**APPENDIX B**
**K165 LINE**
**MERRIMACK RIVER**
**MERRIMACK - LITCHFIELD, NH**

1. The K-165 line will cross the Merrimack River on one new two-pole 115' laminated wood RAX tangent structure (East) and one single pole 110' custom steel structure (West) with a span of 856.2'. The structures will have different configurations. Detailed drawings of these structures have been provided with the petition as FIGURE 1 and FIGURE 2. For the custom steel structure, as shown on the attached figures, the phase wires are spaced 10' vertically. The OPGW cable and static wire is carried on the pole above the phase wires by a support bracket approximately 12' and 11' respectively above the top phase wire. The static wire is carried 1.75' from the top of the pole and the OPGW cable is carried 0.75' from the top of the pole. As shown on FIGURE 1 the RAX structure on the East bank of the Merrimack River has a phase wire horizontal spacing of 14'. The OPGW and static wire is carried on the structures above the phase wires by a support bracket approximately 10.5' above and 6.5' laterally from the closest phase wire. Minimum distance to ground for truck traffic for 115kV is 20.1'and has been met as 60.8'of clearance is provided. A minimum ground clearance of 24' has been kept throughout the new line installment.

2. Flood water elevations for the crossings are calculated based on information found on Department of Housing and Urban Development Federal Insurance Administration's Flood Profiles for the Merrimack River in the Town of Litchfield, NH. Flood water elevations for the Merrimack River were confirmed based on information contained in insurance rate maps and Flood Insurance Study #33017CV001A Panel 503 of 701 provided by FEMA and Flood Insurance Study #33017CV001A Table 5, page 25 and Table 8, page 66, cross-section H. Both documents have an effective date of September 25, 2009. According to this information the flood elevation for the crossing location is 108.8'. Clearance is required to the 10-yr flood elevation in accordance to note 18 Section 232 of the NESC. Clearances will be above this level. All elevations are based on NAVD 88 datum.

3. These lines were designed to safely exceed the 10-year flood elevation. The area of the crossing, as required by the NESC (Table 232-1.7, Note 19), is approximately 72.7 acres. This is based on the total area of the River for a 1-mile stretch in either direction of the crossing (600' x 5,280')/43,560 sf/ac = 72.7 ac). As stated in paragraph 12 of the petition, the minimum required 115 kV conductor clearances for water surface area between 20 and 200 acres is 30.1'.

4. The sags and clearances to the water surface during a 10-year flood event for this crossing are as follows:

- PSNH investigated a multitude of weather and loading conditions for its design. The conditions investigated include NESC C2-2007

Heavy Load Conditions, minus 20 degrees F and 30 degrees F ambient temperature for the static wires, OPGW cable and phase conductors, 120 degrees F ambient temperature for the static wires and OPGW cable, and 285 degrees F for the phase conductors. Loading conditions considered both ice and no ice conditions for ambient temperatures below 32 degrees F. PSNH used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, and between the phase conductors and static wires. PSNH has determined that the weather cases and combinations listed below and shown in the profile of Exhibit 2 of this Appendix result in the minimum clearances and control over all other weather conditions and combinations.

- OPGW wire – Due to the fact that the OPGW wire is located above the phase wires, its clearance to the water surface will always exceed the minimum required NESC distance.

