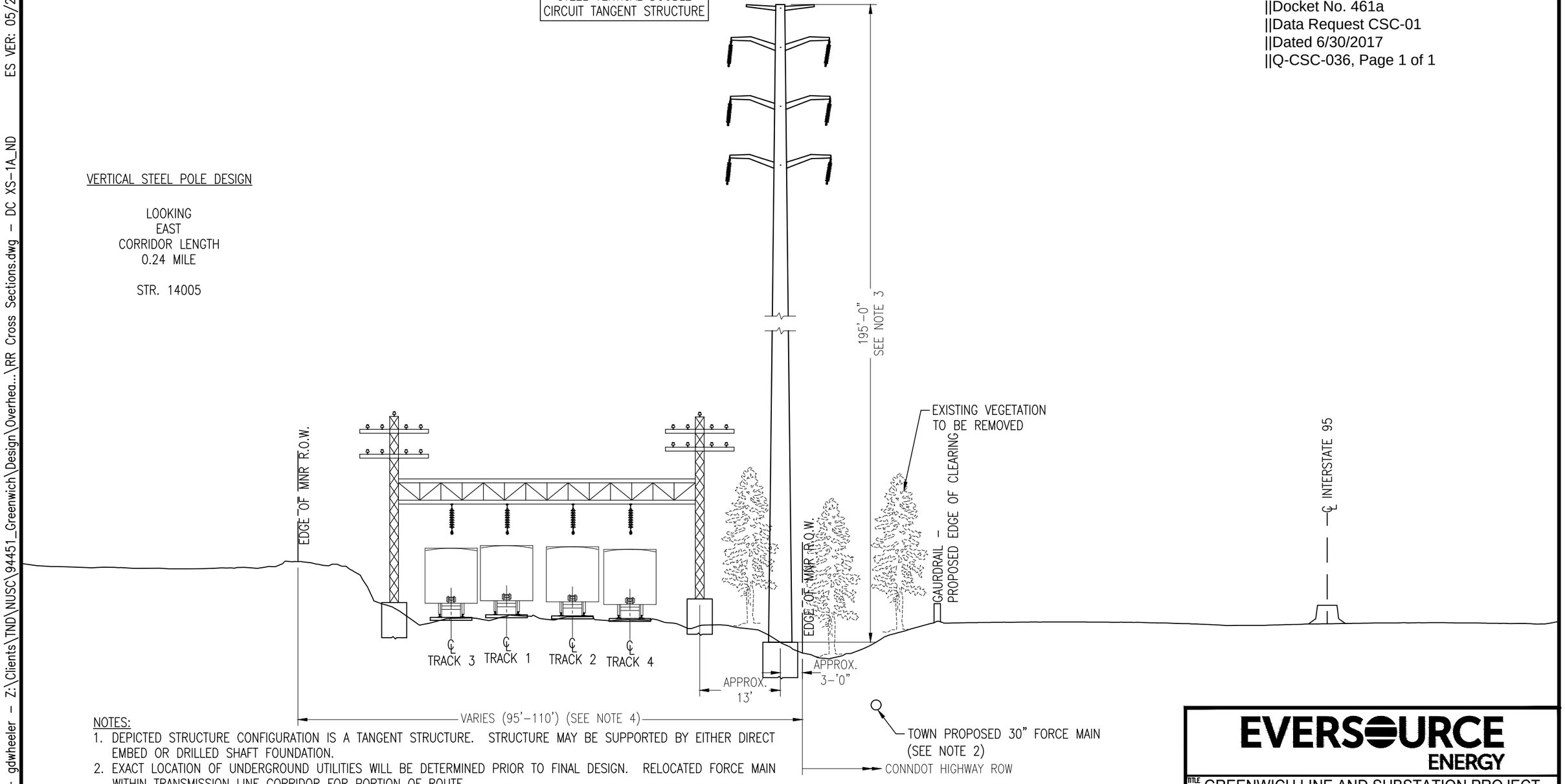
115-kV LINE 1020/1703

STEEL VERTICAL DOUBLE CIRCUIT TANGENT STRUCTURE

VERTICAL STEEL POLE DESIGN

LOOKING EAST
CORRIDOR LENGTH 0.24 MILE

STR. 14005



NOTES:
1. DEPICTED STRUCTURE CONFIGURATION IS A TANGENT STRUCTURE. STRUCTURE MAY BE SUPPORTED BY EITHER DIRECT EMBED OR DRILLED SHAFT FOUNDATION.
2. EXACT LOCATION OF UNDERGROUND UTILITIES WILL BE DETERMINED PRIOR TO FINAL DESIGN. RELOCATED FORCE MAIN WITHIN TRANSMISSION LINE CORRIDOR FOR PORTION OF ROUTE.
3. STRUCTURE HEIGHTS CONTROLLED BY MINIMUM CLEARANCE REQUIREMENT TO RAILROAD CATENARY WIRES.
4. MNR ROW WIDTH VARIES ON SOUTH SIDE OF TRACKS DUE TO CONNDOT HIGHWAY ROW.

PRELIMINARY - NOT ISSUED FOR CONSTRUCTION

EVERSOURCE ENERGY

TITLE GREENWICH LINE AND SUBSTATION PROJECT
FORCE MAIN VARIATION
DOUBLE CIRCUIT STR. 14005
GREENWICH, CT

BY M. PEPICH	CHKD D. CAMPBELL	APP –	APP –
DATE 01/24/17	DATE 01/24/17	DATE	DATE
H-SCALE 1" = 20'	SIZE B	FIELD BOOK & PAGES	
V-SCALE 1" = 20'	V.S.	R.E. DWG	
R.E. PROJ. NUMBER		DWG NO. XSECT-1A REV 1	

||Docket No. 461a
||Data Request CSC-01
||Dated 6/30/2017
||Q-CSC-036, Page 1 of 1

