

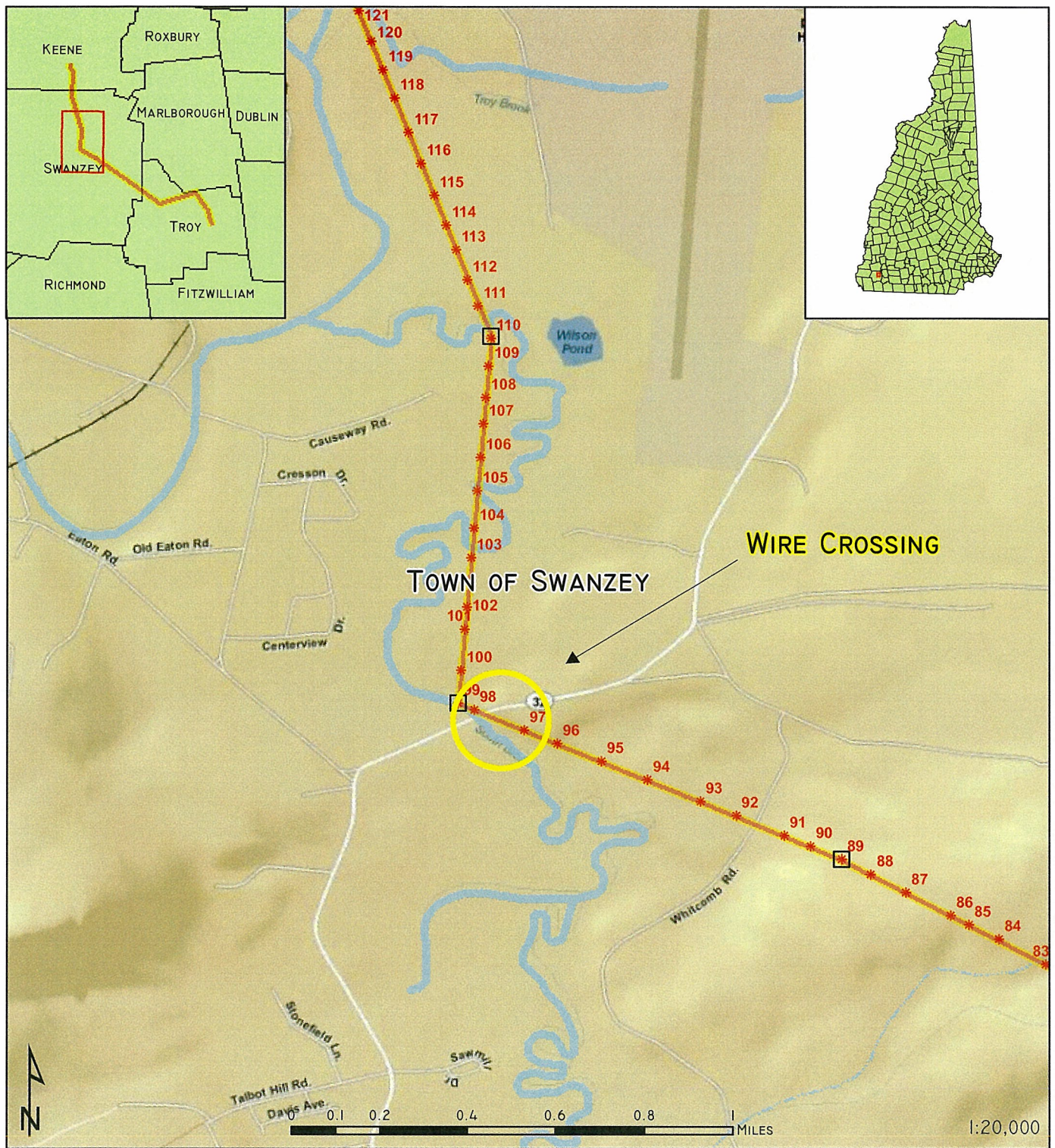
APPENDIX C

Line T-198, Structures 97-98 over the South Branch of the Ashuelot River, Swanzey, NH

