November 24, 2015

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

Re: Docket No. 461 - CSC 461 Greenwich Substation and Line Project

Dear Mr. Stein:

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

Response to HD-01 Late Filed Exhibits dated 10/06/2015
LF-001 and 002

Very truly yours,

John Morissette
Project Manager
Siting
As Agent for CL&P
dba EversourceEnergy

cc: Service List

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

Question:
As discussed at the 10-6 Hearing, provide an analysis of available distribution system alternatives to address the need for the Project, such the alternative of expanding Cos Cob Substation with potential property acquisition to expand the substation site?

Response:
As explained below, available distribution system expansions and modifications would be costly and could provide only a small portion of the capacity that the Project would provide. The proposed Project would provide 135 MVA of capacity at an estimated cost of $140 million, or approximately $1 million per MVA. The four distribution system steps described below would provide only 14 MVA, at an estimated cost of $116 million to $134 million or approximately $8.3 million to $9.6 million per MVA. Considering the limited capacity that would be available through these distribution system steps, they would serve only to allow a temporary deferral of the need for the Project.

To make progress on the key objectives that the Project would accomplish, Eversource would be required to take the following steps to expand and modify its distribution system facilities in Greenwich at the listed costs:

1. **Reduce Loading on the Cos Cob Substation** - Address the forecasted overloads of the Cos Cob 115- to 27.6-kV transformers by replacing the 27.6-kV bus with switchgear with additional feeder positions and replace all three 115- to 27.6-kV transformers with larger transformers located on additional property to be acquired. **Estimated cost: $65 to $75 million**
2. **Increase Distribution Feeder Capacity** - Reduce loading and increase reliability of the five 27.6-kV feeders that supply the network and Prospect Substation. Add a 27.6-kV feeder from Cos Cob Substation to Prospect Substation and replace the Prospect Substation 27.6-kV ring bus with switchgear. **Estimated cost: $33 to $37 million**
3. **Reduce Loading of Prospect Substation** - Address loading of the 27.6- to 13.2-kV transformers at Prospect Substation by replacing all four existing 27.6- to 13.2-kV transformers with 15/20/25 MVA transformers. **Estimated cost: $6 to $8 million**
4. **Replace Prospect Substation Switchgear** - Replace the aging switchgear at Prospect Substation. **Estimated cost: $11 to $14 million**

To address the four key objectives that would be achieved by the Project, Eversource evaluated available distribution system options for each objective.

1. **Reduce load on the Cos Cob 115- to 27.6-kV transformers**.

   The options to reduce load on the 115- to 27.6-kV transformers are either a) transfer load to other sources, b) add another 115- to 27.6-kV transformer, or c) replace all three transformers with larger transformers.

   a. The option to transfer 27.6-kV load to other sources has been done incrementally over the past several years. There are no current options transfer load to Tomac or or to transfer load from the substations that are served by Cos Cob Substation to other substations that are not supplied by Cos Cob Substation.

   b. The option to add 115- to 27.6-kV transformer capacity at Cos Cob Substation could supply either network load or non-network load.

      i. The network load could be supplied from a new source consisting of at least two transformers and switchgear dedicated to the network and all load that is currently supplied from the network feeders. Since this represents a total load of about 100 MVA, this is not a practical alternative. To parse out the network load from the other non-network load that is supplied from the network feeders would require additional transformers plus at least 4 additional feeders and associated new duct bank that would supply Prospect Substation. The additional transformers could not be installed within the existing property at Cos Cob and would therefore require the acquisition of additional property at a cost of approximately $40 million for the land alone. The additional duct bank would require similar effort to the proposed 115-kV lines and would take up room in the street that could impact future efforts to add the 115-kV lines. Again, this is not a practical or cost effective alternative.

ii. Another alternative for adding transformer capacity is to add a new source for the 27.6-kV load that is not tied to the network feeders. However, this option is not feasible due primarily to physical space limitations.

c. The option to replace the three existing 115- to 27.6-kV transformers with larger transformers could be achieved, but would require new switchgear and additional property to provide the necessary space. The total cost of the 27.6-kV switchgear, three new larger transformers and land acquisition would be approximately $65M - $75M.