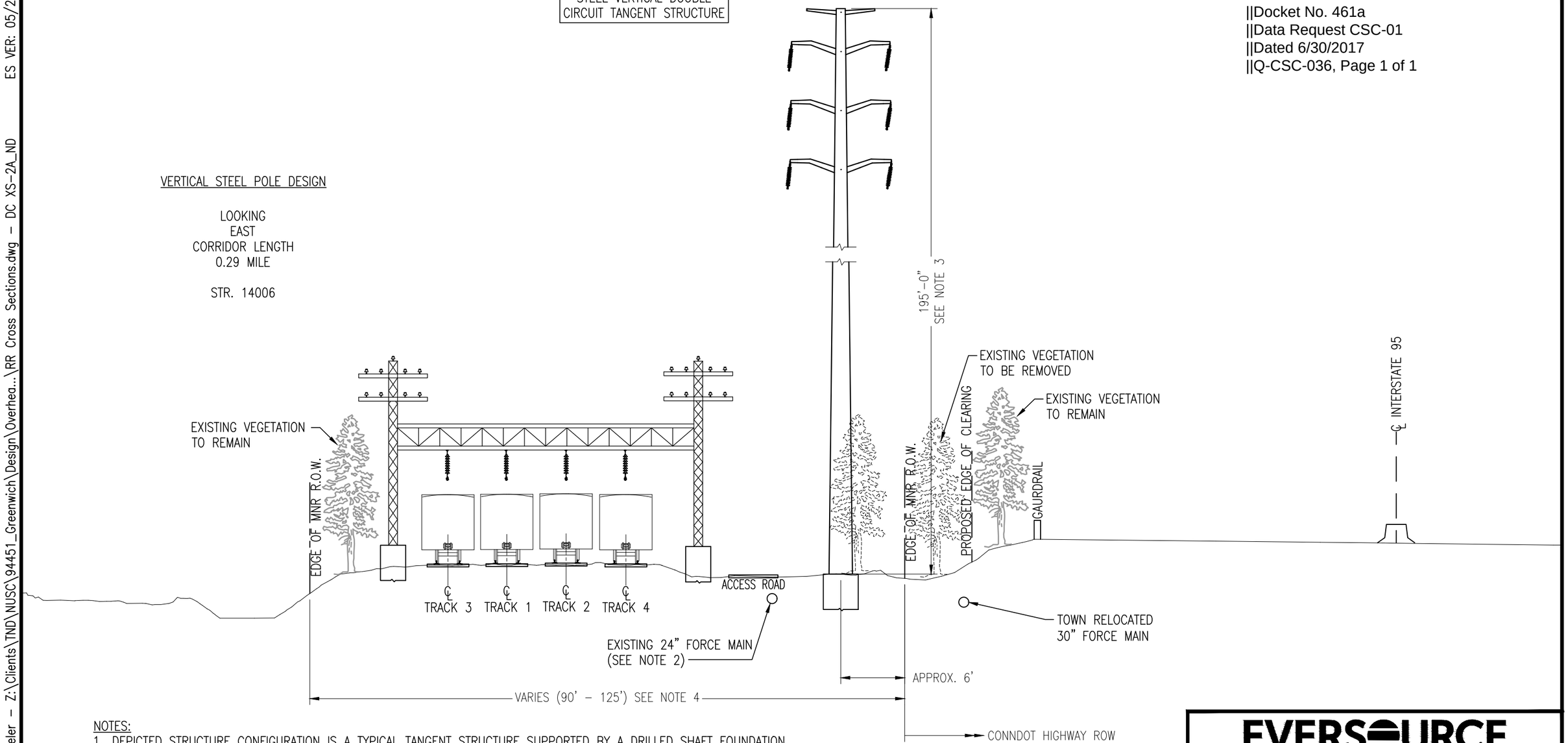
115-kV LINE 1020/1703

STEEL VERTICAL DOUBLE CIRCUIT TANGENT STRUCTURE

VERTICAL STEEL POLE DESIGN

LOOKING EAST
CORRIDOR LENGTH 0.29 MILE

STR. 14006



NOTES:
1. DEPICTED STRUCTURE CONFIGURATION IS A TYPICAL TANGENT STRUCTURE SUPPORTED BY A DRILLED SHAFT FOUNDATION.
2. EXACT LOCATION OF UNDERGROUND UTILITIES WILL BE DETERMINED PRIOR TO FINAL DESIGN. RELOCATED FORCE MAIN WITHIN TRANSMISSION LINE CORRIDOR FOR PORTION OF ROUTE.
3. TYPICAL STRUCTURE HEIGHT CONTROLLED BY MINIMUM CLEARANCE REQUIREMENT TO RAILROAD CATENARY STRUCTURE.
4. MNR ROW WIDTH VARIES ON SOUTH SIDE OF TRACKS DUE TO CONNDOT HIGHWAY ROW.

PRELIMINARY - NOT ISSUED FOR CONSTRUCTION

EVERSOURCE ENERGY

TITLE GREENWICH LINE AND SUBSTATION PROJECT
FORCE MAIN VARIATION
DOUBLE CIRCUIT STR. 14006
GREENWICH, CT

BY M. PEPICH	CHKD D. CAMPBELL	APP -	APP -
DATE 10/20/16	DATE 10/20/16	DATE	DATE
H-SCALE 1" = 20'	SIZE B	FIELD BOOK & PAGES	
V-SCALE 1" = 20'	V.S.	R.E. DWG	
R.E. PROJ. NUMBER		DWG NO. XSECT-2A REV 1	

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 2, App. 6. The cross section sheets depict the new Force Main in the CTDOT Highway ROW. How was the location of the Force Main determined? Has CTDOT agreed to the new Force Main location?

Response:
The location of the new force main was provided to Eversource by ConnDOT. ConnDOT informed Eversource in December 2016 that it did not have comments or concerns with the location but an Encroachment Permit had to be obtained by the Town. Eversource is not aware if ConnDOT has approved the new Force Main location.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, p. A-22. How much space would be required between each type of foundation to avoid potential disturbance or damage to the Force Main during foundation installation?

Response:
Eversource proposes to maintain a minimum of three feet of clear distance from the force main and drilling activities. This would help to minimize the potential from damage from vibrations and to provide a buffer against accidental contact. In areas where the potential exists for sloughing of soil which may expose the force main, a steel caisson would be used to maintain the existing soil conditions.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Has Eversource installed such foundations adjacent to critical sewer infrastructure elsewhere in its service territory? If so, list the project and related distance between the foundations and the sewer infrastructure.

Response:
Yes, Eversource has installed such foundations adjacent to critical sewer infrastructure in its service territory. Caisson foundations are located within a few feet of a sewer main near the Glenbrook Substation, off of Hamilton Avenue, in Stamford, CT. There are no other known installations.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 2, App. 7. Structures 14004, 14005, 14007, 14008 are listed as having a direct embed or drilled shaft foundation. What conditions would require a drilled shaft foundation?

Response:
The preliminary foundation design for structures 14004, 14005, 14007, and 14008 are direct embed foundations backfilled with gravel. The foundation type would change to a drilled shaft foundation if during subsurface investigations that excessive rock or wet conditions are discovered. In general, excessive ground line moment reactions could cause the foundation to become drilled shaft.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, p. F-15. Perform a preliminary Federal Aviation Administration analysis to determine if the 195-foot tall structures for the Force Main variation would constitute an aviation hazard that would require marking and/or lighting.

Response:
Eversource has filed notification with the Federal Aviation Administration – Obstruction Evaluation group. The case study numbers are 2017-ANE-2155-OE (Structure 14005) and 2017-ANE-2156-OE (Structure 14006).

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
What was the Town's rationale in requesting that the 115-kV transmission line be attached to the Indian Field Road Bridge over Interstate 95? If the bridge was to be replaced or rehabilitated, how/where would Eversource relocate the transmission line?

Response:
While Eversource cannot speak for the Town, based on our discussions we understand the rationale to be that attaching the transmission line to the bridge would be less costly then performing a trenchless crossing of I-95. If the bridge was to be replaced or rehabilitated, Eversource would coordinate with ConnDOT to develop a construction sequence that would allow for the transmission line to be installed on the new or upgraded bridge prior to removing the existing transmission line. Eversource would expect that ConnDOT would prepare a similar sequence to maintain existing traffic flow on the existing bridge while they construct the new bridge. Eversource would likely be responsible for the costs associated with any transmission line relocation at this location. ConnDOT has informed Eversource that it is "heavily opposed" to this attachment.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Provide information as to the number of transmission line crossings over/under divided highways that are attached to roadway bridges within Eversource's service territory.

Response:
There are 23 crossings of limited access highways via bridge attachment in the Eversource Service Territory. One location is in Connecticut (Spare pipe) and the other 22 are in Eastern Massachusetts.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 2, App. 9. Describe the composition and flammability of the exterior façade for the 281 Railroad Avenue Substation. How would the façade be supported?

Response:
The proposed façade would consist of a standing seam metal roof system and would be sided with "HardiePlank" over fire retardant sheathing. (HardiePlank is a proprietary fiber cement non-flammable siding product). Architectural glazing will be opaque shatterproof glass. Man doors will be hollow metal and overhead coiling doors will be composed of painted galvanized steel slats enclosing sprayed-in-place polyurethane insulation. The building frame will consist of structural columns and beams, and open web joists with purlins supporting the roof; siding will be supported by cold formed metal girts and studs.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, p. F-1, Section F.1.1. The differences in design between the 281 and 290 Railroad Avenue Substations are listed. Using the bulleted items, describe the essential function of each item and whether the design change would compromise the operation of the substation.

Response:
The referenced text lists differences in design between an Air Insulated Substation and an all-indoor Substation. Either type of substation could be constructed at either 281 or 290 Railroad Avenue. The bulleted items list features of the AIS design that the all-indoor design would not have. These features and their functions are set out below:

- **Room for a future mobile transformer position.** - A mobile transformer position provides a location and means for installing a mobile transformer in an expeditious manner in order to help serve load during system contingencies. The absence of room to add a future mobile position at 281 Railroad Avenue would not compromise the normal operation of the substation. However, it could inhibit restoration of service after a contingency.
- **A plug and switch system rather than a traditional circuit breaker.** – The plug and switch system (PASS M0) is a hybrid between gas insulated and air insulated equipment and is suggested to be installed at 281 Railroad Avenue. It comes complete with internal CT's (current transformer), disconnect switches and the circuit breaker. The system includes a combination of the 115kV breaker, disconnect switches, 115kV cable terminations, and gas-to-air bushings as required for the substation. The advantages of a PASS M0 are: the equipment has a reduced footprint and it is all factory assembled and factory tested ready to be installed with only external wiring required. The operation of the substation would not be compromised by the use of a plug and switch system rather than traditional circuit breaker
- **A 13.2-kV switchgear enclosure**. An enclosure for the switchgear protects it from the weather. Since the entire substation is protected by the architecturally treated building enclosure at 281 Railroad Avenue (except there is no roof over the transformers), there is no need to provide a redundant enclosure around the switchgear. The operation of the substation would not be compromised by protecting the switchgear from weather by placing it inside a building rather than in a separate enclosure,.
- **One lightning mast approximately 65 feet in height.** The lightning mast provides lightning protection for all the equipment and bus in the Air Insulated

Substation. The architecturally treated building enclosure is provided with 10 feet high air terminals around the perimeter of the roof for lightning protection in lieu of the mast. The operation of the substation would not be compromised by the use of air terminals rather than a mast for lightning protection.

- **A separate control house for transmission relaying, battery and toilet**. The control panels, battery room and toilet will be included in the architecturally treated building enclosure in lieu of a separate control house. The operation of the substation would not be compromised by this difference.
- **A 15-foot tall brick veneer wall surrounding the substation.** The 15-foot-tall brick veneer wall surrounding the AIS Substation shields a portion of the view of the substation from the public. The architecturally treated building enclosure completely shields the view of the substation. The operation of the substation would not be compromised by the more extensive shielding.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
What would be the cost of a 15-foot tall brick wall to enclose the 281 Railroad Avenue Substation?

