NH PUC Docket DE 16-442:

Petition of PSNH d/b/a Eversource Energy to Construct and Maintain
Electric Lines, Neutral Wire and Fiber Optic Cable Over/Across the
Public Lands Owned by the State of NH
in Towns of Durham and Newington

SUMMARY
Revisions between Originally Submitted Petition
And Revised Engineering Design

PETITION OF PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE D/B/A EVERSOURCE ENERGY FOR LICENSES TO CONSTRUCT AND MAINTAIN ELECTRIC LINES, NEUTRAL WIRE AND FIBER OPTIC CABLE OVER AND ACROSS PUBLIC LANDS OWNED BY THE STATE OF NEW HAMPSHIRE IN THE TOWNS OF DURHAM AND NEWINGTON, NEW HAMPSHIRE

Reasons for revision

The original petition of Public Service Company of New Hampshire D/B/A Eversource Energy for licenses to construct and maintain electric lines, neutral wire and fiber optic cable at five locations over and across public lands owned by the State of New Hampshire in the Towns of Durham and Newington, New Hampshire was originally submitted on April 12, 2016 as part of the Application for Certificate of Site and Facility for the Seacoast Reliability Project. Following that submittal several engineering design changes have occurred to accommodate concerns of abutters to the project corridor as well as refine the design to align with Eversource standard structure configurations. This results in minor changes to the engineering crossing drawings and petition appendices as originally submitted, as listed below. The crossings still meet or exceed all NESC requirements.

Changes to Original Petition

Revision to paragraph 15 (page 5) of the petition:

15. As part of the redesign, 34.5kV wood pole labeled Hen3 was shifted out of the wetland and wood pole labeled Hen4 was eliminated for the design, so wetlands permits are no longer required for those structures. Reference to these poles is accordingly eliminated from this paragraph.

Changes to Appendix A

1. Paragraph #1- Revised Drawing number F10799002 (Exhibits 2 and 3) has been supplied. No changes to location plan (Exhibit 1).
2. Paragraph #3- **Change** "WT-1-UB," "WT-2-UB" and "RAX-UB" **to** "ST-1-UB", "ST-2-UB" and "SRAX-UB" respectively.
3. Paragraph #3 Bullet 1- **Change** "7.5-15 feet" **to** "7.5-13 feet"
4. Paragraph #3 Bullet 1- **Change** "nine inches" **to** "six inches"
5. Paragraph #3 Bullet 1- **Change** "7.5 feet" **to** "7.0 feet"
6. Paragraph #3 Bullet 2- **Change** "7.5-15.5 feet" **to** "7.5-12.5 feet"
7. Paragraph #3 Bullet 2- **Change** "nine inches" **to** "six inches"
8. Paragraph #3 Bullet 2- **Change** "0-2.5 feet" **to** "0-5 feet"
9. Paragraph #3 Bullet 3- **Change** "nine inches" **to** "six inches"

10. Paragraph #3 Bullet 3- **Change** "15 feet" **to** "11.75 feet"
11. Table 1 Column 3- **Change** 15.5 feet **to** 18 feet
12. Paragraph #5- **Change** "water" **to** "land"
13. **Replace** Table 3 with revised table below

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 285°F (ft)
46	98	47	84	347	46.4
47	84	48	93.5	464	46.1
48	93.5	49	86.5	217	56
49	86.5	50	88.5	295	52.7
50	88.5	51	79	295	51.5
51	79	52	93.5	325	48.6
52	93.5	53	79	409	50.1
53	79	54	88.5	351	47.5
54	88.5	55	93.5	327	49.2
55	93.5	56	88.5	506	50.9
56	88.5	57	74.5	381	41.1
57	74.5	58	65.5	634	40.4

14. **Replace** Table 4 with revised table below

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 212°F (ft)
46	98	47	84	347	26.2
47	84	48	93.5	464	26.7
48	93.5	49	86.5	217	32.1
49	86.5	50	88.5	295	30.3
50	88.5	51	79	295	31.5
51	79	52	93.5	325	26.9
52	93.5	53	79	409	30.1
53	79	54	88.5	351	25.9
54	88.5	55	93.5	327	26.6
55	93.5	56	88.5	506	25.8
56	88.5	57	74.5	381	21.6
57	74.5	58	65.5	634	24.9

15. **Replace** Table 5 with revised table below

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 120°F (ft)
46	98	47	84	347	19.15
47	84	48	93.5	464	19.35
48	93.5	49	86.5	217	27.4
49	86.5	50	88.5	295	25.1
50	88.5	51	79	295	24.9
51	79	52	93.5	325	20.7
52	93.5	53	79	409	23.5
53	79	54	88.5	351	19.7
54	88.5	55	93.5	327	18.9
55	93.5	56	88.5	506	19.4
56	88.5	57	74.5	381	23.6
57	74.5	58	65.5	634	26.9

Changes to Appendix B

1. Paragraph #1- Revised Drawing number F10799002 (Exhibit 3) has been supplied. No changes to location plan (Exhibit 1).
2. Paragraph #3- **Change** "RAX-UB" **to** "SRAX-UB".
3. Paragraph #3 - **Change** "nine inches" **to** "six inches"
4. Paragraph #3 - **Change** "15 feet" **to** "11.75 feet"
5. Table 1 Column 3- **Change** 15.5 feet **to** 18 feet
6. Paragraph #5- **Change** "water" **to** "land"
7. **Replace** Table 3 with revised table below

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 285°F (ft)
59	50	60	66	264	33.2
60	66	61	79	393	43.2

8. **Replace** Table 4 with revised table below

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 212°F (ft)
59	50	60	66	264	21.6
60	66	61	79	393	23.1

9. **Replace** Table 5 with revised table below

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 120°F (ft)
59	50	60	66	264	23.6
60	66	61	79	393	25.1

Changes to Appendix C

1. Paragraph #1- Revised Drawing number F10799004 (Exhibit 5) has been supplied. No changes to location plan (Exhibit 4).
2. Paragraph #3- **Change** "WT-1-UB **to** "ST-1-UB".
3. Paragraph #3 - **Change** "7.5-15 feet" **to** "7.5-13 feet"
4. Paragraph #3 - **Change** "nine inches" **to** "six inches"
5. Paragraph #3 - **Change** "7.5 feet" **to** "7.0 feet"
6. Table 1 Column 3- **Change** 15.5 feet **to** 18 feet
7. Paragraph #5- **Change** "water" **to** "land"
8. **Replace** Table 3 with revised table below

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 285°F (ft)
74	93.5	75	84	355	47.4
75	84	76	84	414	53.1
76	84	77	84	415	47.4

77	84	78	84	369	42.1
78	84	79	103	376	44.9
79	103	80	103	411	61.5

9. **Replace** Table 4 with revised table below

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 212°F (ft)
74	93.5	75	84	355	30.1
75	84	76	84	414	35.1
76	84	77	84	415	30.1
77	84	78	84	369	25.5
78	84	79	103	376	25.4
79	103	80	103	411	44.0

10. **Replace** Table 5 with revised table below

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 120°F (ft)
74	93.5	75	84	355	19.1
75	84	76	84	414	29.45
76	84	77	84	415	22.96
77	84	78	84	369	19.25
78	84	79	103	376	19.98
79	103	80	103	411	38.28

Changes to Appendix D

1. Paragraph #1- Revised Drawing number F10799006 (Exhibit 7) has been supplied. No changes to location plan (Exhibit 6).
2. Paragraph #3- **Change** "WT-2-UB", "SPRA-BP" and "WA-2" **to** "ST-2-UB", "SPT" and "SA-2" respectively.
3. Paragraph #3 - **Change** "7-15.5 feet" **to** "7-12.5 feet"
4. Paragraph #3 - **Change** "nine inches" **to** "six inches"
5. Paragraph #3 - **Change** "ten feet" **to** "10.25 feet"
6. Table 1 Column 3- **Change** 15.5 feet **to** 18 feet
7. Paragraph #5- **Change** "water" **to** "land"
8. **Replace** Table 3 with revised table below

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 285°F (ft)
123	100	124	100	465	25.8
124	100	125	84	387	52.7
125	84	126	84	506	28.3
126	84	127	66	340	30.1
127	66	128	84	463	27.7
128	84	129	79	430	33.4

9. **Replace** Table 4 with revised table below

Structure	Height	Structure	Height	Span	Clearance

(Back)	(Ft)	(Ahead)	(ft)	(ft)	At 212°F (ft)
9	66.5	10	70	470	22.9
10	70	11	53	394	50.5
11	53	12	48.5	508	24.5
12	48.5	13	39.5	342	25.7
13	39.5	14	61	440	32.3
14	61	15	56	60	55.9

10. **Replace** Table 5 with revised table below

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 120°F (ft)
9	66.5	10	70	470	18.2
10	70	11	53	394	42.75
11	53	12	48.5	508	18.6
12	48.5	13	39.5	342	19.4
13	39.5	14	61	440	27.4
14	61	15	56	60	NA

Changes to Appendix E

1. Paragraph #1- Revised Drawing number F10799008 (Exhibit 9) has been supplied. No changes to location plan (Exhibit 8).
2. Paragraph #3- **Change** "WT-2-UB" and "WA-2" **to** "ST-2-UB" and "SA-2" respectively.
3. Paragraph #3 - **Change** "7-15.5 feet" **to** "7-12.5 feet"
4. Paragraph #3 - **Change** "nine inches" **to** "six inches"
5. Paragraph #3 - **Change** "ten feet" **to** "10.25 feet"
6. Paragraph #5- **Change** "water" **to** "land"
7. **Replace** Table 3 with revised table below

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 285°F (ft)
131	75	132	79	486	29.5
132	79	133	75	357	33.1

15. A wetlands permit from the New Hampshire Department of Environmental Services (NHDES) and the U.S. Army Corp or Engineers (USACE) is required for the installation of Structures 48 and Hen1 (see Appendix A), and for access during construction. The appropriate wetlands permits will be applied for and obtained by PSNH prior to the installation of any new structures in wetlands, in conjunction with PSNH's Seacoast Reliability Project siting application for the F107 Line. The F107 crossings are subject to approval and the issuance of a certificate of site and facility by the New Hampshire Site Evaluation Committee (NHSEC) as part of PSNH's Seacoast Reliability Project filing. All approvals as part of that process will be obtained prior to construction.