2. **Increase Distribution Feeder Capacity to improve reliability for the 27.6-kV feeders.**

a. Add an additional 27.6-kV feeder from Cos Cob to Prospect Substation. Size the new feeder for 115 kV, but initially energize the feeder at 27.6 kV. It would be assumed that if the initial use is for the 27.6-kV distribution feeder, and consequently, the cost would be borne solely by CL&P distribution customers.

i. This alternative would be to build an overhead or underground route that could accommodate a 27.6-kV feeder initially, but could also accommodate a future 115-kV line. Note that the termination points at Cos Cob and Prospect would be minimally built for the 27.6-kV initial application.

ii. If the overhead option were built, the double circuit towers would be installed with all required easements. The cost of this option would be $73 million for the overhead option minus one circuit conductor and associated arm. In addition, this option would require substation tie in costs at both ends that would add to the total option cost..

iii. If the underground option were built, all pipes and vaults would be installed with all required easements. The cost of this option would be $64 million for the underground minus one circuit underground cable. In addition, this option would require substation tie in costs at both ends that would add to the total option cost..

iv. Another alternative would be to simply build a standard distribution ductbank from Cos Cob to Prospect for one or two 27.6-kV feeders. This ductbank could be built to accommodate additional 13.2kV feeders in the future when the Greenwich Substation is built and we would need additional feeder ties to Cos Cob. The additional duct bank would require similar effort to the proposed 115-kV lines and would take up room in the street that could hamstring future efforts to add the 115-kV lines. The cost of this would be approximately $25 million.

b. The additional 27.6-kV feeder would require modifications at both Cos Cob and Prospect Substations. Neither substation can easily accommodate these expansions and would require fairly extensive changes.

i. Cos Cob Substation end - Add one 27.6-kV feeder position. This would be provided in the new 27.6-kV switchgear in Cos Cob Substation as discussed in (1.c.) above.

ii. Prospect Substation end - Add one 27.6-kV feeder position on the ring bus at Prospect Substation. Due to the very tight configuration, any addition to the 27.6-kV ring bus would require a fence expansion into the parking area. Based on the fact that the ring bus would expand to 6 incoming lines, 3 outgoing lines and 4 transformers, it would be necessary to replace the outdoor ring bus with new 27-kV switchgear in Prospect Substation. This would allow room for the larger transformers and would provide an opportunity to elevate the switchgear above the flood plain. The cost for new 27.6-kV switchgear with the additional incoming feeder position is approximately $8 - $12 million. Note that this option would reduce parking for 330 Railroad Ave.

3. **Reduce Loading of Prospect Substation - Address the loading of the 27.6- to 13.2-kV transformers at Prospect Substation.**

   Options to reduce load on these 27.6- to 13.2-kV transformers would be either a) transfer load to other sources, or b) replace the transformers with larger transformers.

   Replacing the four transformers at Prospect substation with larger transformers is a feasible option while transferring load to other sources is not. Assuming there would be the necessary room provided by the 27.6-kV switchgear per the above 27.6-kV switchgear addition (2.b.ii), the installation of four new 15/20/25 MVA, 27.6-13.2-kV transformers would be feasible and would cost approximately $6 - $8 million.

4. **Replace Prospect Substation Switchgear - Replace the aging/obsolete 13.2-kV switchgear at Prospect Substation.**

   a. A project had been approved to replace the switchgear (ranging in age from 46-65 years old), but has been deferred based on the proposed Project that would make switchgear replacement unnecessary because all 13.2-kV feeders would be transferred to the new Greenwich Substation. If the proposed Greenwich Substation is not built, the Prospect switchgear replacement would be necessary and would cost approximately $8 - $10 million in substation costs and approximately $4 million in distribution feeder costs.

A theoretical alternative that would address the four issues above would be to supply all of Prospect Substation's 13.2-kV load from an existing substation in Stamford. Due to the distances involved to provide a new source from a substation in Stamford, this is not a practical or economical alternative.

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

Question:
To avoid underground transmission near the water features in Bruce Park review an overhead option that crosses to the north section of the park or south of the interstate. Provide visual simulations, diagram, cross section and minimizing the ROW width.

Response:
The Company evaluated an overhead transmission line segment crossing along the north section of the Bruce Park located just south of the Interstate 95 ROW and a variation extending the overhead line segment that would cross the I-95 and railroad corridors overhead. The estimated costs of these options would be approximately $67 million and $60 million, respectively, which is approximately $5-12 million less than the estimated cost of the underground transmission lines along the Preferred Route including Bruce Park.