Response:
The cost to construct a 15-foot tall brick wall to enclose an AIS Substation at the 281 Railroad Avenue location would be approximately $1.3M.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
What length of duct bank and underground cable could be installed within the roadways per workday?

Response:
The installation of the duct bank and the installation of the underground cable are two distinctly different operations, each with their own unique set of challenges, which results in highly variable production rates:

i. Duct Bank and Vault Installation: Below grade conditions and accessibility are the biggest challenges for this operation. Existing underground utility density and the presence of rock and groundwater typically dictate how much excavation can take place in a work day that would allow for duct bank installation. In some areas, a crew may be able to install 50-75 feet/day and in other areas, significantly less. Accessibility and traffic management are also major factors as they allow for A) the removal of spoils from the site, B) the delivery of conduit material to the site, and C) the delivery of backfill material (concrete) to the site. When crews are restricted to a single lane closure this hampers site logistics and reduces the productivity.

ii. Underground Cable Installation and Splicing: Cable installation would begin after the duct bank and vaults have been installed in a section. Crews could typically pull approximately one to two phases per day, between termination points. Ample work space around the vault is a significant factor to efficient cable pulling. Under most conditions, a crew could install cable in a vault to vault section in 2-3 days. Cable splicing is a longer effort. It is expected to take up to two weeks at each vault location to complete the splicing effort.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
What would be the expected life-span of the town-requested pedestrian bridge over Indian Harbor?

Response:
The expected life span of the structural steel and foundations will be at least 50 years with proper maintenance. However the life span of the wood deck will be around 10 years depending on use and maintenance.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
In lieu of the pedestrian bridge proposed for the AMP; a. Where would the cofferdam crossing occur? b. What is the expected trench depth within the harbor and on the land side of the cofferdam? c. What soils and substrates are expected in the trench location both within the harbor and on adjacent land? d. Is it possible to cross the harbor to the south of the Davis Avenue bridge?

Response:

A). The cofferdam crossing would be located in the same general location as the proposed pedestrian bridge.

B). The approximate depth of Indian Harbor at the cofferdam crossing is 2.5 feet and the harbor bed is composed of approximately 7 feet of sediment over bedrock. The duct bank would be founded on the bedrock. On the landside of the harbor the depth of the duct bank trench will be approximately 5'-4" deep.

C). Most of the borings taken to date show fine and coarse sands, gravel, some silts, weathered rock and bedrock.

D). Yes, it is possible the cross the harbor on the south side of the existing Davis Avenue bridge utilizing a cofferdam, however Eversource would need to acquire land rights across private property located on the west side of the harbor.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, p. C-7 and p. C-14. Describe the visibility of the PMP from the Indian Harbor Area in Bruce Park. What structures are likely to be visible year-round above the tree canopy along the south side of Interstate 95? Approximately how much of each of these structures would be visible above the tree canopy?

Response:
From the Indian Harbor area within Bruce Park, generally in the area of the Bruce Park Drive/Davis Avenue bridge, two transmission structures and associated lines spanning the harbor above the MNR bridge would be visible above the tree canopy along the south side of I-95. This includes Structure #14005, which may be seen +/-50 feet above the tree canopy; and Structure #14006, which may appear +/- 40 feet above the tree canopy.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 2, App. 5. a. For Photo 3 - Is a transmission pole within the field of view. If so, what is the pole number and height of the proposed structure? b. For Photos 4 - 10 - What is the pole number and height used in the photo-simulations? c. Provide photo-simulations of the 195-foot transmission structures required for the Force Main Alternative.

Response:

a. There are two transmission poles within the field of view; structure numbers 14011 and 14010, each of which would be 98 feet tall. See attached graphic, *Photo 3 Simulations Proposed Modified Project* identifying structure locations.

b. Below are the pole numbers and structure heights used in the photo simulations:

- Photo 4 – Structure #14008 = 125 feet tall
- Photo 5 - Structure #14009 = 125 feet tall; Structure #14010 = 98 feet tall
- Photo 6 - Structure #14007 = 103 feet tall; Structure #14008 = 125 feet tall
- Photo 7 - Structure #14008 = 125 feet tall
- Photo 8 - Structure #14007 = 103 feet tall
- Photo 9 - Structure #14006 = 103 feet tall; Structure #14007 = 103 feet tall; Structure #14008 = 125 feet tall
- Photo 10 - Structure #14005 – 130 feet tall

c. Refer to the attached *Force Main Variation Photo-simulations.*

PROPOSED

PHOTO	LOCATION	ORIENTATION
3	**CIRCLE DRIVE**	**SOUTHEAST**

ALL-POINTS TECHNOLOGY CORPORATION

EVERSOURCE ENERGY

EXISTING

PHOTO	LOCATION	ORIENTATION
5	**CIRCLE DRIVE**	**SOUTHEAST**

PROPOSED

PHOTO	LOCATION	ORIENTATION
5	**CIRCLE DRIVE**	**SOUTHEAST**

ALL-POINTS TECHNOLOGY CORPORATION

EVERSOURCE ENERGY

EXISTING

PHOTO	LOCATION	ORIENTATION
10	**BRUCE PARK DRIVE**	**NORTHWEST**

PROPOSED

PHOTO	LOCATION	ORIENTATION
10	**BRUCE PARK DRIVE**	**NORTHWEST**

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, p. C-14, para. 3. Identify the roadway described as "west of Bruce Park".

Response:
These roadways include the west end of Davis Avenue, near its intersection with Orchard Place, Indian Harbor Drive and Museum Drive.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, p. F-2, Table F-1. How many residences abut the 281 Railroad Avenues site?

Response:
A total of six (6) parcels physically abut the 281 Railroad Avenue Site including: four (4) residential properties - three (3) to the west and one (1) to the east; and, two (2) mixed use parcel – one (1) each to the east and west. These mixed use parcels include street-level storefronts and top level apartments. Three (3) additional residential properties are located across Woodland Drive to the north. The parcel to the south at 280 Railroad Avenue is a retail plaza with offices on the second floor.

C:\GIS\Projects\Eversource\Greenwich_SS_Route_2017\mxd\Petition_Figures\ExhibitB_Alternate_Route\Residences Proximate to 281 RR Ave.mxd

||Docket No. 461a
||Data Request CSC-01
||Dated 6/30/2017
||Q-CSC-053, Page 1 of 1

Legend

- Substation Termination
- Proposed Substation Layout
- Alternate Modified Route
- Proposed Splice Vault
- Alternate Project Substation Location
- Alternate Project Material Staging Area Location
- Approximate Parcel Boundary

Abutters:

- Direct Abutter - Residential
- Direct Abutter - Mixed-Use
- Indirect Abutter - Residential
- Indirect Abutter - Retail/Offices

N W E S

50 25 0 50 Feet

Map Notes:
Base Map: 2016 Orthophotography (CTECO Map Service)
Map Scale: 1 inch = 100 feet
Map Date: June 2017

Residences Proximate to Alternate Greenwich Substation Location

Greenwich Substation
281 Railroad Avenue
Greenwich, Connecticut

EVERSOURCE ENERGY

ALL-POINTS TECHNOLOGY CORPORATION

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, p. F-2, Table F-1. Describe potential noise mitigation measures that may be required at the 281 Railroad Avenues site.

Response:
The conceptual design of an indoor substation at 281 Railroad Ave includes concrete fire walls around the transformers with an open roof. Acoustical modeling has determined that the concrete fire walls will be sufficient to mitigate noise from the transformers such that the transformer noise at the property line is predicted to be less than the most restrictive limits of applicable state and local noise regulations. Therefore, no additional noise mitigation measures will be needed. A copy of an acoustic evaluation report by Cavanaugh Tocci Associates that provides the basis for this response is attached.

June 14, 2017

Mr. James Borowitz, PE
Distribution and Substation Engineering & Design
Eversource Energy
107 Selden Street
Berlin, CT 06037

SUBJECT: Greenwich 28F Substation
Acoustic Evaluation

Dear Mr. Borowitz,

Cavanaugh Tocci Associates has evaluated environmental sound impact associated with a proposed substation at 281 Railroad Avenue in Greenwich, Connecticut. The objectives of this evaluation were:

- To quantify and characterize existing background sound in the community surrounding the project,
- To define acoustic design goals based on applicable noise regulations,
- To estimate the acoustic impact of the proposed project in the surrounding community.

Results of the evaluation are summarized herein. Appendix A of this report is a glossary of relevant acoustic terminology.