1. The location of this crossing is shown on the attached location map marked as Exhibit C1.
2. The design and proposed construction of this crossing is shown on the attached PSNH Transmission Drawing entitled "PROPOSED ADSS LINE, 115 kV. – LINE T-198, MILE 8, STR 97-98, SOUTH BRANCH ASHUELOT RIVER WATER CROSSING, SWANZEY, NEW HAMPSHIRE." (Drawing No. D-7649-505) marked as Exhibit C2.
3. Line T-198 crosses the South Branch Ashuelot River on two H frame wood tangent structures with a span of 515 feet. The river width is 99 feet at time of survey. A detail of these structures has been provided with this Petition as FIGURE1 and FIGURE 4 respectively. Minimum distances to ground for truck traffic on Route 32 of 15.5 feet for the ADSS and 20.1 feet for 115kV open supply per the NESC have been met as 47.3 and 48.9 feet of clearance is provided respectively for the ADSS and the conductor wires.
4. Surface water elevations for the South Branch Ashuelot River were based on information contained in NH GRANIT, which references FEMA information. The normal flood level for this crossing is approximately 464.8 feet. The surface area of the crossing, as required by the NESC (Section 232, Note 19), is approximately 1.9 acres. This is based on the total area of the River for a 1-mile stretch in either direction of the crossing that includes the crossing based on FEMA digital maps and FEMA identified river boundaries. A GIS tool (ESRI ArcView) was used to calculate the surface area polygon. As stated in paragraph 6 of this petition, the minimum required clearances for 115 kV conductor and ADSS cable over water surface areas less than 20 acres is 22.1 and 17.5 feet, respectively.
5. As stated in NESC Table 232-1 Note 18, the surface area shall be enclosed by its high water mark and clearances shall be based on the normal flood level. In this case, the final river elevation at this location during the normal flood is 464.8 feet. As stated in paragraph 6 of this petition and paragraph 4 of this Appendix, the minimum required clearances for 115 kV conductors and ADSS cable over water surface areas less than 20 acres is 22.1 and 17.5 feet, respectively. The sags and clearances to the water surface are as follows:

- Shield wires - Due to the fact that the static wires are located above the phase wires, its clearances to the water surface will always exceed the minimum required NESC distance.
- Conductors (phase wires) – The maximum conductor sag for the NESC Heavy Loading weather case is always less than the 285 deg F maximum operating temperature (phase wires) based on PSNH transmission standards. The 285 deg F 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 22.1 feet with a clearance of 30.0 feet under temporary emergency conditions.
- For ADSS cable - The maximum ADSS sag for a weather case of ½ inch radial ice at 32 deg F, no wind is the weather condition that produces the greatest sag exceeding the NESC Heavy weather condition, and therefore the minimum clearances to the water surface. This design will exceed the minimum clearance requirement of 17.5 feet with a clearance of 27.4 feet.
- Minimum phase to ADSS clearance – The conditions that would produce the minimum clearance between the phase wires and ADSS cable would be at the maximum operating temperature of 285 deg F for the phase wires and 90 deg F for ADSS. Based on NESC Section 235 and Table 235-5(1)b for communication conductors and cables located in the supply space the vertical clearance between the communication cable and 115kV of the same utility at the structure is 40 inches (3.3 feet) and its Note 10 which states there is no clearance specified between fiber optic supply cables meeting Rule 230F1b and supply cables and conductors. Since no vertical clearance is specified, this case meets the minimum clearance diagonally of 40 inches (3.3 feet) at the structure and at mid span because of horizontal separation.
- Minimum phase to overhead ground wire (static wire) clearance – Based on NESC 235E.1, the weather case that would produce the minimum clearance between the phase wires and the static wires would be a combination of winter weather factors. The phase conductor condition is 30 deg F and the static wire condition is ½” radial ice at 30 deg F based on Table 230-1 for Zone 1. Under these conditions the vertical clearance based on NESC Table 235-6(2)a for span wires when parallel to a line is calculated to be 4.8 feet $(29'' + (115\text{kV} \times 1.05 - 50\text{kV}) \times 0.4'')$. In this case, the minimum NESC clearance of 4.8 feet between the static wire and the phase conductor is met through horizontal separation alone.

- Minimum clearance between ADSS and wires carried on different supporting structures (i.e. ADSS to distribution power lines) – The NESC condition of ½” ice, no wind at 32 deg F provides the minimum NESC clearance between the ADSS cable and wires carried by other structures. Based on Section 233 and Table 233-1, the NESC minimum clearance between ADSS which meets Rule 230E1 and open supply conductors, 750V to 22kV, is 2 feet. This clearance requirement is met in the case described by this Appendix.
- Minimum clearance between phase and wires carried on different supporting structures (i.e. phase to distribution power lines) – The maximum operating condition of 285 deg F produces the greatest sag in the phase wires and the minimum clearance between the phase wire and wires carried by other structures. Based on Section 233 and Table 233-1.4, the NESC minimum clearance between an open supply conductor of 115kV and open supply conductors 750V to 22kV is 2 feet plus the clearance calculated by Rule 233.C.2, where voltages exceed 22kV. NESC Rule 233.C.2a states that an additional clearance of 1.6 feet or $\frac{((115 \text{ kV} \times 1.05/\sqrt{3}) - 22\text{kV}) \times .4\text{in}}{12}$ is needed for 115 kV, which brings the total required minimum clearance to 3.6 feet. This clearance requirement is met in the case described by this Appendix.



VANDERWEIL

EXHIBIT C1

115 kV LINE - T-I98
MONADNOCK S/S TO EMERALD STREET S/S

LOCUS MAP - STRUCTURES 97-98

SWANZEY, NH

- SUBSTATIONS
- STRUCTURES
- T-I98 CIRCUIT