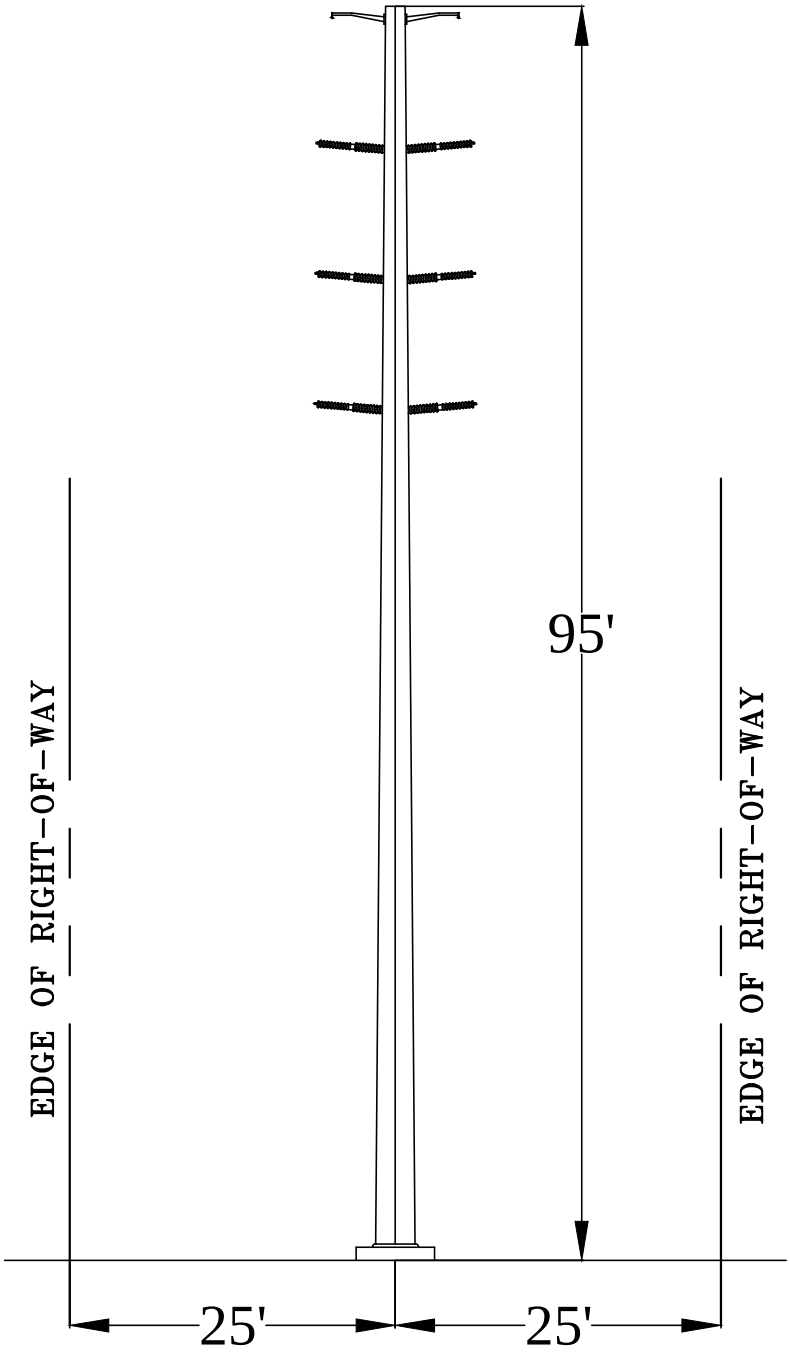
Bruce Park Overhead - requires two transition stations (approximately 75 feet by 75 feet each), one near Kinsman Lane and the second along Davis Avenue, where the overhead transmission line segment would transition to underground high pressure fluid filled (HPFF) transmission lines. These underground lines would extend along the Preferred Route from the respective transition stations to Cos Cob Substation to the northeast and to the proposed new Greenwich Substation to the west. This overhead line segment would create a hybrid overhead/underground line route variation.

The overhead line segment would have the following features:

- Two overhead transmission lines crossing the north edge of the park that would be supported on eight double-circuit steel structures. The structures would have heights that range from approximately 65 feet to 100 feet and would be spaced on average approximately 320 feet apart.
- These structures would incorporate design features that include rigid-post insulators and limited span lengths to achieve a minimum ROW width of 50 feet for the two overhead lines across Bruce Park. See Attachment.
- The Company would need to acquire an easement from the Town of Greenwich for overhead transmission line facilities along this overhead line segment and for the two transition stations at each end of this segment.

Visual simulations of the overhead transmission lines, the aerial route depiction in the Bruce Park and a cross-section drawing of a typical structure for this overhead line segment are attached to this response.