Existing Background Sound

Sound is a feature of all environments. Sound is only objectionable when it is inconsistent with its environment; by being either too loud or by being distinctive in character (i.e. tonally or temporally varying). The goal of acoustical design is to render facility noise consistent with the level and character of other sounds in the environment. To this end, the following environmental noise analysis evaluates sound produced by the proposed Project in light of existing environmental sound levels.

An environmental sound survey was conducted to quantify and characterize the existing acoustic environment in the vicinity of the proposed Project. In order to document typical background sound levels in the project area, the sound monitoring program consisted of short term intermittent measurements (attended 15-minute samples), performed at one representative receptor location. Figure 1 is an aerial photograph of the project site indicating the sound monitoring location. The measurements were conducted during early morning hours (12:00 midnight to 1:00 a.m.), and daytime hours (10:00 a.m. to 11:00 a.m.) on Wednesday April 1, 2015. The measurements were conducted with a Bruel and Kjaer Instruments Type 2250 sound level analyzer outfitted with a ½ inch electret microphone and windscreen. The instrument was calibrated before and after use with a Bruel and Kjaer Instruments Type 4231 acoustical calibrator. During all measurements, the meter was mounted on a

tripod with the microphone situated approximately 5 feet above the ground. These instruments conform to ANSI S1.4 for Type 1 precision sound measurement instrumentation and have current calibration certificates traceable to the National Institute of Standards and Technology (NIST).

The results of the measurements are presented in Appendix B. The data presentation format has three chief elements:

- The first is a listing of A-weighted descriptors on the upper left-hand side of the figures. Note that the statistical descriptors (L_n) are presented in order of decreasing value. Logically, the L_{max} is the highest sound level reached during the 15-minute interval; the L_{01} is the next highest since it is exceeded only 1 percent of the time interval, and so forth. The L_{eq} and L_{90} are highlighted, as they are the key descriptors used in evaluating background sound levels.

- The second element in these figures is a 1/3 octave band spectrum of the L_{90} sound pressure level. This spectrum is used to identify the presence of distinct tonal characteristics and to quantify the frequency content associated with the background sounds. In these samples, a prominent discrete tone in the 160 Hz frequency band was identified during the nighttime sample. The source of this tone is an exhaust fan at the nearby restaurant located at 249 Railroad Avenue

- The third element at the bottom of the figures is a graphic level record, or time history, of the A-weighted sound level in 1-second increments recorded over the 15-minute interval. The peaks in these figures are associated with transient sounds produced by passing vehicles on local roads.

The background sound levels measured at these locations are dominated by sound produced by local traffic and more distant traffic on I-95. In addition, occasionally there are transient sounds from passing trains. The results of the survey indicate that the measured daytime background (L_{90}) sound level was 51 dBA. During late night and early morning hours, when traffic is at a minimum, the background sound levels dropped to 44 dBA.

Environmental Noise Regulations

There are two regulations that are pertinent with respect to sound produced by the proposed facility. These are the Connecticut Regulations for the Control of Noise, which are enforced by the Connecticut Department of Energy and Environmental Protection (originally prepared by the Connecticut Department of Environmental Protection), and the Town of Greenwich Noise Ordinance. The following briefly discusses the applicable aspects of these regulations.

State of Connecticut Noise Regulation

The State of Connecticut Noise Regulation (Section 22a-69-1 to 7.4) defines limits for environmental sound produced by this project. The sound level limits are based on both emitter and receptor land use classifications, and are listed below in Table 1:

TABLE 1
Connecticut Regulations for the Control of Noise Sound Level Limits (dBA)

Emitter Class	Receptor Class			
	C	B	A/Day	A/Night
C	70	66	61	51
B	62	62	55	45
A	62	55	55	45

Definitions

In the above table, day is defined as the time interval 7:00 a.m. to 10:00 p.m. Night is defined as the time interval 10:00 p.m. to 7:00 a.m. Noise Zone Classifications are based on the actual use of the land. Where multiple land uses exist on the same property, the least restrictive limits apply.

A Class A noise zone is land generally designated for residential use or areas where serenity and tranquility are essential to the intended use.

A Class B noise zone includes land uses generally of a commercial nature.

A Class C noise zone includes uses generally of an industrial nature but also includes utilities such as the substation.

Exceptions and Other Limit Provisions

Section 22a-69-3.3 Prominent Discrete Tones

To offset the undesirable nature of tonal sound in the environment, the regulation penalizes sources of prominent, audible discrete tones. If a facility produces such sounds, the applicable limits in Table 1 are reduced by 5 dBA. In its definitions (Section 22a-69-1.2), the regulation defines a method for identifying prominent discrete tones based on measuring one-third octave band sound levels.

Town of Greenwich Noise Ordinance

The Town of Greenwich noise ordinance contained in the Greenwich Municipal code (Chapter 6B Noise) also defines limits for environmental sound produced by this project. The sound level limits are based on zoning districts and are listed below in Table 2:

TABLE 2
Town of Greenwich CT Sound Level Limits (dBA)

Emitter Zone	Receptor Zone		
	Business	Residential/Day	Residential/Night
Residential	55	55	45
Business	62	55	45

Note that this local ordinance does not incorporate provisions for tonal sound.

Facility Acoustic Requirements

Our interpretation of the above referenced regulations follows:

- The substation will produce sound continuously during daytime and nighttime hours. As such, where the regulations provide more stringent limits for nighttime operation, these will apply.

- With respect to the State noise regulation the substation is classified as a Class C emitter, and the surrounding properties are classified as either Class B or Class A uses. Thus, at Class B receptors, the limit is 66 dBA, and at Class A receptors the more stringent nighttime limit of 51 dBA applies. Since it is likely that sound produced by the new substation may be characterized as producing a prominent discrete tone, these limits should be reduced by an additional 5 dBA; Class B receptor 61 dBA, and Class A receptor 46 dBA.

- With respect to the Town noise regulation the substation is located within a Business Zone (GB – General Business). Therefore, the limits are 62 dBA at all receptor in the Business zones, and 45 dBA at all receptors in Residential zones.

To assure compliance with both regulations, project sound should be limited to 45 dBA at Residential receptors, and 61 dBA at Commercial/Business receptors.

Project Noise Analysis

Project related sound impacts that are associated with equipment at the proposed site has been calculated using CadnaA environmental sound modeling software (Version 2017 DataKustic GmbH). The CadnaA sound modeling software uses algorithms and procedures described in International Standard ISO 9613-2:1996 “Acoustics- Attenuation of sound during propagation outdoors – Part 2: General method of calculation”. This standard and its associated methodology are the most universally accepted approach for environmental sound modeling of industrial and transit sound sources. The methodology described in this standard provides estimates of A-weighted sound levels for meteorological conditions that are favorable for the propagation of sound (downwind with a wind speed of 1-5 meters/sec). This methodology is also valid for sound propagation under well-developed moderate ground based temperature profile inversions, which commonly occur on clear calm nights.

Figures 2 is a site plan indicating the proposed layout of equipment at the substation. Receptor sound levels were calculated using the following data and corrections:

- Transformer sound power levels (in octave bands)
    - Based on specified National Electric Manufacturers Association (NEMA) sound ratings for the two 60 MVA transformers. Essentially the NEMA sound rating is the average A-weighted sound level measured at a distance of approximately 1 foot from the transformer (6 feet from fan cooled surfaces). For this analysis, a maximum NEMA sound rating of 61 dBA has been specified.
- Distance between source and receptor (geometric divergence)
- Atmospheric absorption (10°C and 70% relative humidity)
- Reflections and screening from building and barrier structures

Figures 3 presents the results of the acoustic modeling for the proposed substation. Tables 3 below provide a summary of these results:

TABLE 3
Summary of Estimated Sound Impacts for the Proposed Substation

Location	Category	Estimated Project Related Sound Level (dBA)	Most Stringent Noise Regulation Limit (dBA)
R-N	Residential	34	45
R-NE	Residential	33	45
R-E	Residential	39	45
C-E	Commercial	38	61
C-S	Commercial	34	61
C-W	Commercial	37	61
R-W	Residential	35	45
R-NW	Residential	37	45