16. For all of the overhead crossings which are the subject of this petition, PSNH owns a permanent, minimum 100 foot wide easement or a 100 foot wide use and occupancy utility corridor for its lines and facilities on the public lands of the proposed crossing locations. Each of the overhead crossings will be constructed within the limits of those easements and corridors.

17. Aerial crossings of NH Route 108 are required as part of the crossing between structures 59 and 61 described in Appendix B of this petition. The appropriate NHDOT permission agreements will be applied for and obtained by PSNH prior to the installation of any new structure that will impact NHDOT jurisdictional areas, in conjunction with PSNH's Seacoast Reliability Project siting application.

18. All Seacoast Reliability Project structures in Newington, including all those proposed for the public land crossings which are the subject of this petition, will need an air obstruction determination from the Federal Aviation Administration (FAA) under Federal Aviation Regulation Part 77.9(b), due to proximity to the Portsmouth International Airport at Pease. Determinations will be requested from the FAA and appropriate measures will be taken by PSNH prior to the installation of any new structures that will impact FAA jurisdictional areas.

19. PSNH submits that the licenses petitioned for herein may be exercised without substantially affecting the rights of the public in the public lands covered in this petition. Minimum safe line clearances above all surfaces will be maintained at all times. The use and enjoyment by the public of the public lands will not be diminished in any material respect as a result of the overhead lines.

WHEREFORE, PSNH respectfully requests that the Commission:

a. Find that the licenses petitioned for herein may be exercised without substantially affecting the public rights in the public lands of the State of New Hampshire which are the subject of this petition;

REVISED
APPENDIX A

F107 & 380 & 3162 Lines
Spans 46-58
State of New Hampshire-Fish and Game Department
DURHAM, NH

1. The design and proposed construction of this crossing is shown on the attached Eversource Energy Drawings entitled "Seacoast Reliability Project Structures #46-56, State of NH Property Crossing" (Drawing No. F10799002 Sheet 1 of 2) and "Seacoast Reliability Project Structures #56-61, State of NH Property Crossing" (Drawing No. F10799002 Sheet 2 of 2) marked as Exhibit 2 and Exhibit 3, respectively.

2. The location of this crossing is shown on the attached Location Plan marked as Exhibit 1.

3. Lines F107, 380 and 3162 will cross the public land north of Bennett Road primarily on 1-pole, direct embed, steel tangent suspension structures designated as Type ST-1-UB, and on a direct embed, steel tangent suspension structures designated as Type ST-2-UB. Structure 49 is a 1-pole, steel deadend structure on a concrete foundation designated as Type SPDE-VUB. Structures 57 and 58 are two-pole, direct embed tangent structures designated as Type SRAX-UB. Details of these structures are shown on Exhibit 11. Above ground structure heights (AGH) for each of the crossing structures is shown on Exhibits 2 and 3.

- As shown on Exhibit 11, for the Type ST-1-UB structures the 115kV phase wires have an approximate separation at the structure of 7.5 -13 feet vertically and 0-13 feet horizontally in a delta configuration. The static wire is carried on the structure by a support bracket approximately six inches down from the top of the structure. The 34.5kV phase wires are arranged horizontally approximately 15 feet below the lowest 115kV conductor and have an approximate separation at the structure of 0-5 feet vertically and 2.5-6 feet horizontally. The neutral wire is carried on the structure by a support bracket approximately 70 feet down below the 34.5kV phase wires.

- As shown on Exhibit 11, for the Type ST-2-UB structures the 115kV phase wires have an approximate separation at the structure of 7.5 -12.5 feet vertically and 0-13 feet horizontally in a delta configuration. The static wire is carried on the structure by a support bracket approximately six inches down from the top of the structure. The 34.5kV phase wires are arranged horizontally approximately 15.5 feet below the lowest 115kV conductor and have an approximate separation at the structure of 0-5 feet vertically and 2.5-6 feet horizontally. The neutral wire is carried on the structure by a support bracket approximately seven feet down below the 34.5kV phase wires.

- As shown on Exhibit 11, for the Type SPDE-VUB structures the 115kV phase wires have an approximate separation at the structure of ten feet vertically and zero feet horizontally in a vertical configuration. The static wire is carried on the structure by a support bracket approximately six inches down from the top of the structure. The 34.5kV phase wires are arranged vertically approximately 13 feet below the lowest 115kV conductor and have an approximate separation at the structure of 5 feet vertically and 0 feet horizontally. The neutral wire is carried on the structure by a support bracket approximately six feet down below the 34.5kV phase wires.

- As shown on Exhibit 11, for the Type SRAX-UB structures the 115kV phase wires have an approximate separation at the structure of zero feet vertically and 14 feet horizontally in a horizontal configuration. The static wire is carried on the structure by a support bracket approximately six inches down from the top of the structure. The 34.5kV phase wires are arranged on a bracket in a spacer cable bundle approximately 11.75 feet below the lowest 115kV conductor and have an approximate separation of 24 inches within the bundle. The neutral wire is carried as the messenger portion of the spacer cable bundle. Structures marked as "Hen" are single wood pole structures used to support the 34.5kV spacer cable on long spans. Only the 34.5kV cables and messenger are attached to the pole on a support bracket located approximately 6 inches from the top of the pole. All NESC clearances at the structure as described in paragraph 12 and 13 of the petition have been met by exceeding the horizontal and/or vertical clearances required.

4. Information for the mapping of property, physical features, adjacent transmission lines and ROW boundaries were collected from various sources as detailed below:

- The property lines are based on information from Town of Durham Tax maps
- The physical features such as the location of railroads were digitized from geo-referenced aerial imagery of the project area, dated 2013.
- The existing and future limits of the electric right-of-way (ROW) as well as the road ROW are based on geo-references information received from NHDOT and ground survey, dated 2015.
- Topography and obstacle survey were from aerial LIDAR survey, dated 2013.

5. PSNH has, through the design and modeling process, investigated a multitude of weather and loading and service conditions to verify that proper NESC and PSNH required clearances will be maintained. The NESC clearance verifications, combined with PSNH standard conductor and shield wire clearance and spacing requirements, ensure minimum clearances will be maintained under all service conditions. These conditions include the maximum operating temperature of each

conductor and cable (285°F for 115kV, 212°F for 34.5kv and 120°F for 0kV), and conductor at 32°F with 0.5 inches of radial ice and 32°F with no ice. PSNH used these design conditions and all combinations thereof to determine the minimum clearance of all conductors to the both ground and aerial obstacles, between the phase conductors and OPGW cable and neutral conductors. All NESC clearances have been met by exceeding the horizontal and/or vertical clearances required. Per PSNH standards, span by span verifications were completed to validate the specified NESC clearance requirements were met. The applicable clearances mandated by the NESC and internal PSNH standards are identified and summarized below:

Table 1-Required Vertical Clearances*

Vertical Clearance Type	NESC Minimum Design Clearance (ft)	PSNH Standard Design Clearance (ft)
115kV to Ground- Vehicle/Horse Access**	20.1	24
34.5kV to Ground- Vehicle/Horse Access**	18.5	19.5
0kV to Ground- Vehicle/Horse Access**,***	15.5	18
115kV to 115kV (At Structure)	5.1	9
34.5kV to 34.5kV (At Structure)	2.3	4.5
115kV to 34.5kV (At Structure)	4.1	8
115kV to 0kV (At Structure)	3.4	8
34.5kV to 0kV (At Structure)	1.4	5.6
115kV to 115kV (In Span)	4.4	9
34.5kV to 34.5kV (In Span)	1.7	4.5
115kV to 34.5kV (In Span)	3.4	8
115kV to 0kV(In Span)	2.0	8
34.5kV to 0kV (In Span)	1.3	1.3

* Clearances defined in paragraph 11 and 12 of the petition
**PSNH designs all new transmission lines for vehicle access clearance regardless of accessibility
***Because PSNH designs all new lines with a neutral clearance of 18 feet the 34.5kV clearance to ground will always exceed the 18.5 feet required clearance.