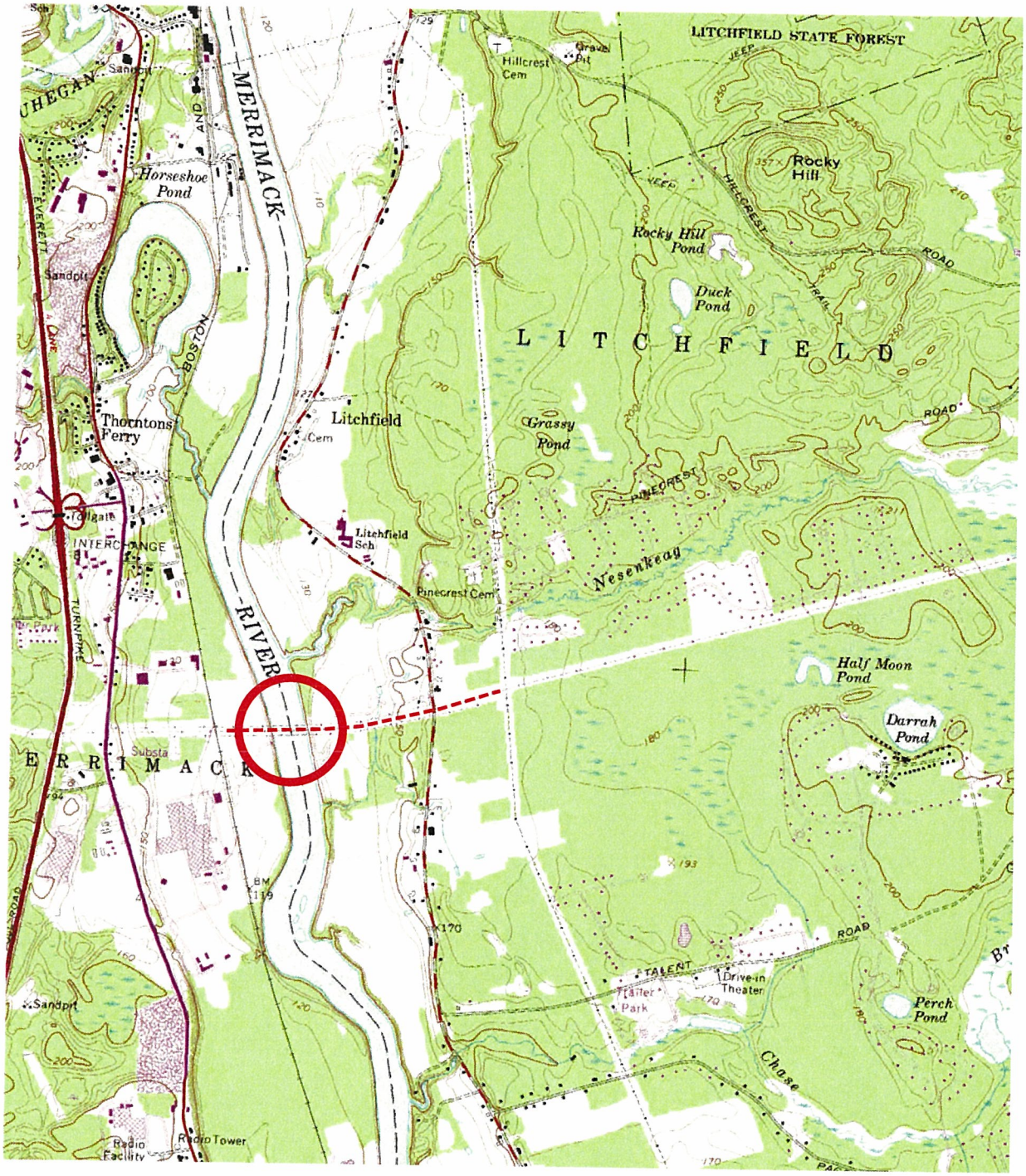
- Static wire – Due to the fact that the 19#10 alumoweld static wire is located above the phase wires, its clearance to the water surface will always exceed the minimum required NESC distance.

- NESC Heavy Loading - The maximum conductor sag for this weather case will be 32.1' with a clearance to the water surface of 64.2'

- 285 degrees F – Max operating temperature (phase wires) based on PSNH transmission standards - The maximum conductor sag for this loading case will be 55.1' with a clearance to the water surface of 41.1'. This condition produces the greatest sag in the phase wires and therefore the minimum clearance to the water surface. This design will exceed the minimum clearance requirement of 30.1 by 11' under temporary emergency conditions during a 10-yr storm event.

- Minimum phase to OPGW clearance – The weather case that would produce the minimum clearance between the phase wires and the OPGW wire would be a combination of winter weather factors. First, the phase wires would have to be at 30 deg. F just after an ice storm and would have just dropped their ice. The OPGW wire would also be at 30 deg. F and would still be iced with 1" of radial ice. Under these conditions the clearance would be 4.8' vertically and 5.5' horizontally from the OPGW wire to the closest phase wire. This results in a minimum clearance of 7.3' diagonally from the OPGW wires to the closest phase wire. Based on Section 235.C.2.a.1 and Table 235-6 section 2.a of the NESC, the minimum clearance required in any direction is 58", or approximately 4.8' [29" + (120.8 kV-50 kV) x 0.4"].