Conclusion

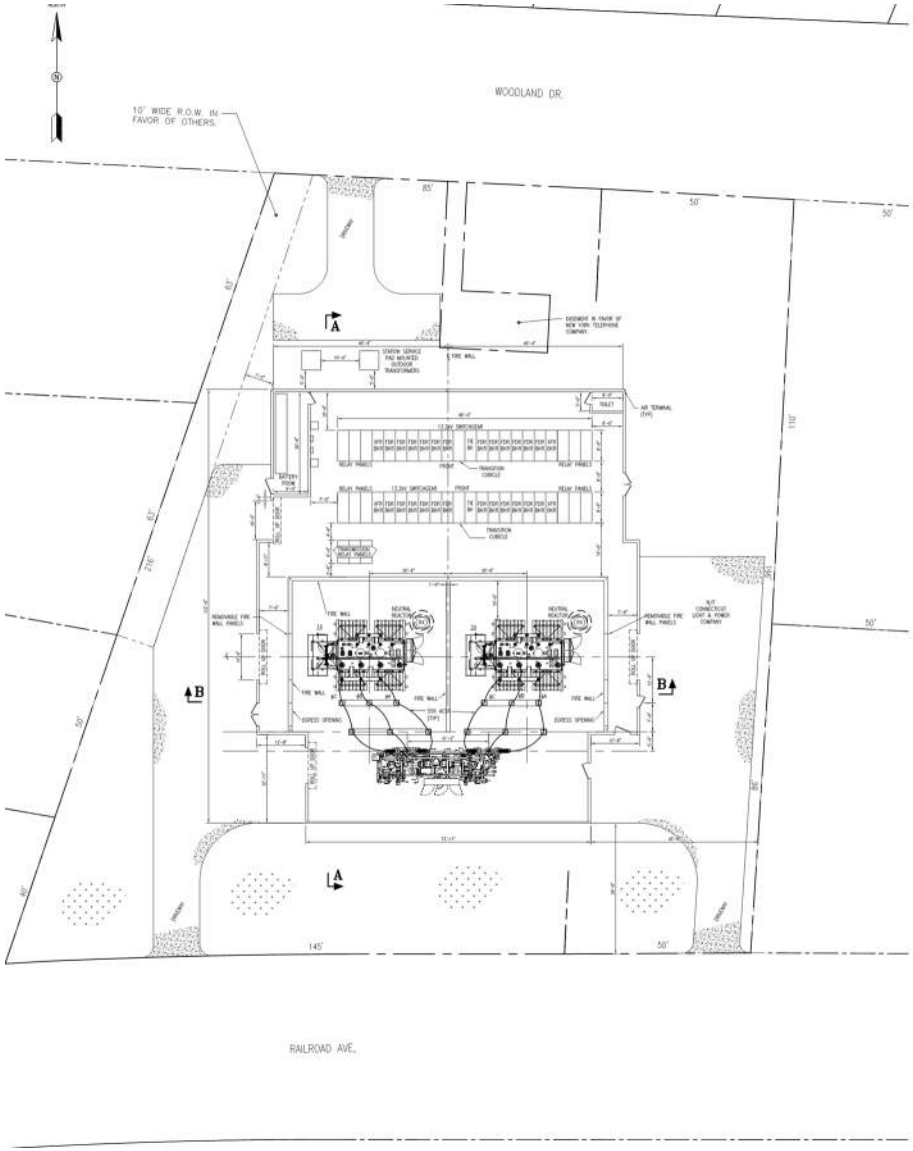
Based on our review of the data presented in Table 3, it is our opinion that sound produced by the proposed substation will comply with the most stringent requirements of the state and local noise regulations. Furthermore, since project related sound is estimated to be below existing lowest background sound levels, it is our opinion that sound produced by the proposed Project will not produce a noticeable impact on the acoustic environment, and will not have an unreasonable adverse effect at all surrounding properties.

Sincerely,
CAVANAUGH TOCCI

Douglas H. Bell
15086/Greenwich 28F Substation - Acoustic Evaluation 2017.docx

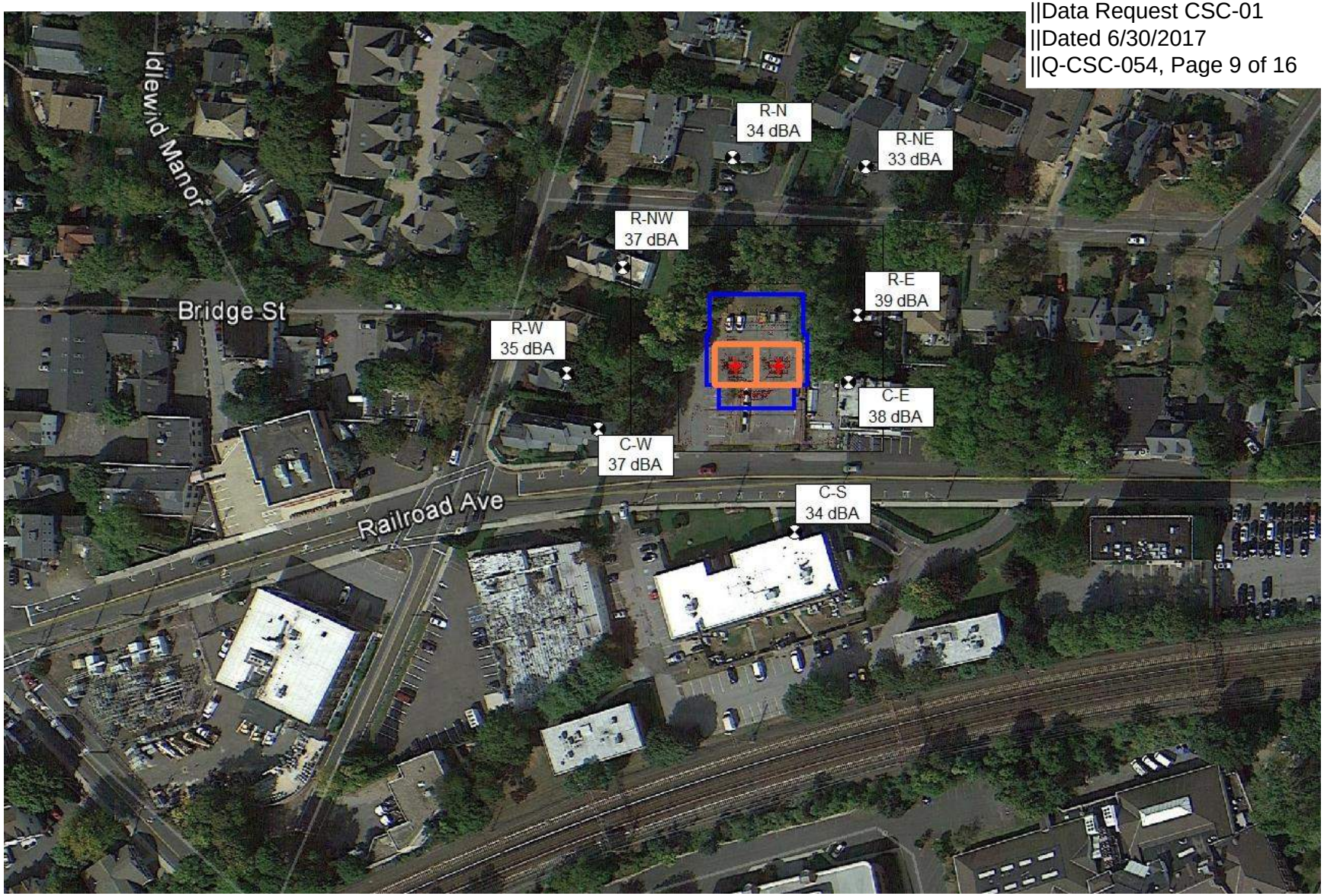
Aerial Photograph of Project Area Indicating Sound Monitoring Location

Figure 1



Proposed Site Plan of Substation

Figure 2



Estimates of Project Related Sound at Surrounding Properties

Figure 3

Appendix A

Sound Measurement Terminology

SOUND MEASUREMENT TERMINOLOGY

In order to quantify the amplitude, frequency, and temporal characteristics of sound, various acoustical descriptors are used. The following is an introduction to acoustic terminology that is used in this report.

Sound Level

Sound levels are typically quantified using a logarithmic decibel (dB) scale. The use of a logarithmic scale helps to compress the wide range of human sensitivity to sound amplitude into a scale that ranges from approximately 0 to 180 dB. Note however, that the use of the logarithmic scale prevents simple arithmetic operations when combining the cumulative impact of sources. For example, two sources of equal sound level operated simultaneously results in a combined sound level that is only 3 dB higher than if only one source was operated alone. An important feature of the human perception of continuous sound is that an increase or decrease in sound pressure level by 3 dB or less is barely perceptible, and an increase or decrease by 10 dB is perceived as a doubling or halving of noise level.

A-weighting

Generally, the sensitivity of human hearing is restricted to the frequency range of 20 Hz to 20,000 Hz. However, the human ear is most sensitive to sound in the 500 Hz to 5,000 Hz frequency range. Above and below this range, the ear becomes progressively less sensitive. To account for this feature of human hearing, sound level meters incorporate filtering of acoustic signals that corresponds to the varying sensitivity of the human ear to sound at different frequencies. This filtering is called A-weighting. Sound level measurements that are obtained using this filtering are referred to as A-weighted sound levels and are signified by the identifier, dBA. A-weighted sound levels are widely used for evaluating human exposure to environmental sounds. To help place A-weighted sound levels in perspective, Figure A-1 contains a scale showing typical sound levels for common interior and environmental sound sources.