Table 2-Required Horizontal Clearances*

Horizontal Clearance Type	NESC Minimum Design Clearance (ft)	PSNH Standard Design Clearance (ft)
115kV to 115kV (At Structure)	4.8	8
34.5kV to 34.5kV (At Structure)	1.9	5
115kV to 34.5kV (At Structure)	3.8	7
115kV to 0kV (At Structure)	3.1	7
34.5kV to 0kV (At Structure)	1.5	1.75
115kV to 115kV (In Span)	6.7	8
34.5kV to 34.5kV (In Span)	4.6	5
115kV to 34.5kV (In Span)	5.9	7
115kV to 0kV(In Span)	5.4	7
34.5kV to 0kV (In Span)	4.2	5

*Clearances defined in paragraph 12 of the petition

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

- 115 kV Phase Conductors Vertical Clearance –The 285°F weather condition for the maximum operating temperature of the phase conductors produces the greatest sag in the phase wires and therefore the minimum clearance to the ground. A summary of the clearances as part of this crossing is listed in the table below. These clearances exceed the vertical clearance requirements for 115kV phase conductors over roadways and ground accessible by vehicles as listed above.

Table 3- 115kV Summary of Clearances at Crossing

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 285°F (ft)
46	98	47	84	347	46.4
47	84	48	93.5	464	46.1
48	93.5	49	86.5	217	56
49	86.5	50	88.5	295	52.7
50	88.5	51	79	295	51.5
51	79	52	93.5	325	48.6
52	93.5	53	79	409	50.1
53	79	54	88.5	351	47.5
54	88.5	55	93.5	327	49.2
55	93.5	56	88.5	506	50.9
56	88.5	57	74.5	381	41.1
57	74.5	58	65.5	634	40.4

- 34.5 kV Phase Conductors Vertical Clearance –The 212°F weather condition for the maximum operating temperature of the phase conductors produces the greatest sag in the phase wires and therefore the minimum clearance to the ground. A summary of the clearances as part of this crossing is listed in the table below. These clearances exceed the vertical clearance requirements for 34.5kV phase conductors over roadways and ground accessible by vehicles as listed above.

Table 4- 34.5kV Summary of Clearances at Crossing

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 212°F (ft)
46	98	47	84	347	26.2
47	84	48	93.5	464	26.7
48	93.5	49	86.5	217	32.1
49	86.5	50	88.5	295	30.3
50	88.5	51	79	295	31.5
51	79	52	93.5	325	26.9
52	93.5	53	79	409	30.1
53	79	54	88.5	351	25.9
54	88.5	55	93.5	327	26.6

55	93.5	56	88.5	506	25.8
56	88.5	57	74.5	381	21.6
57	74.5	58	65.5	634	24.9

- 0 kV Neutral- For the neutral conductors the 120°F weather condition for the maximum operating temperature of the phase conductors produces the greatest sag in the phase wires and therefore the minimum clearance to the ground. A summary of the clearances as part of this crossing is listed in the table below. These clearances exceed the vertical clearance requirements for 0kV neutral conductors over roadways and ground accessible by vehicles as listed above.

Table 5- 0kV Summary of Clearances at Crossing

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 120°F (ft)
46	98	47	84	347	19.15
47	84	48	93.5	464	19.35
48	93.5	49	86.5	217	27.4
49	86.5	50	88.5	295	25.1
50	88.5	51	79	295	24.9
51	79	52	93.5	325	20.7
52	93.5	53	79	409	23.5
53	79	54	88.5	351	19.7
54	88.5	55	93.5	327	18.9
55	93.5	56	88.5	506	19.4
56	88.5	57	74.5	381	23.6
57	74.5	58	65.5	634	26.9

- Conductors and Cables Horizontal Clearance – PSNH Standard centerline spacing is based upon the geometric configuration of the structures along a line assuming a maximum 800 foot span length under 6 pounds per square foot (“psf”) sustained transverse wind. The F107 Line is spaced apart from adjacent lines as specified by PSNH standard and no span along the PSNH portion of the F107 Line exceeds an 800 foot length. Furthermore, a span by span verification was completed assuming a 9psf sustained transverse wind to ensure the horizontal clearances above were exceeded.

REVISED
APPENDIX B

F107 & 3162 Lines
Spans 59-61
State of New Hampshire-Fish and Game Department
DURHAM, NH

1. The design and proposed construction of this crossing is shown on the attached Eversource Energy Drawings entitled "Seacoast Reliability Project Structures #56-61, State of NH Property Crossing" (Drawing No. F10799002 Sheet 2 of 2) marked as Exhibit 3.

2. The location of this crossing is also shown on the attached Location Plan marked as Exhibit 1.

3. Lines F107and 3162 will cross the public land north of Bennett Road. Structure 59 is a multipole, steel, running angle structure on a concrete foundation designated as Type C-UB. Structures 60 and 61 are two-pole, direct embed tangent structures designated as Type SRAX-UB. Details of these structures are shown on Exhibit 11. Above ground structure heights (AGH) for each of the crossing structures is shown on Exhibit 3. As shown on Exhibit 11, for the Type SRAX-UB structures the 115kV phase wires have an approximate separation at the structure of zero feet vertically and 14 feet horizontally in a horizontal configuration. The static wire is carried on the structure by a support bracket approximately six inches down from the top of the structure. The 34.5kV phase wires are arranged on a bracket in a spacer cable bundle approximately 11.75 feet below the lowest 115kV conductor and have an approximate separation of 24 inches within the bundle. The neutral wire is carried as the messenger portion of the spacer cable bundle. Structures marked as "Hen" are single wood pole structures used to support the 34.5kV spacer cable on long spans. Only the 34.5kV cables and messenger are attached to the pole on a support bracket located approximately 6 inches from the top of the pole. As shown on Exhibit 11, for the Type C-UB structure the 115kV phase wires have an approximate separation at the structure of zero feet vertically and 14 feet horizontally in a horizontal configuration. The static wire is carried on the structure by a support bracket approximately twelve inches down from the top of the structure. The 34.5kV phase wires are arranged on a bracket in a spacer cable bundle approximately 15.75 feet below the lowest 115kV conductor and have an approximate separation of 24 inches within the bundle. The neutral wire is carried as the messenger portion of the spacer cable bundle. Structures marked as "Hen" are single wood pole structures used to support the 34.5kV spacer cable on long spans. Only the 34.5kV cables and messenger are attached to the pole on a support bracket located approximately 6 inches from the top of the pole. All NESC clearances at the structure as described in paragraph 12 and 13 of the petition have been met by exceeding the horizontal and/or vertical clearances required.

4. Information for the mapping of property, physical features, adjacent transmission lines and ROW boundaries were collected from various sources as detailed below:

- The property lines are based on information from Town of Durham Tax maps
- The physical features such as the location of railroads were digitized from geo-referenced aerial imagery of the project area, dated 2013.

- The existing and future limits of the electric right-of-way (ROW) as well as the road ROW are based on geo-references information received from NHDOT and ground survey, dated 2015.
- Topography and obstacle survey were from aerial LIDAR survey, dated 2013.

5. PSNH has investigated through the design and modeling process a multitude of weather and loading and service conditions to verify that proper NESC and PSNH required clearances will be maintained. The NESC clearance verifications, combined with PSNH standard conductor and shield wire clearance and spacing requirements, ensure minimum clearances will be maintained under all service conditions. These conditions include the maximum operating temperature of each conductor and cable (285°F for 115kV, 212°F for 34.5kv and 120°F for 0kV), and conductor at 32°F with 0.5 inches of radial ice and 32°F with no ice. PSNH used these design conditions and all combinations thereof to determine the minimum clearance of all conductors to the both ground and aerial obstacles, between the phase conductors and OPGW cable and neutral conductors. All NESC clearances have been met by exceeding the horizontal and/or vertical clearances required. Per PSNH standards, span by span verifications were completed to validate the specified NESC clearance requirements were met. The applicable clearances mandated by the NESC and internal PSNH standards are identified and summarized below:

Table 1-Required Vertical Clearances*

Vertical Clearance Type	NESC Minimum Design Clearance (ft)	PSNH Standard Design Clearance (ft)
115kV to Ground- Vehicle/Horse Access**	20.1	24
34.5kV to Ground- Vehicle/Horse Access**	18.5	19.5
0kV to Ground- Vehicle/Horse Access**,***	15.5	18
115kV to 115kV (At Structure)	5.1	9
34.5kV to 34.5kV (At Structure)	2.3	4.5
115kV to 34.5kV (At Structure)	4.1	8
115kV to 0kV (At Structure)	3.4	8
34.5kV to 0kV (At Structure)	1.4	5.6
115kV to 115kV (In Span)	4.4	9
34.5kV to 34.5kV (In Span)	1.7	4.5
115kV to 34.5kV (In Span)	3.4	8
115kV to 0kV(In Span)	2.0	8
34.5kV to 0kV (In Span)	1.3	1.3

* Clearances defined in paragraph 11 and 12 of the petition
**PSNH designs all new transmission lines for vehicle access clearance regardless of accessibility
***Because PSNH designs all new lines with a neutral clearance of 18 feet the 34.5kV clearance to ground will always exceed the 18.5 feet required clearance.

Table 2-Required Horizontal Clearances*

Horizontal Clearance Type	NESC Minimum Design Clearance (ft)	PSNH Standard Design Clearance (ft)
115kV to 115kV (At Structure)	4.8	8
34.5kV to 34.5kV (At Structure)	1.9	5

115kV to 34.5kV (At Structure)	3.8	7
115kV to 0kV (At Structure)	3.1	7
34.5kV to 0kV (At Structure)	1.5	1.75
115kV to 115kV (In Span)	6.7	8
34.5kV to 34.5kV (In Span)	4.6	5
115kV to 34.5kV (In Span)	5.9	7
115kV to 0kV(In Span)	5.4	7
34.5kV to 0kV (In Span)	4.2	5

*Clearances defined in paragraph 12 of the petition

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

- 115 kV Phase Conductors Vertical Clearance –The 285°F weather condition for the maximum operating temperature of the phase conductors produces the greatest sag in the phase wires and therefore the minimum clearance to the ground. A summary of the clearances as part of this crossing is listed in the table below. These clearances exceed the vertical clearance requirements for 115kV phase conductors over roadways and ground accessible by vehicles as listed above.