Extended Overhead Crossing over I-95 and Railroad - As an option to the hybrid overhead/underground route variation described above, the Company also evaluated an extended overhead line segment that would cross the I-95 and railroad corridors overhead, rather than the underground crossing. This option would eliminate the transition station near Kinsman Lane and instead would place a transition station east of Indian Field Road north of I-95 and the railroad. For this option, the Company would need to acquire easements from the Town for the overhead transmission line facilities through Bruce Park and for the transition station at Davis Avenue and also acquire easements from private property owners for the transition station on Indian Field Road.

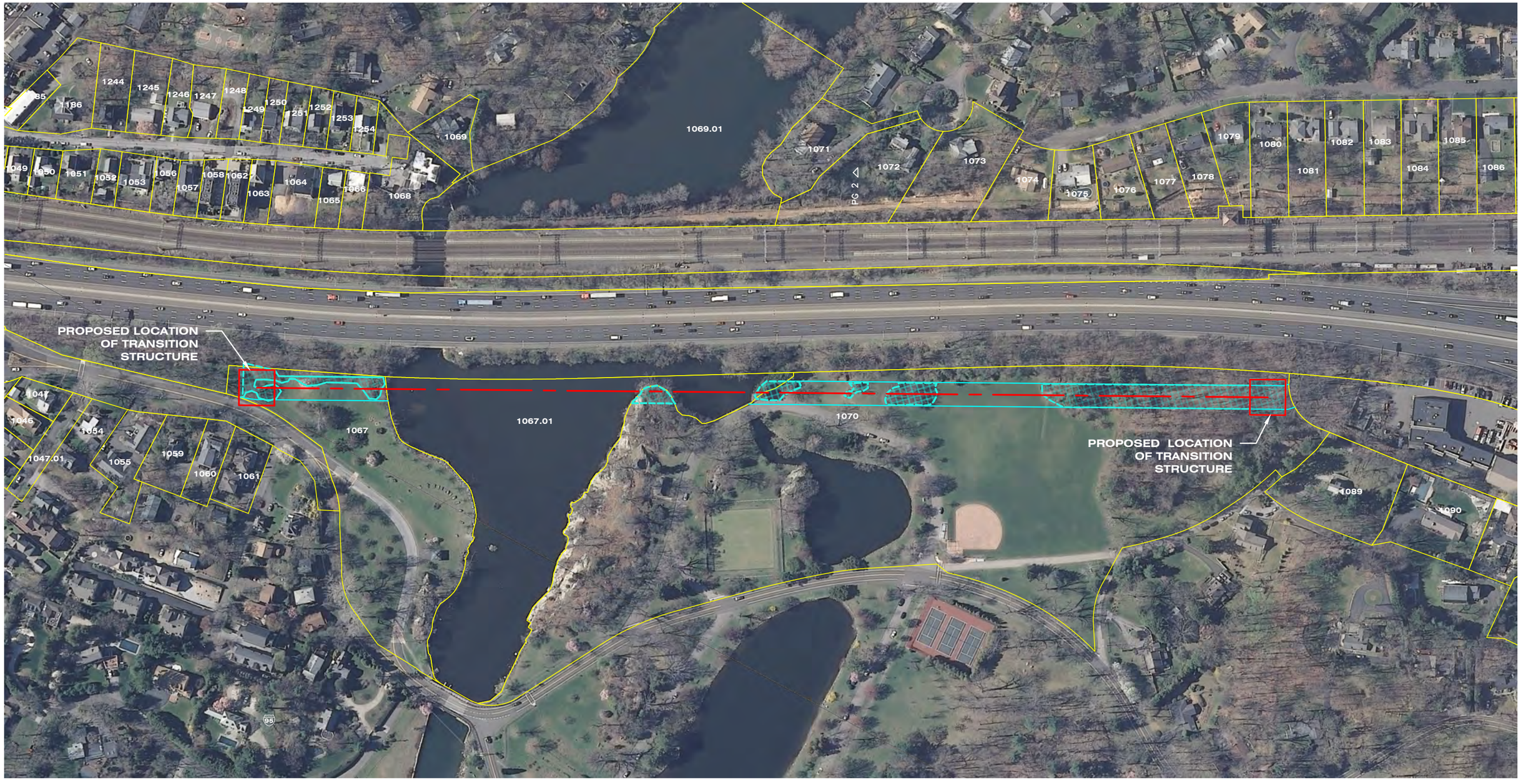


EVERSOURCE ENERGY

TITLE

GREENWICH S/S AND LINE PROJECT
BRUCE PARK OPTION
ROW CROSS SECTION DRAWING
GREENWICH, CT

BY CPS	CHKD	APP	APP
DATE 10/20/2015	DATE	DATE	DATE
H-SCALE N.T.S.	SIZE A	FIELD BOOK & PAGES	
V-SCALE N.T.S.	V.S.	R.E. DWG	
R.E. PROJ. NUMBER 403813RA		DWG NO. GREEN-BP-XS	