Spectral Characteristics – Octave and 1/3 Octave Band Sound Levels

To characterize a sound, it is often necessary to evaluate the frequency distribution of the sound energy. As mentioned before, the frequencies of most interest where human exposure is concerned range between 20 Hz and 20,000 Hz. This frequency range is commonly divided into octave bands, where an octave band is a range of frequencies. Each octave band is referred to by its center frequency and has a bandwidth of one octave (a doubling of frequency). To cover the full range of human hearing, it is necessary to measure sound in 10 separate octave bands. Typically, the lowest frequency band measured has a center frequency of 31.5 Hz. The next frequency band has a center frequency of 63 Hz. This geometric series continues to the highest frequency band that has a center frequency of 16,000 Hz. A set of octave band sound levels to describe a particular sound is called an octave band spectrum. Covering the full range of

hearing, an octave band spectrum would have 10 values, one for each band. Under certain circumstances, more frequency resolution in acoustical data is needed to identify the presence of tonal sounds. A 1/3 octave band spectrum uses filters that divide each octave band into 3 separate frequency bands. Note that octave band and 1/3 octave band sound levels are not usually A-weighted, with their units being dB.

Environmental Noise Descriptors

Sound levels in the environment are continuously fluctuating and it is difficult to quantify these time-varying levels with single number descriptors. Statistical approaches, which use *percentile sound levels* and *equivalent sound levels*, are often used to quantify the temporal characteristics of environmental sound.

Percentile sound levels (L_n) are the A-weighted sound levels that are exceeded for specific percentages of time within a noise measurement interval. For example if a measurement interval is one hour long, the 50th percentile sound level (L_{50}) is the A-weighted sound level that is exceeded for 30 minutes of that interval.

- L_{90} is the sound level in dBA exceeded 90 percent of the time during the measurement period. The 90th percentile sound level represents the nominally lowest level reached during the monitoring interval and is typically influenced by sound of relatively low level, but nearly constant duration, such as distant traffic or continuously operating industrial equipment. The L_{90} is often used in standards to quantify the existing background or residual sound level.

- L_{50} is the median sound level: the sound level in dBA exceeded 50 percent of the time during the measurement period.

- L_{10} is the sound level exceeded only 10 percent of the time. It is close to the maximum level observed during the measurement period. The L_{10} is sometimes called the intrusive sound level because it is caused by occasional louder noises like those from passing motor vehicles or aircraft.

By using percentile sound levels, it is possible to characterize the sound environment in terms of the steady-state background sound (L_{90}) and occasional transient sound (L_{10}).

The equivalent sound level (L_{eq}) is the energy average of the A weighted sound level for the measurement interval. Sounds of low level and long duration, as well as sounds of high level and short duration influence this sound level descriptor.

Noise levels at night generally produce greater annoyance than do the same levels which occur during the day. It is generally agreed that a given level of environmental noise during the day would appear to be 10 dBA louder at night – at least in terms of potential for causing community concern. The day night average sound level (Ldn) is a 24 hour average A-weighted

sound level where a 10 dB "penalty" is applied to sound occurring between the hours of 10:00 p.m. and 7:00 a.m. The 10 dB penalty accounts for the heightened sensitivity of a community to noise occurring at night.

When a steady continuous sound is measured, the L_{10}, L_{50}, L_{90} and L_{eq} are all equal. For a constant sound level, such as from a power plant operating continuously for a 24-hour period, the L_{dn} is approximately 6 dBA higher than the directly measured sound level.

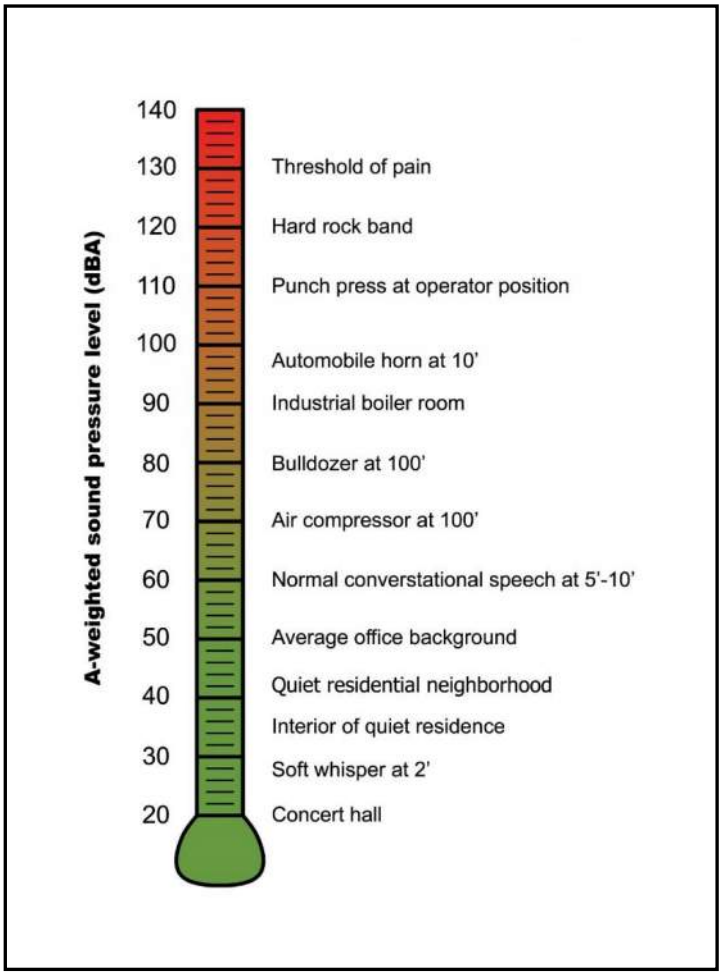


Figure A-1
Typical Sound Levels for Common Interior and Environmental Sources

Appendix B

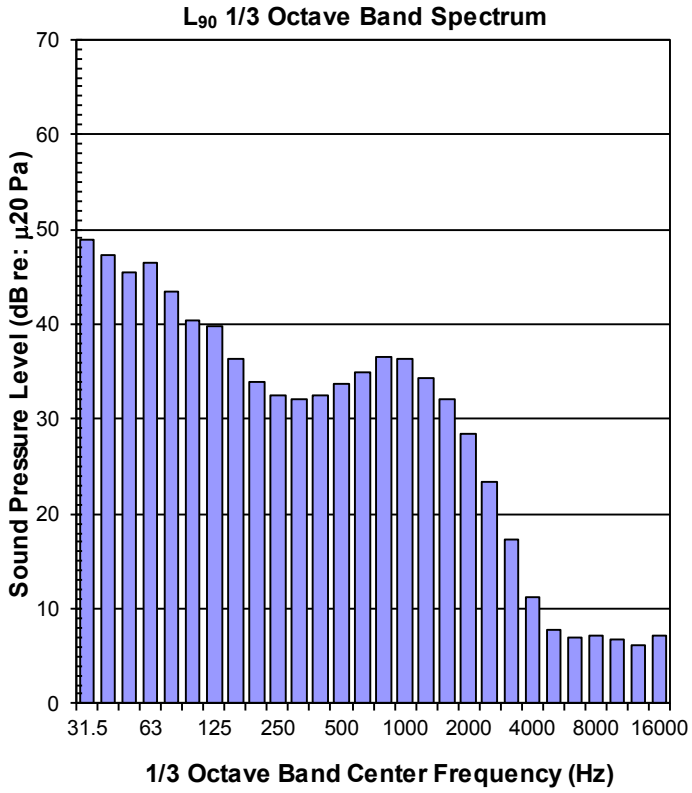
Intermittent Sound Measurements

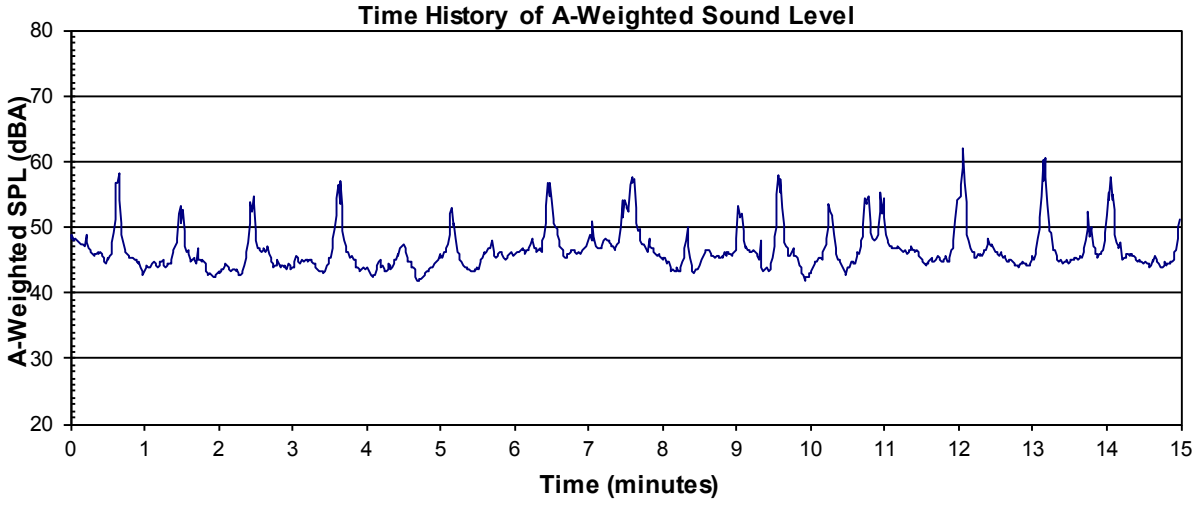
281 Railroad Avenue - Night

Measured Wednesday, April 01, 2015, Between 12:19 AM & 12:34 AM

A-Weighted Descriptors (dBA)