Table 3- 115kV Summary of Clearances at Crossing

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 285°F (ft)
59	50	60	66	264	33.2
60	66	61	79	393	43.2

- 34.5 kV Phase Conductors Vertical Clearance –The 212°F weather condition for the maximum operating temperature of the phase conductors produces the greatest sag in the phase wires and therefore the minimum clearance to the ground. A summary of the clearances as part of this crossing is listed in the table below. These clearances exceed the vertical clearance requirements for 34.5kV phase conductors over roadways and ground accessible by vehicles as listed above.

Table 4- 34.5kV Summary of Clearances at Crossing

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 212°F (ft)
59	50	60	66	264	21.6
60	66	61	79	393	23.1

- 0 kV Neutral- For the neutral conductors the 120°F weather condition for the maximum operating temperature of the phase conductors produces the greatest sag in the phase wires and therefore the minimum clearance to the

ground. A summary of the clearances as part of this crossing is listed in the table below. These clearances exceed the vertical clearance requirements for 0kV neutral conductors over roadways and ground accessible by vehicles as listed above.

Table 5- 0kV Summary of Clearances at Crossing

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 120°F (ft)
59	50	60	66	264	23.6
60	66	61	79	393	25.1

- Conductors and Cables Horizontal Clearance – PSNH Standard centerline spacing is based upon the geometric configuration of the structures along a line assuming a maximum 800 foot span length under 6 pounds per square foot ("psf") sustained transverse wind. The F107 Line is spaced apart from adjacent lines as specified by PSNH standard and no span along the PSNH portion of the F107 Line exceeds an 800 foot length. Furthermore, a span by span verification was completed assuming a 9psf sustained transverse wind to ensure the horizontal clearances above were exceeded.

REVISED
APPENDIX C

F107 & 3162 Lines
Spans 74-80
State of New Hampshire-Fish and Game Department
DURHAM, NH

1. The design and proposed construction of this crossing is shown on the attached Eversource Energy Drawings entitled "Seacoast Reliability Project Structures #74-80, State of NH Property Crossing" (Drawing No. F10799004) marked as Exhibit 5.

2. The location of this crossing is shown on the attached Location Plan marked as Exhibit 4.

3. Lines F107 and 3162 will cross the public land east of Sandy Brook Drive primarily on 1-pole, direct embed, steel tangent suspension structures designated as Type ST-1-UB. Details of these structures are shown on Exhibit 11. Above ground structure heights (AGH) for each of the crossing structures is shown on Exhibit 5. As shown on Exhibit 11, for the Type ST-1-UB structures the 115kV phase wires have an approximate separation at the structure of 7.5 -13 feet vertically and 0-13 feet horizontally in a delta configuration. The static wire is carried on the structure by a support bracket approximately six inches down from the top of the structure. The 34.5kV phase wires are arranged horizontally approximately 15 feet below the lowest 115kV conductor and have an approximate separation at the structure of 0-5 feet vertically and 2.5-6 feet horizontally. The neutral wire is carried on the structure by a support bracket approximately 70feet down below the 34.5kV phase wires. All NESC clearances at the structure as described in paragraph 12 and 13 of the petition have been met by exceeding the horizontal and/or vertical clearances required.

4. Information for the mapping of property, physical features, adjacent transmission lines and ROW boundaries were collected from various sources as detailed below:

- The property lines are based on information from Town of Durham Tax maps
- The physical features such as the location of railroads were digitized from geo-referenced aerial imagery of the project area, dated 2013.
- The existing and future limits of the electric right-of-way (ROW) as well as the road ROW are based on geo-references information received from NHDOT and ground survey, dated 2015.
- Topography and obstacle survey were from aerial LIDAR survey, dated 2013.

5. PSNH has investigated through the design and modeling process a multitude of weather and loading and service conditions to verify that proper NESC and PSNH required clearances will be maintained. The NESC clearance verifications, combined with PSNH standard conductor and shield wire clearance and spacing requirements, ensure minimum clearances will be maintained under all service conditions. These conditions include the maximum operating temperature of each conductor and cable (285^{o}F for 115kV, 212^{o}F for 34.5kv and 120^{o}F for 0kV), and conductor at 32^{o}F with 0.5 inches of radial ice and 32^{o}F with no ice. PSNH used these

design conditions and all combinations thereof to determine the minimum clearance of all conductors to the both ground and aerial obstacles, between the phase conductors and OPGW cable and neutral conductors. All NESC clearances have been met by exceeding the horizontal and/or vertical clearances required. Per PSNH standards, span by span verifications were completed to validate the specified NESC clearance requirements were met. The applicable clearances mandated by the NESC and internal PSNH standards are identified and summarized below:

Table 1-Required Vertical Clearances*

Vertical Clearance Type	NESC Minimum Design Clearance (ft)	PSNH Standard Design Clearance (ft)
115kV to Ground- Vehicle/Horse Access**	20.1	24
34.5kV to Ground- Vehicle/Horse Access**	18.5	19.5
0kV to Ground- Vehicle/Horse Access**,***	15.5	18
115kV to 115kV (At Structure)	5.1	9
34.5kV to 34.5kV (At Structure)	2.3	4.5
115kV to 34.5kV (At Structure)	4.1	8
115kV to 0kV (At Structure)	3.4	8
34.5kV to 0kV (At Structure)	1.4	5.6
115kV to 115kV (In Span)	4.4	9
34.5kV to 34.5kV (In Span)	1.7	4.5
115kV to 34.5kV (In Span)	3.4	8
115kV to 0kV(In Span)	2.0	8
34.5kV to 0kV (In Span)	1.3	1.3

* Clearances defined in paragraph 11 and 12 of the petition
**PSNH designs all new transmission lines for vehicle access clearance regardless of accessibility
***Because PSNH designs all new lines with a neutral clearance of 18 feet the 34.5kV clearance to ground will always exceed the 18.5 feet required clearance.

Table 2-Required Horizontal Clearances*

Horizontal Clearance Type	NESC Minimum Design Clearance (ft)	PSNH Standard Design Clearance (ft)
115kV to 115kV (At Structure)	4.8	8
34.5kV to 34.5kV (At Structure)	1.9	5
115kV to 34.5kV (At Structure)	3.8	7
115kV to 0kV (At Structure)	3.1	7
34.5kV to 0kV (At Structure)	1.5	1.75
115kV to 115kV (In Span)	6.7	8
34.5kV to 34.5kV (In Span)	4.6	5
115kV to 34.5kV (In Span)	5.9	7
115kV to 0kV(In Span)	5.4	7
34.5kV to 0kV (In Span)	4.2	5

*Clearances defined in paragraph 12 of the petition

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

- 115 kV Phase Conductors Vertical Clearance –The 285°F weather condition for the maximum operating temperature of the phase conductors produces the greatest sag in the phase wires and therefore the minimum clearance to the ground. A summary of the clearances as part of this crossing is listed in the table below. These clearances exceed the vertical clearance requirements for 115kV phase conductors over roadways and ground accessible by vehicles as listed above.

Table 3- 115kV Summary of Clearances at Crossing

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 285°F (ft)
74	93.5	75	84	355	47.4
75	84	76	84	414	53.1
76	84	77	84	415	47.4
77	84	78	84	369	42.1
78	84	79	103	376	44.9
79	103	80	103	411	61.5

- 34.5 kV Phase Conductors Vertical Clearance –The 212°F weather condition for the maximum operating temperature of the phase conductors produces the greatest sag in the phase wires and therefore the minimum clearance to the ground. A summary of the clearances as part of this crossing is listed in the table below. These clearances exceed the vertical clearance requirements for 34.5kV phase conductors over roadways and ground accessible by vehicles as listed above.

Table 4- 34.5kV Summary of Clearances at Crossing

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 212°F (ft)
74	93.5	75	84	355	30.1
75	84	76	84	414	35.1
76	84	77	84	415	30.1
77	84	78	84	369	25.5
78	84	79	103	376	25.4
79	103	80	103	411	44.0

- 0 kV Neutral- For the neutral conductors the 120°F weather condition for the maximum operating temperature of the phase conductors produces the greatest sag in the phase wires and therefore the minimum clearance to the ground. A summary of the clearances as part of this crossing is listed in the table below. These clearances exceed the vertical clearance requirements for 0kV neutral conductors over roadways and ground accessible by vehicles as listed above.

Table 5- 0kV Summary of Clearances at Crossing

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 120°F (ft)
74	93.5	75	84	355	19.1
75	84	76	84	414	29.45
76	84	77	84	415	22.96
77	84	78	84	369	19.25
78	84	79	103	376	19.98
79	103	80	103	411	38.28

- Conductors and Cables Horizontal Clearance – PSNH Standard centerline spacing is based upon the geometric configuration of the structures along a line assuming a maximum 800 foot span length under 6 pounds per square foot ("psf") sustained transverse wind. The F107 Line is spaced apart from adjacent lines as specified by PSNH standard and no span along the PSNH portion of the F107 Line exceeds an 800 foot length. Furthermore, a span by span verification was completed assuming a 9psf sustained transverse wind to ensure the horizontal clearances above were exceeded.