LEGEND

PROPOSED OVERHEAD CENTERLINE

PROPOSED EASEMENT BOUNDARY

PARCEL BOUNDARY

PROPOSED EDGE OF CLEARING

SCALE

0 50 100 200 400

Cornerstone Energy Services

EVERSOURCE ENERGY

PROPOSED POWER LINE ROUTE FROM
COS COB SUBSTATION TO GREENWICH SUBSTATION
"BRUCE PARK RECREATIONAL AREA"

SCALE: 1" = 200'	PAGE 1 OF 1	DATE: 11/20/2015

PHOTO LOG

Legend

- Existing Transmission Structure
- Photo Location

N W E S

500 250 0 500 Feet

1 inch = 500 feet

All-Points Technology Corporation

Eversource Energy

EXISTING

PHOTO	LOCATION	ORIENTATION
1	**BRUCE PARK**	**NORTHEAST**

PROPOSED

PHOTO	LOCATION	ORIENTATION
1	**BRUCE PARK**	**NORTHEAST**

ALL-POINTS TECHNOLOGY CORPORATION

EVERSOURCE ENERGY

EXISTING

PHOTO	LOCATION	ORIENTATION
2	**BRUCE PARK**	**NORTHWEST**

PROPOSED

PHOTO	LOCATION	ORIENTATION
2	**BRUCE PARK**	**NORTHWEST**

ALL-POINTS TECHNOLOGY CORPORATION

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EXISTING

PHOTO	LOCATION	ORIENTATION
3	**BRUCE PARK**	**NORTHWEST**

PROPOSED

PHOTO	LOCATION	ORIENTATION
3	**BRUCE PARK**	**NORTHWEST**

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EXISTING

PHOTO	LOCATION	ORIENTATION
4	**DAVIS AVENUE**	**NORTHWEST**

PROPOSED

PHOTO	LOCATION	ORIENTATION
4	**DAVIS AVENUE**	**NORTHWEST**

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EXISTING

PHOTO	LOCATION	ORIENTATION
5	**BRUCE PARK**	

PROPOSED

PHOTO	LOCATION	ORIENTATION
5	**BRUCE PARK**	

EXISTING

PHOTO	LOCATION	ORIENTATION
6	**BRUCE PARK**	**SOUTHWEST**

PROPOSED

PHOTO	LOCATION	ORIENTATION
6	**BRUCE PARK**	**SOUTHWEST**

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EVERSOURCE ENERGY

EXISTING

PHOTO	LOCATION	ORIENTATION
7	**BRUCE PARK**	**NORTHEAST**

PROPOSED

PHOTO	LOCATION	ORIENTATION
7	**BRUCE PARK**	**NORTHEAST**

ALL-POINTS TECHNOLOGY CORPORATION

EVERSOURCE ENERGY

EXISTING

PHOTO	LOCATION	ORIENTATION
8	**BRUCE PARK**	**NORTHEAST**

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PROPOSED

PHOTO	LOCATION	ORIENTATION
8	**BRUCE PARK**	**NORTHEAST**

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EVERSOURCE ENERGY

EXISTING

PHOTO	LOCATION	ORIENTATION
9	**BRUCE PARK**	**SOUTHWEST**

PROPOSED

PHOTO	LOCATION	ORIENTATION
9	**BRUCE PARK**	**SOUTHWEST**

EXISTING

PHOTO	LOCATION	ORIENTATION
10	**KINSMAN LANE**	**NORTHEAST**

PROPOSED

PHOTO	LOCATION	ORIENTATION
10	**KINSMAN LANE**	**NORTHEAST**

ALL-POINTS TECHNOLOGY CORPORATION

EVERSOURCE ENERGY

EXISTING

PHOTO	LOCATION	ORIENTATION
11	**HOME PLACE AT DAVIS AVENUE**	**NORTH**

PROPOSED

PHOTO	LOCATION	ORIENTATION
11	**HOME PLACE AT DAVIS AVENUE**	**NORTH**