L_{eq}:	**48**
L_{max}:	63
L_{01}:	58
L_{10}:	51
L_{50}:	46
L_{90}:	**44**
L_{99}:	42
L_{min}:	41





Run002

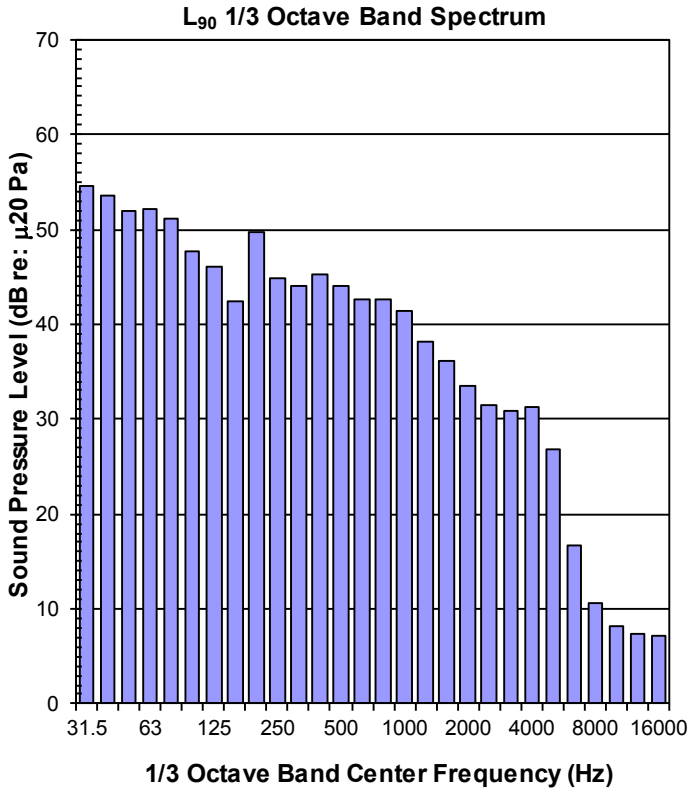
Appendix B – 1

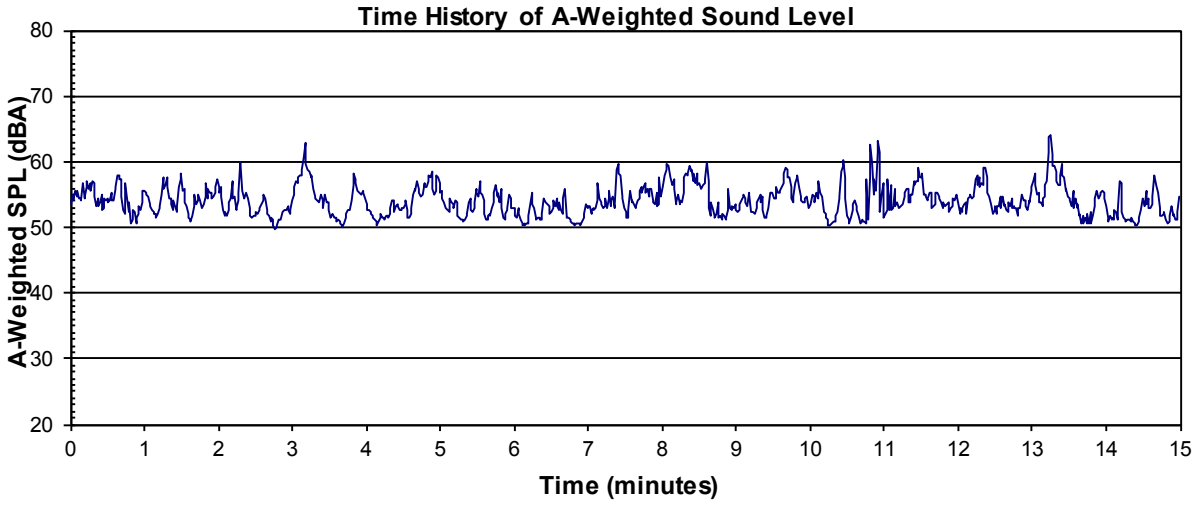
281 Railroad Avenue - Day

Measured Wednesday, April 01, 2015, Between 10:44 AM & 10:59 AM

A-Weighted Descriptors (dBA)

L_{eq}:	**55**
L_{max}:	71
L_{01}:	61
L_{10}:	57
L_{50}:	54
L_{90}:	**51**
L_{99}:	50
L_{min}:	49





Run003

Appendix B – 2

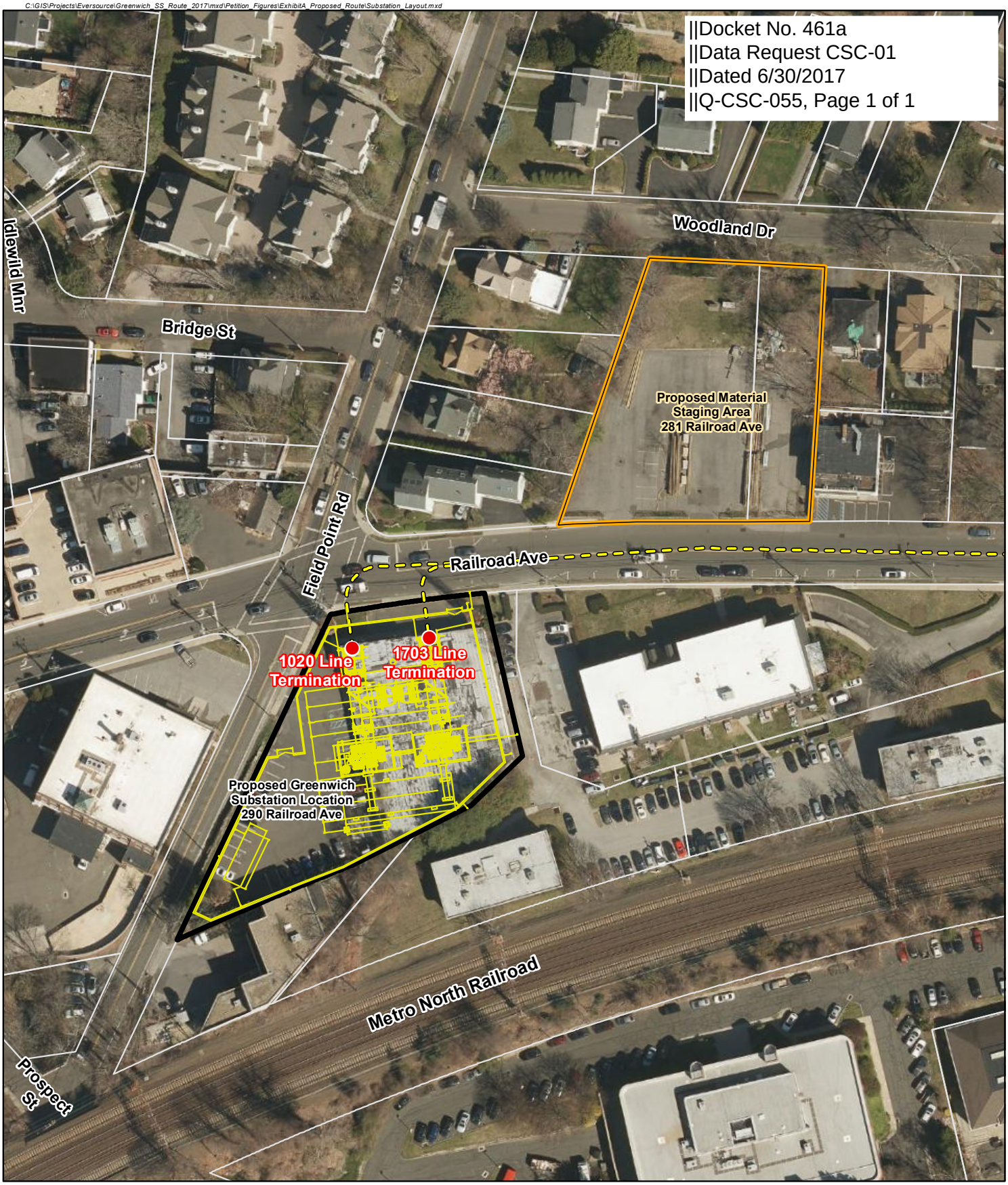
Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Council FOF #239. Provide a similar aerial photograph/substation schematic for both the 281 and 290 Railroad Avenue Substations.