REVISED
APPENDIX D

F107 Lines Spans 123-129
3850 Line Spans 9-15
State of New Hampshire- Department of Transportation
NEWINGTON, NH

1. The design and proposed construction of this crossing is shown on the attached Eversource Energy Drawings entitled "Seacoast Reliability Project Structures #123-129, State of NH Property Crossing" (Drawing No. F10799006 Sheet 1 of 1) and "Seacoast Reliability Project Structures #9-14, State of NH Property Crossing" (Drawing No. 385099001 Sheet 1 of 1) marked as Exhibit 7 and Exhibit 10, respectively.

2. The location of this crossing is shown on the attached Location Plan marked as Exhibit 6.

3. Lines F107 will cross the public land west of the Spaulding Turnpike primarily on 1-pole, direct embed, steel tangent suspension structures designated as Type ST-2-SB. Structures 123 and 124 are a 1-pole, steel running angle structure on a concrete foundation designated as Type SPT. Structure 128 is a 1-pole, direct embed running angle structure designated as Type SA-2. Details of these structures are shown on Exhibit 11. Above ground structure heights (AGH) for each of the crossing structures is shown on Exhibits 7 and 10. As shown on Exhibit 11, for the Type ST-2-SB structures the 115kV phase wires have an approximate separation at the structure of 7 -12.5 feet vertically and 0-13 feet horizontally in a delta configuration. The static wire is carried on the structure by a support bracket approximately six inches down from the top of the structure. As shown on Exhibit 11, for the Type SPT structures the 115kV phase wires have an approximate separation at the structure of ten feet vertically and zero feet horizontally in a vertical configuration. The static wire is carried on the structure by a support bracket approximately nine inches down from the top of the structure. As shown on Exhibit 11, for the Type SA-2 structures the 115kV phase wires have an approximate separation at the structure of 10.25 feet vertically and zero feet horizontally in a vertical configuration. The static wire is carried on the structure by a support bracket approximately six inches down from the top of the structure. All NESC clearances at the structure as described in paragraph 12 and 13 of the petition have been met by exceeding the horizontal and/or vertical clearances required.

4. Line 3850 will cross the public land west of the Spaulding Turnpike primarily on 1-pole, direct embed, wood or steel tangent structures designated at Type TAN and Type DX. Structure 10 is a 1-pole, wood or steel direct embed deadend structure designated as Type DEA. Structures 14 and 15 are 1-pole, wood or steel direct embed deadend structure designated as Type DE. As shown on Exhibit 11, for the Type Tan and Type DX structures the 34.5kV phase wires have an approximate separation at the structure of 0 feet vertically and 4.7 feet horizontally in a horizontal configuration. The neutral wire is carried on the structure by a support bracket approximately five feet down below the 34.5kV phase wires. As shown on Exhibit 11, for the Type DE structures the 34.5kV phase wires have an approximate separation at the structure of 0 feet vertically and 4.5 feet horizontally in a horizontal configuration. The neutral wire is carried

on the structure by a support bracket approximately six feet down below the 34.5kV phase wires. As shown on Exhibit 11, for the Type DEA structures the 34.5kV phase wires have an approximate separation at the structure of 0-5 feet vertically and 4.5 feet horizontally in a horizontal configuration. The neutral wire is carried on the structure by a support bracket approximately five feet down below the lowest 34.5kV phase wires. All NESC clearances at the structure as described in paragraph 11 of the petition have been met by exceeding the horizontal and/or vertical clearances required.

5. Information for the mapping of property, physical features, adjacent transmission lines and ROW boundaries were collected from various sources as detailed below:

- The property lines are based on information from Town of Newington Tax maps
- The physical features such as the location of road were digitized from geo-referenced aerial imagery of the project area, dated 2013.
- The existing and future limits of the electric right-of-way (ROW) as well as the road ROW are based on geo-references information received from NHDOT and ground survey, dated 2015.
- Topography and obstacle survey were from aerial LIDAR survey, dated 2013.

6. PSNH has, through the design and modeling process, investigated a multitude of weather and loading and service conditions to verify that proper NESC and PSNH required clearances will be maintained. The NESC clearance verifications, combined with PSNH standard conductor and shield wire clearance and spacing requirements, ensure minimum clearances will be maintained under all service conditions. These conditions include the maximum operating temperature of each conductor and cable (285^{o}F for 115kV, 212^{o}F for 34.5kv and 120^{o}F for 0kV), and conductor at 32^{o}F with 0.5 inches of radial ice and 32^{o}F with no ice. PSNH used these design conditions and all combinations thereof to determine the minimum clearance of all conductors to the both ground and aerial obstacles, between the phase conductors and OPGW cable and neutral conductors. All NESC clearances have been met by exceeding the horizontal and/or vertical clearances required. Per PSNH standards, span by span verifications were completed to validate the specified NESC clearance requirements were met. The applicable clearances mandated by the NESC and internal PSNH standards are identified and summarized below:

Table 1-Required Vertical Clearances*

Vertical Clearance Type	NESC Minimum Design Clearance (ft)	PSNH Standard Design Clearance (ft)
115kV to Ground- Vehicle/Horse Access**	20.1	24
34.5kV to Ground- Vehicle/Horse Access**	18.5	19.5
0kV to Ground- Vehicle/Horse Access**,***	15.5	18
115kV to 115kV (At Structure)	5.1	9
34.5kV to 34.5kV (At Structure)	2.3	4.5
115kV to 34.5kV (At Structure)	4.1	8
115kV to 0kV (At Structure)	3.4	8
34.5kV to 0kV (At Structure)	1.4	5.6
115kV to 115kV (In Span)	4.4	9

34.5kV to 34.5kV (In Span)	1.7	4.5
115kV to 34.5kV (In Span)	3.4	8
115kV to 0kV(In Span)	2.0	8
34.5kV to 0kV (In Span)	1.3	1.3

* Clearances defined in paragraph 11 and 12 of the petition
**PSNH designs all new transmission lines for vehicle access clearance regardless of accessibility
***Because PSNH designs all new lines with a neutral clearance of 18 feet the 34.5kV clearance to ground will always exceed the 18.5 feet required clearance.

Table 2-Required Horizontal Clearances*

Horizontal Clearance Type	NESC Minimum Design Clearance (ft)	PSNH Standard Design Clearance (ft)
115kV to 115kV (At Structure)	4.8	8
34.5kV to 34.5kV (At Structure)	1.9	5
115kV to 34.5kV (At Structure)	3.8	7
115kV to 0kV (At Structure)	3.1	7
34.5kV to 0kV (At Structure)	1.5	1.75
115kV to 115kV (In Span)	6.7	8
34.5kV to 34.5kV (In Span)	4.6	5
115kV to 34.5kV (In Span)	5.9	7
115kV to 0kV(In Span)	5.4	7
34.5kV to 0kV (In Span)	4.2	5

*Clearances defined in paragraph 12 of the petition

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

- 115 kV Phase Conductors Vertical Clearance –The 285°F weather condition for the maximum operating temperature of the phase conductors produces the greatest sag in the phase wires and therefore the minimum clearance to the ground. A summary of the clearances as part of this crossing is listed in the table below. These clearances exceed the vertical clearance requirements for 115kV phase conductors over roadways and ground accessible by vehicles as listed above.

Table 3- 115kV Summary of Clearances at Crossing

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 285°F (ft)
123	100	124	100	465	25.8
124	100	125	84	387	52.7
125	84	126	84	506	28.3
126	84	127	66	340	30.1
127	66	128	84	463	27.7
128	84	129	79	430	33.4

- 34.5 kV Phase Conductors Vertical Clearance –The 212°F weather condition for the maximum operating temperature of the phase conductors produces the greatest sag in the phase wires and therefore the minimum clearance to the ground. A summary of the clearances as part of this crossing is listed in the

table below. These clearances exceed the vertical clearance requirements for 34.5kV phase conductors over roadways and ground accessible by vehicles as listed above.

Table 4- 34.5kV Summary of Clearances at Crossing

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 212°F (ft)
9	66.5	10	70	470	22.9
10	70	11	53	394	50.5
11	53	12	48.5	508	24.5
12	48.5	13	39.5	342	25.7
13	39.5	14	61	440	32.3
14	61	15	56	60	55.9

- 0 kV Neutral- For the neutral conductors the 120°F weather condition for the maximum operating temperature of the phase conductors produces the greatest sag in the phase wires and therefore the minimum clearance to the ground. A summary of the clearances as part of this crossing is listed in the table below. These clearances exceed the vertical clearance requirements for 0kV neutral conductors over roadways and ground accessible by vehicles as listed above.

Table 5- 0kV Summary of Clearances at Crossing

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 120°F (ft)
9	66.5	10	70	470	18.2
10	70	11	53	394	42.75
11	53	12	48.5	508	18.6
12	48.5	13	39.5	342	19.4
13	39.5	14	61	440	27.4
14	61	15	56	60	NA

- Conductors and Cables Horizontal Clearance – PSNH Standard centerline spacing is based upon the geometric configuration of the structures along a line assuming a maximum 800 foot span length under 6 pounds per square foot (“psf”) sustained transverse wind. The F107 Line is spaced apart from adjacent lines as specified by PSNH standard and no span along the PSNH portion of the F107 Line exceeds an 800 foot length. Furthermore, a span by span verification was completed assuming a 9psf sustained transverse wind to ensure the horizontal clearances above were exceeded.