- Minimum phase to static wire clearance – The weather case that would produce the minimum clearance between the phase wires and the static wire would be a combination of winter weather factors. First, the phase wires would have to be at 30 deg. F just after an ice storm and would have just dropped their ice. The static wire would also be at 30 deg. F and would still be iced with 1" of radial ice. Under these conditions the clearance would be 9.3' vertically and 2.3' horizontally from the static wire to the closest phase wire. This results in a minimum clearance of 9.6'. Based on Section 235.C.2.a.1 and Table 235-6 section 2.a of the NESC, the minimum clearance required in any direction is 58", or approximately 4.8' [29" + (120.8 kV-50 kV) x 0.4"].




200 100 0 300

GRAPHIC SCALE
1"=200'

# EXHIBIT 1

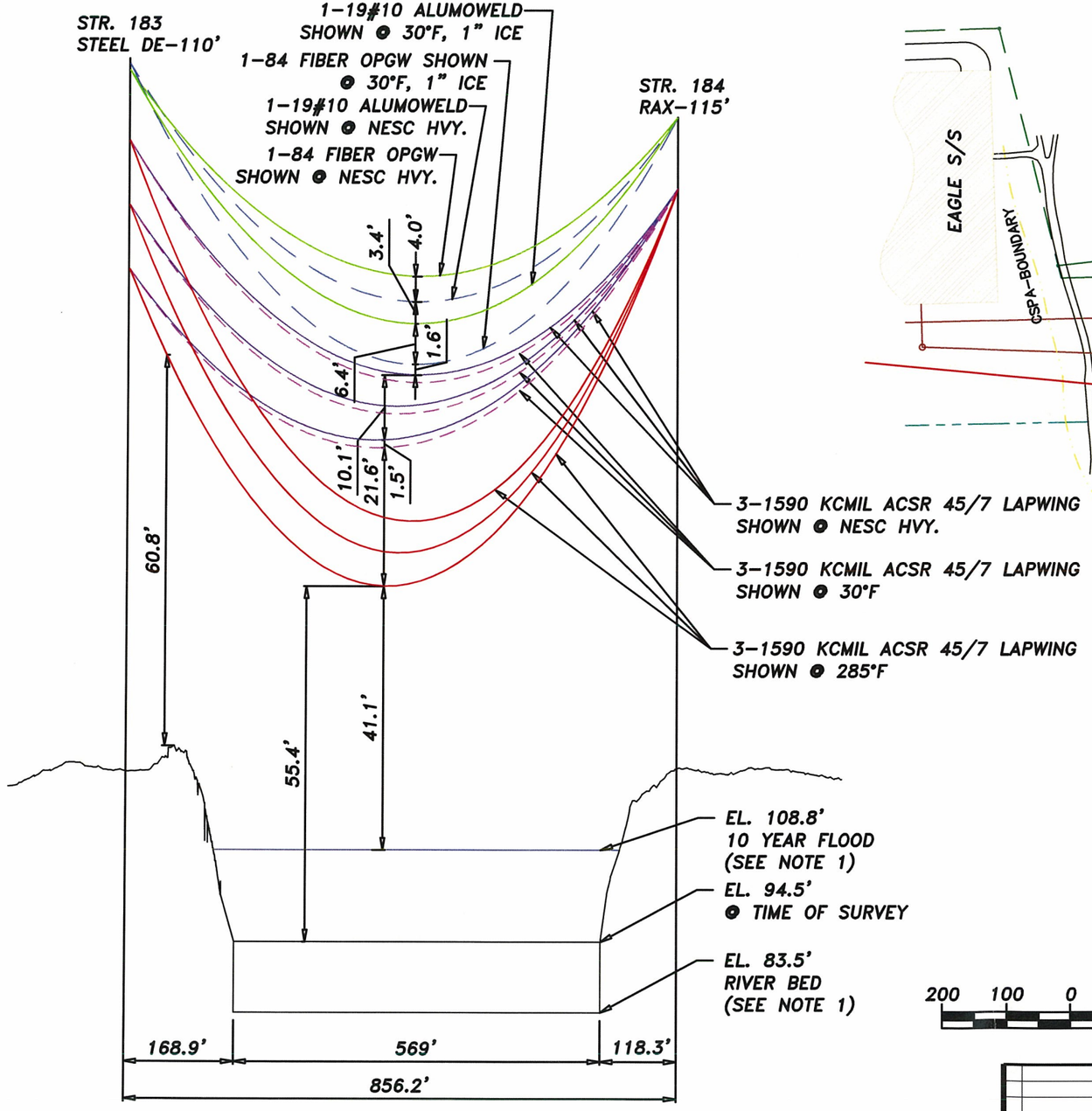
| NO. | REVISION | DATE | DRWN | CHCK | APPR |
|---|---|---|---|---|---|