Response:
Aerial photographs/substation schematics for both the 281 and 290 Railroad Avenue Substations are attached.

C:\GIS\Projects\Eversource\Greenwich_SS_Route_2017\mxd\Petition_Figures\ExhibitA_Proposed_Route\Substation_Layout.mxd

||Docket No. 461a
||Data Request CSC-01
||Dated 6/30/2017
||Q-CSC-055, Page 1 of 1



Legend

- Substation Termination
- Proposed Substation Layout
- Proposed Modified Route
- Proposed Greenwich Substation Location
- Proposed Material Staging Area
- Approximate Parcel Boundary

Proposed Modified Greenwich Substation

Greenwich Substation
290 Railroad Avenue
Greenwich, Connecticut

N
W E
S

50 25 0 50
Feet

Map Notes:
Base Map: 2016 Orthophotography (CTECO Map Service)
Map Scale:1 inch = 100 feet
Map Date: May 2017

EVERSOURCE ENERGY

ALL-POINTS TECHNOLOGY CORPORATION

C:\GIS\Projects\Eversource\Greenwich_SS_Route_2017\mxd\Petition_Figures\ExhibitB_Alternate_Route\Substation_Layout.mxd

Legend

- Substation Termination
- Proposed Substation Layout
- Alternate Modified Route
- Proposed Splice Vault
- Alternate Project Substation Location
- Alternate Project Material Staging Area Location
- Approximate Parcel Boundary

Alternate Greenwich Substation Location

Greenwich Substation
281 Railroad Avenue
Greenwich, Connecticut

Map Notes:
Base Map: 2016 Orthophotography (CTECO Map Service)
Map Scale: 1 inch = 100 feet
Map Date: May 2017

N W E S
50 25 0 50 Feet

EVERSOURCE ENERGY
ALL-POINTS TECHNOLOGY CORPORATION

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Council FOF #74. Provide more information regarding the pole-mounted transformer fire at the Cos Cob Substation in June 2015. Where was the pole-mounted transformer located? What exactly burned and what equipment was destroyed.

Response:
At approximately 6:30 pm on 6/16/15, a small transformer used for providing power to substation auxiliary equipment faulted internally. This station service transformer was a typical "pole-top" mounted together with two other identical transformers about 18 feet above ground on a steel structure adjacent to the Cos Cob 11R-1X power transformer. The fault caused protective relays to immediately and automatically trip, which isolated the electric supply and de-energized the station service transformers as well as the 11R-1X. As a result of the fault, the top of the station service transformer was dislodged and its insulating oil was ignited.. The faulted station service transformer was damaged beyond repair and the fire resulted in some external damage to the two adjacent station service transformers mounted on the same structure. There was no damage to other equipment or to the 11R-1X power transformer. There were no customer outages as a result of the incident.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Provide a chart listing the costs of each component of both the PMP and AMP, including route variations.

Response:
The chart below lists the costs of each component of both the PMP and AMP, along with route variations.

Project Estimates			Component Cost Category
Project Component	**PMP**	**AMP**	
Transmission Line	$33,430,842	$52,515,678	non-PTF Transmission
Greenwich Substation	$28,136,749	$28,992,801	
Transmission Component	$13,961,853	$12,291,549	non-PTF Transmission
Distribution Component	$14,174,896	$16,701,252	Distribution
Cos Cob Substation	$12,669,170	$12,669,170	Transmission PTF
Prospect Substation Modifications	$952,837	$952,837	Distribution
Distribution Feeder Relocation	$2,890,743	$4,586,275	Distribution
Total	**$78,080,340**	**$99,716,760**	
Variations			
Project Component	**Additional Cost to PMP**	**Additional Cost to AMP**	
All Indoor Substation Variation at 290 RR	$1,400,000	N/A	
ConnDOT Line Exit Variation (Vol 1, Ex. A	$2,200,000	N/A	
Two Single Circuit Transmission Line Vari	$10,500,000	N/A	
Force Main Variation (Vol 1, Ex. A, sec. F.	$700,000	N/A	
Pipejacking Underneath I-95 (Vol 1, Ex. B	N/A	$2,800,000	
	Reduced Cost to PMP	**Reduced Cost to AMP**	
Cofferdam Variation (Vol 1, Ex. B, sec. A.	N/A	$1,800,000	

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Define regionalized and localized costs.

Response:
Please see below the definitions of regionalized and localized costs as per ISO-NE website or access the link below for a direct path: https://www.iso-ne.com/system-planning/transmission-planning/transmission-cost-allocations

Regionalized cost: Projects that will improve reliability throughout the region, provide a benefit for all of New England, and their costs are shared by the region. A region's share of the costs is proportionate to its electricity demand.

Localized cost: Projects or portions of a project that do not provide a regional reliability benefit are typically the responsibility of the transmission owner.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
How does Eversource propose to recover the cost of the PMP? Include the costs and cost recovery mechanisms for both regionalized and localized components and why the components are regionalized or localized.

Response:
The majority of the GSLP costs are non -PTF components and as such will be recovered in local transmission rates.. The upgrades at Cos Cob substation are considered a pool transmission facility (PTF).. Therefore, Eversource plans to seek regional cost recovery for modifications at Cos Cob ($12.7 M). ISO New England is responsible for making the determination of which regional project costs can be recovered through regional transmission rates, and whether any regional project costs should be localized.

The remaining $65.4M of the GSLP under the PMP scenario will be recovered through Eversource's local transmission rates rates for the non-PTF components and distribution rates for the distribution components that are identified on the table in response to Q-CSC-057.

All transmission cost recovery is consistent with the ISO-NE Open Access Tariff.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
How does Eversource propose to recover the cost of the proposed AMP? Include the costs and cost recovery mechanisms for both regionalized and localized components and why the components are regionalized or localized.

Response:
See response to Q-CSC-059. The cost for modifications at Cos Cob would be proposed for regionalized cost treatment under either the PMP or AMP scenario. Similar to the PMP, the remaining costs ($87.1M) of the GSLP under the AMP is expected to be recovered through Eversource's local tariff for the non PTF transmission components and distribution rates for the distribution components, as identified on the table in response to Q-CSC-057. All transmission cost recovery is consistent with the ISO-NE Open Access Tariff.

Witness: **Witness Panel**
Request from: **Connecticut Siting Council**

Question:
Reference Reopened Application Vol. 1, Pre-filed Testimony pp. 19-20. What are the costs to comply with the Town requested conditions?

Response:
The costs to comply with the Town requested conditions would be composed of the following

- **All-indoor substation with architectural enclosure.** The incremental cost of the substation design preferred by the Town, as compared with an open air substation enclosed by a masonry wall, is $1.4 million (M). This cost is included in the estimated cost of the AMP.
- **Pedestrian Bridge Attachment**: Utilizing a pedestrian bridge to cross Indian Harbor is estimated to cost approximately $1.8M more than using an open trench with a cofferdam and approximately $850 thousand more than utilizing a HDD. This cost is included in the estimated cost of the AMP.
- **I-95 Bridge Attachment:** The Town condition to attach the transmission lines to the Indian Field Road overpass is the least cost alternative to cross I-95. However, at a March 15, 2017 meeting, ConnDot Highways stated that it was "heavily opposed" to attaching the cable to the underside of the Indian Field Road overpass as it poses safety and maintenance concerns. If the cable cannot be attached to the overpass, a jack and bore would be utilized to cross under I-95. A jack and bore would cost approximately $2.8M more than attaching to the Indian Field Road overpass. The estimated cost of the AMP assumes that the cables would be attached to the bridge.
- **Construction in Bruce Park:** The challenges with construction within Bruce Park are associated with requiring all work and equipment to be confined to the paved roadways and not performing any vegetation removal. We do not have an estimate of the incremental cost of the additional time and complexity of the construction effort that would result from compliance with these conditions. Our primary concern is that the project cannot be constructed while strictly complying with these conditions.
- **Arch Street Vault** The referenced testimony expresses a concern with respect to challenges to locating the Arch Street Vault in the public parking lot if ConnDOT would not allow it to be installed in the paved surface of Arch Street. That concern was misplaced, because Eversource may install the vault in the parking lot pursuant to its

franchise right to locate its facilities in "public grounds." Accordingly, there should be no incremental cost above the estimated AMP cost related to the Arch Street Vault.