REVISED
APPENDIX E

F107 Lines
Spans 131-133
State of New Hampshire-Department of Transportation
NEWINGTON, NH

1. The design and proposed construction of this crossing is shown on the attached Eversource Energy Drawings entitled "Seacoast Reliability Project Structures #131-133, State of NH Property Crossing" (Drawing No. F10799008 Sheet 1 of 1) marked as Exhibit 9.

2. The location of this crossing is shown on the attached Location Plan marked as Exhibit 8.

3. Lines F107 will cross the public land west of the Spaulding Turnpike primarily on 1-pole, direct embed, steel tangent suspension structures designated as Type ST-2-SB. Structure 133 is a 1-pole, direct embed running angle structure designated as Type SA-2. Details of these structures are shown on Exhibit 11. Above ground structure heights (AGH) for each of the crossing structures is shown on Exhibit 9. As shown on Exhibit 11, for the Type ST-2-SB structures the 115kV phase wires have an approximate separation at the structure of 7 -12.5 feet vertically and 0-13 feet horizontally in a delta configuration. The static wire is carried on the structure by a support bracket approximately six inches down from the top of the structure. As shown on Exhibit 11, for the Type SA-2 structures the 115kV phase wires have an approximate separation at the structure of10.25 feet vertically and zero feet horizontally in a vertical configuration. The static wire is carried on the structure by a support bracket approximately six inches down from the top of the structure. All NESC clearances at the structure as described in paragraph 12 and 13 of the petition have been met by exceeding the horizontal and/or vertical clearances required.

4. Information for the mapping of property, physical features, adjacent transmission lines and ROW boundaries were collected from various sources as detailed below:

- The property lines are based on information from Town of Newington Tax maps
- The physical features such as the location of road were digitized from geo-referenced aerial imagery of the project area, dated 2013.
- The existing and future limits of the electric right-of-way (ROW) as well as the road ROW are based on geo-references information received from NHDOT and ground survey, dated 2015.
- Topography and obstacle survey were from aerial LIDAR survey, dated 2013.

5. PSNH has, through the design and modeling process, investigated a multitude of weather and loading and service conditions to verify that proper NESC and PSNH required clearances will be maintained. The NESC clearance verifications, combined with PSNH standard conductor and shield wire clearance and spacing requirements, ensure minimum clearances will be maintained under all service conditions. These conditions include the maximum operating temperature of each conductor and cable (285°F for 115kV, 212°F for 34.5kv and 120°F for 0kV), and conductor at 32°F with 0.5 inches of radial ice and 32°F with no ice. PSNH used these design conditions and all combinations thereof to determine the minimum clearance of all conductors to the both ground and aerial obstacles, between the phase conductors and OPGW cable and neutral conductors. All NESC clearances have been met by exceeding the horizontal and/or vertical clearances required. Per PSNH standards, span by span verifications were completed to validate the specified NESC clearance requirements were met. The applicable clearances mandated by the NESC and internal PSNH standards are identified and summarized below:

Table 1-Required Vertical Clearances*

Vertical Clearance Type	NESC Minimum Design Clearance (ft)	PSNH Standard Design Clearance (ft)
115kV to Ground- Vehicle/Horse Access**	20.1	24
0kV to Ground- Vehicle/Horse Access**	15.5	15.5
115kV to 115kV (At Structure)	5.1	9
115kV to 0kV (At Structure)	3.4	8
115kV to 115kV (In Span)	4.4	9
115kV to 0kV(In Span)	2.0	8

* Clearances defined in paragraph 11 and 12 of the petition
**PSNH designs all new transmission lines for vehicle access clearance regardless of accessibility

Table 2-Required Horizontal Clearances*

Horizontal Clearance Type	NESC Minimum Design Clearance (ft)	PSNH Standard Design Clearance (ft)
115kV to 115kV (At Structure)	4.8	8
115kV to 0kV (At Structure)	3.1	7
115kV to 115kV (In Span)	6.7	8
115kV to 0kV(In Span)	5.4	7

*Clearances defined in paragraph 12 of the petition

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

- 115 kV Phase Conductors Vertical Clearance –The 285°F weather condition for the maximum operating temperature of the phase conductors produces the greatest sag in the phase wires and therefore the minimum clearance to the ground. A summary of the clearances as part of this crossing is listed in the table below. These clearances exceed the vertical clearance requirements for 115kV phase

conductors over roadways and ground accessible by vehicles as listed above.

Table 3- 115kV Summary of Clearances at Crossing

Structure (Back)	Height (Ft)	Structure (Ahead)	Height (ft)	Span (ft)	Clearance At 285°F (ft)
131	75	132	79	486	29.5
132	79	133	75	357	33.1

- Conductors and Cables Horizontal Clearance – PSNH Standard centerline spacing is based upon the geometric configuration of the structures along a line assuming a maximum 800 foot span length under 6 pounds per square foot ("psf") sustained transverse wind. The F107 Line is spaced apart from adjacent lines as specified by PSNH standard and no span along the PSNH portion of the F107 Line exceeds an 800 foot length. Furthermore, a span by span verification was completed assuming a 9psf sustained transverse wind to ensure the horizontal clearances above were exceeded.

ES VER: 11/2015

LINE LIST	OWNER	MANAGED BY	OWNER ADDRESS	TAX MAP ID
232	STATE OF NEW HAMPSHIRE	NH DEPARTMENT OF FISH AND GAME	11 HAZEN DRIVE, CONCORD NH	MAP 15 LOT 1-0
238	STATE OF NEW HAMPSHIRE	NH DEPARTMENT OF FISH AND GAME	11 HAZEN DRIVE, CONCORD NH	MAP 15 LOT 7-3

200 100 0 200 400 600

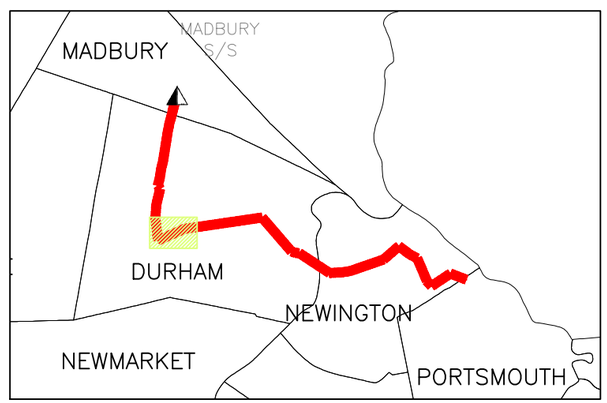
GRAPHIC SCALE
1" = 200'

EXHIBIT 1

LEGEND

PROJECT ROW

PARCEL BOUNDRY



NO.	ISSUED FOR PERMITTING	DATE	DRWN	CHKD	APPRVL
2	REVISED 30 PERCENT DESIGN	10/21/16	SCF	KMS	-
1	ISSUED FOR PERMITTING	7/22/16	CTS	-	-

EVERSOURCE ENERGY

T 2

SEACOAST RELIABILITY PROJECT
LINE LIST 232 & 238
STATE OF NH PROPERTY CROSSING

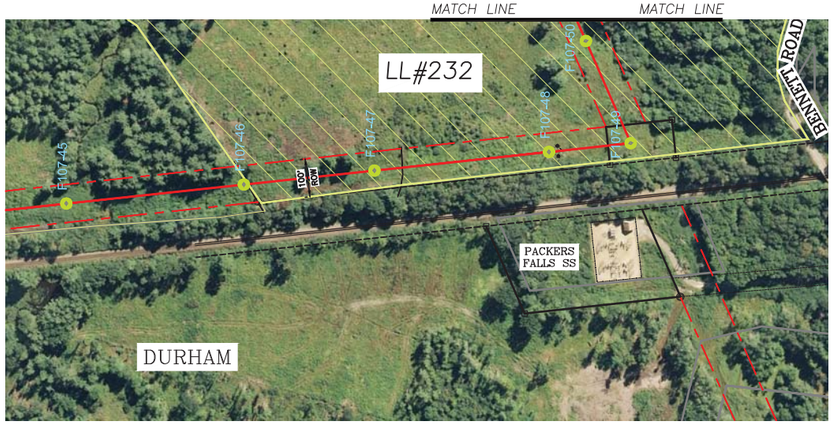
DATE: 01/22/16
SCALE: AS NOTED

DES: - CHK: JRS
DRW: CTS APR: -

TOWN: DURHAM
TRANSMISSION LINE: F107
MILE NO: - -
DISCIPLINE/SHT NO. --
SHEET 1 OF 1
F10799001

10/18/2016 2:07 PM - sfisher - \\refs1\line\Projects\133005\00\DWG\03 Line\CROSSING\LAND CROSSING\F10799001.dwg - EXHIBIT 1