DRAWN: KMW
DESIGNED: NDL
CHECKED: VSM
APPROVED: JDC

Northeast Utilities — Transmission Business

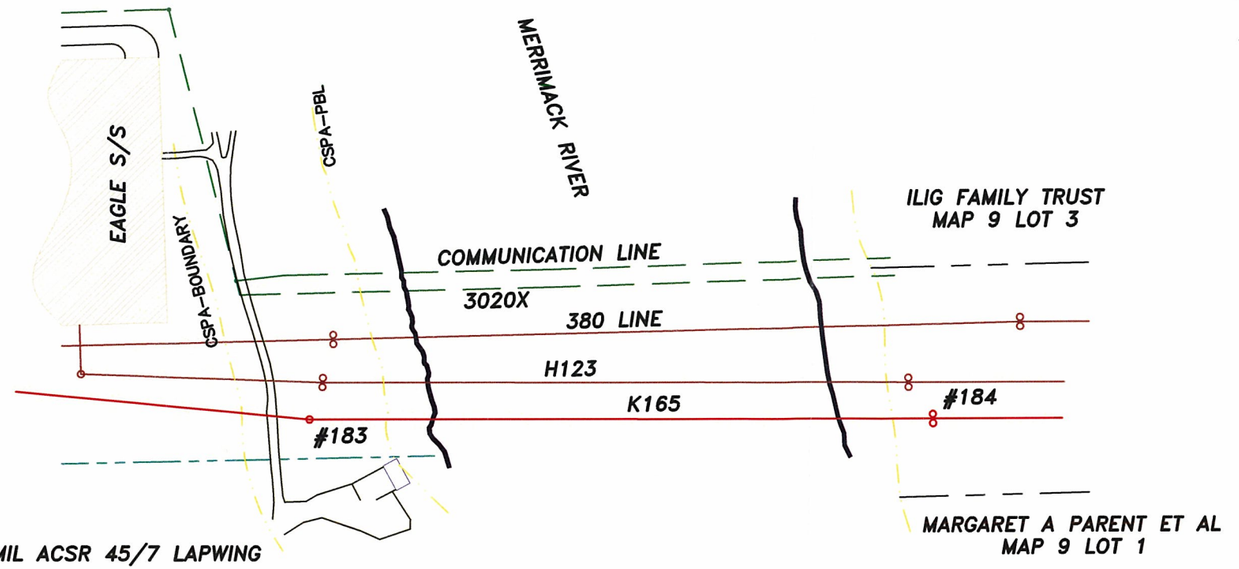
LOCATION PLAN
K–165 LINE (115 KV)
**MERRIMACK RIVER WATER CROSSING**
MERRIMACK–LITCHFIELD, NEW HAMPSHIRE

| SCALE | DATE | SHEET | DRAWING NO. |
|---|---|---|---|
| 1"=200' | 5/2011 | 1 OF 1 | D–7649–606A |




## PROFILE VIEW

SCALE: 1"=200' HORIZ.
SCALE: 1"=20' VERT.




## PLAN VIEW

SCALE: 1"=200'

N

## NOTE:

1. THE 10 YEAR FLOOD ZONE AND RIVER BED ELEVATION WAS CALCULATED USING NAVD88 DATUM.

## LEGEND:

- DENOTES FEE PROPERTY
- EDGE OF UTILITY EASEMENT
- RIVER
- T-LINE CENTERLINE
- CSPA BOUNDARY
- DISTRIBUTION LINE

## EXHIBIT 2

200 100 0 200 500

| NO. | REVISION | DATE | DRWN | CHCK | APPR |
|---|---|---|---|---|---|
| 0 | CROSSING ADJ WO#T1154C1 - EPN7163 | 6/11 | PES | VSM | JDC |

Northeast Utilities | Transmission Business

| | | | | |
|---|---|---|---|---|
| DRAWN: PES | K165 LINE (115kV) CROSSING BETWEEN STR. #183 & #184 | | | |
| DESIGNED: NDL | MERRIMACK RIVER CROSSING | | | |
| CHECKED: VSM | MERRIMACK AND LITCHFIELD, NEW HAMPSHIRE | | | |
| APPROVED: JDC | SCALE: AS NOTED | DATE: 5/2011 | SHEET: 1 OF 1 | DRAWING NO.: D-7649-606 |