ES VER: 11/2015



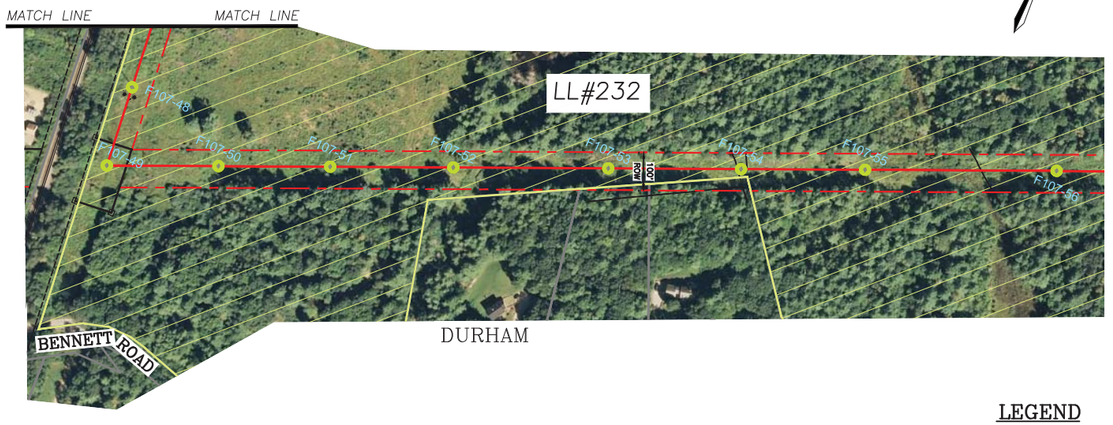
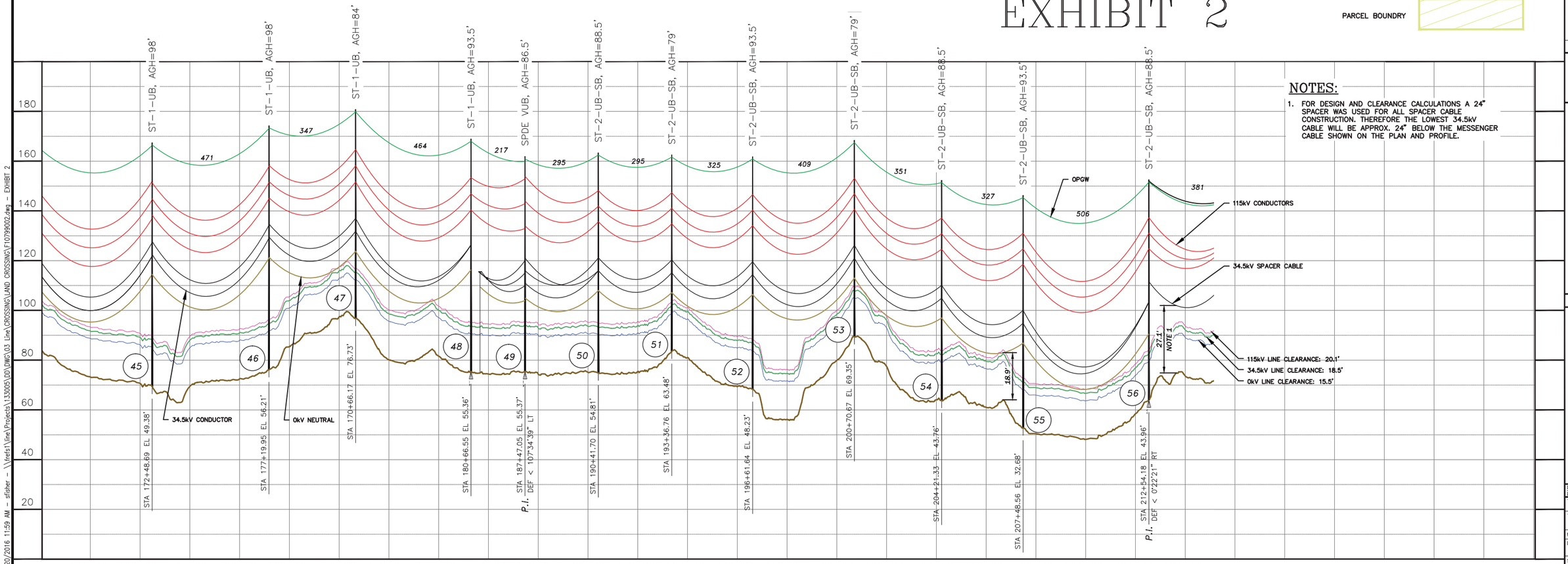


EXHIBIT 2



NOTES:

1. FOR DESIGN AND CLEARANCE CALCULATIONS A 24" SPACER WAS USED FOR ALL SPACER CABLE CONSTRUCTION. THEREFORE THE LOWEST 34.5kV CABLE WILL BE APPROX. 24" BELOW THE MESSENGER CABLE SHOWN ON THE PLAN AND PROFILE.

LEGEND

PROJECT LINE

PROJECT ROW

PARCEL BOUNDRY

NO.	REVISION	DATE	DRWN	CHKD	APPRV.
1	ISSUED FOR PERMITTING	10/21/16	CTS	KMS	–
2	REVISED 30 PERCENT DESIGN	12/2/16	CTS	KMS	–

EVERSOURCE ENERGY

T 2

SEACOAST RELIABILITY PROJECT
STRUCTURES #46-56
STATE OF NH PROPERTY CROSSING

DATE: 01/22/16

SCALE: H 1"=200', V 1"=20'

DES: – CHK:JRS
DSN: CTS APP: –

TOWN: DURHAM

TRANSMISSION LINE: F107

MILE NO: – –

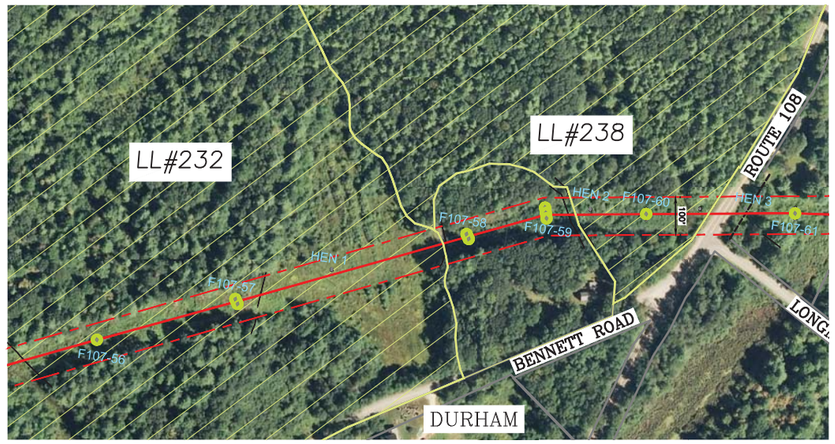
DISCIPLINE/SHT NO. – –

SHEET 1 OF 2

F10799002

10/20/2016 11:59 AM – sfisher – \\refs\Vine\Projects\133005\02\DWG\03 Line\CROSSING\LAND CROSSING\F10799002.dwg – EXHIBIT 2

ES VER: 11/2015



N

LEGEND

PROJECT LINE

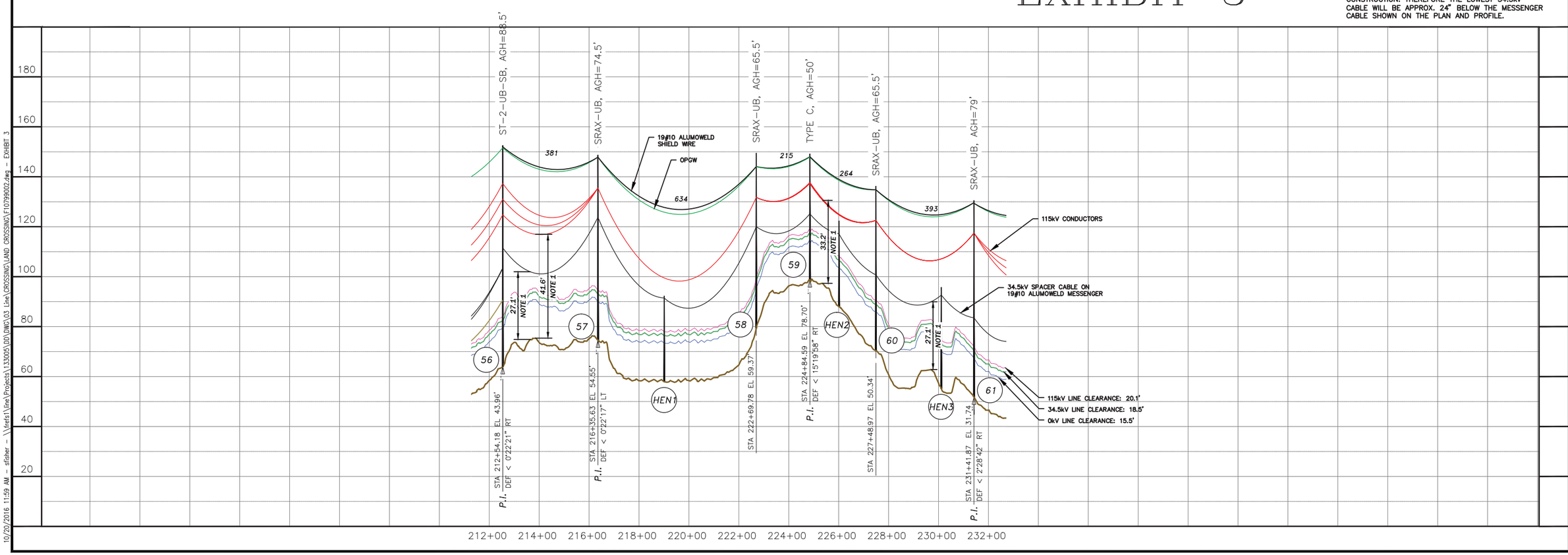
PROJECT ROW

PARCEL BOUNDRY

EXHIBIT 3

NOTES:

1. FOR DESIGN AND CLEARANCE CALCULATIONS A 24" SPACER WAS USED FOR ALL SPACER CABLE CONSTRUCTION. THEREFORE THE LOWEST 34.5kV CABLE WILL BE APPROX. 24" BELOW THE MESSENGER CABLE SHOWN ON THE PLAN AND PROFILE.



NO.	REVISION	DATE	DRWN	CHKD	APPRV.
1	ISSUED FOR PERMITTING	7/27/16	CTS	KMS	–
2	REVISED 30 PERCENT DESIGN	10/21/16	SCF	KMS	–

EVERSOURCE ENERGY

T 2

SEACOAST RELIABILITY PROJECT
STRUCTURES #56-61
STATE OF HN PROPERTY CROSSING

SCALE: H: 1"=200', V: 1"=20' DATE: 01/20/16

DES: – CHK: KMS
DRW: CTS APP: –

TOWN: DURHAM

TRANSMISSION LINE: F107

MILE NO: – –

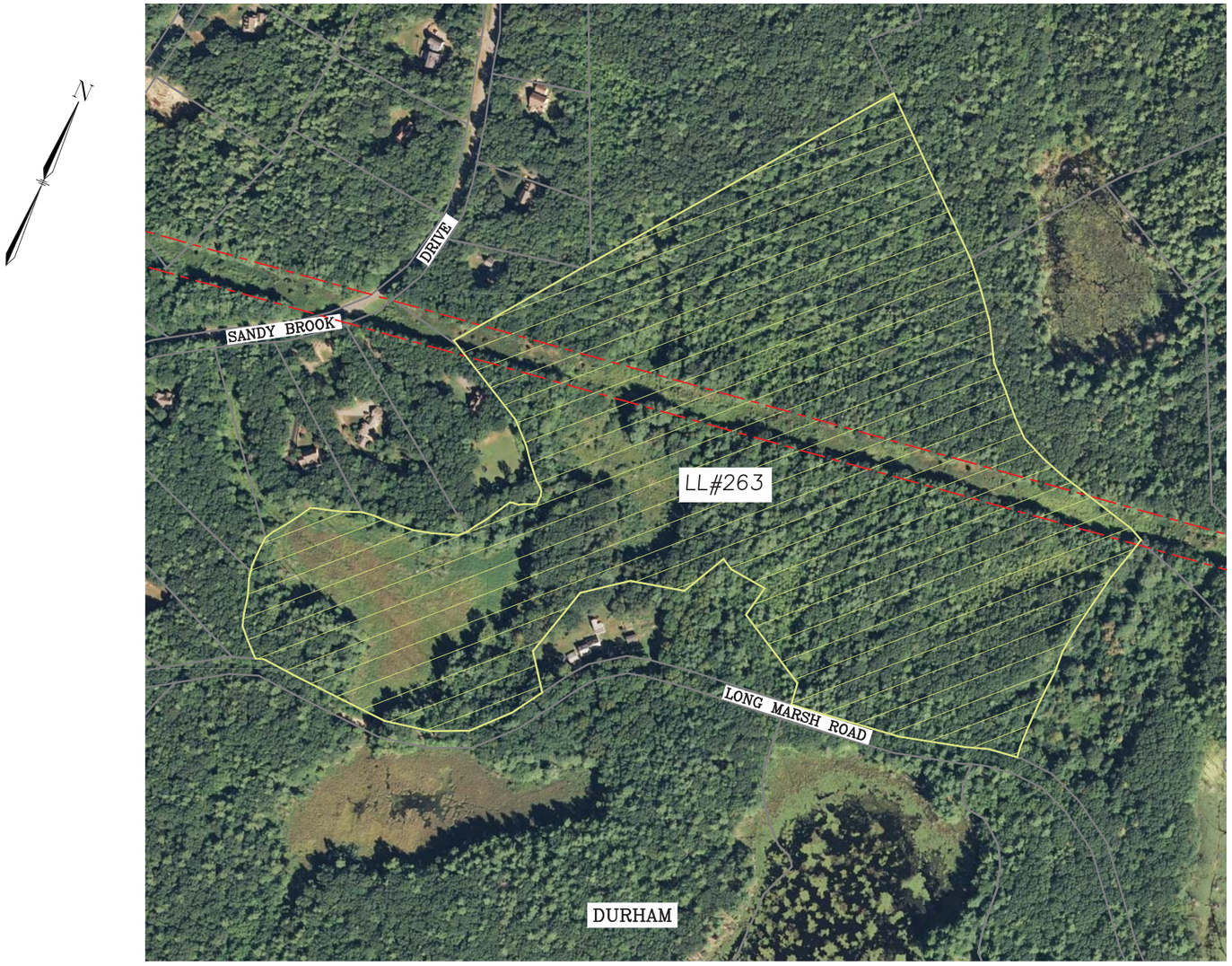
DISCIPLINE/SHT NO. –

SHEET 2 OF 2

F10799002

10/20/2016 11:59 AM – sfisher – \\refs1\Line\Projects\1330051\DWG\03 Line\CROSSING\LAND CROSSING\F10799002.dwg – EXHIBIT 3

ES VER: 11/2015



LINE LIST	OWNER	MANAGED BY	OWNER ADDRESS	TAX MAP ID
263	STATE OF NEW HAMPSHIRE	NH DEPARTMENT OF FISH AND GAME	11 HAZEN DRIVE, CONCORD NH	MAP 15 LOT 5–0

200 100 0 200 400 600

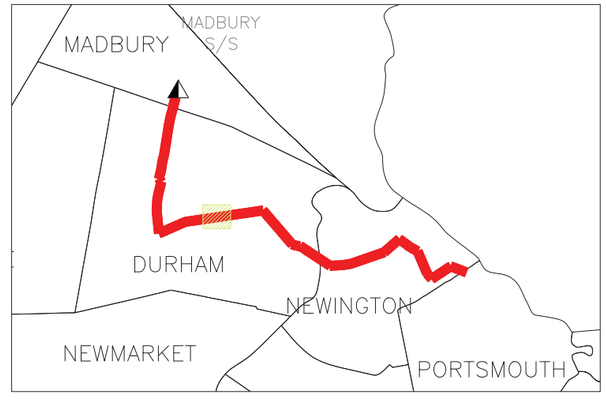
GRAPHIC SCALE
1" = 200'

EXHIBIT 4

LEGEND

PROJECT ROW

PARCEL BOUNDRY



NO.	REVISION	DATE	DRWN	CHKD	APPRV.
2	REVISED 30 PERCENT DESIGN	10/21/16	SCF	JMS	–
1	ISSUED FOR PERMITTING	1/22/16	CTS	JRS	–

EVERSOURCE ENERGY

T | 2

SEACOAST RELIABILITY PROJECT
LINE LIST 263
STATE OF NH PROPERTY CROSSING

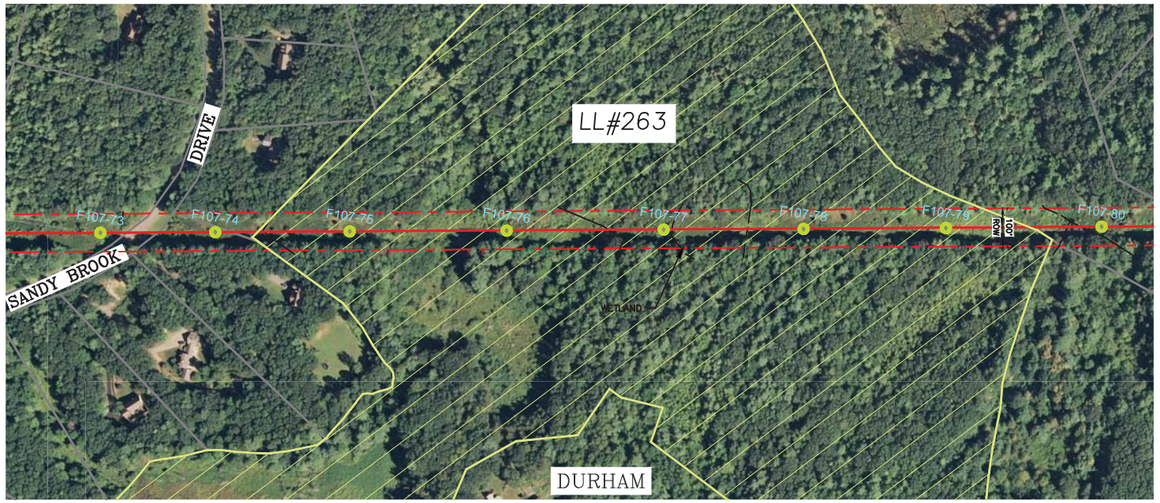
DATE: 01/22/16
SCALE: AS NOTED

DES: – | CHK: JRS
DRW: CTS | APR: –

TOWN: DURHAM
TRANSMISSION LINE: F107
MILE NO: – –
DISCIPLINE/SHT NO. --
SHEET 1 OF 1

F10799003

ES VER: 11/2015



N

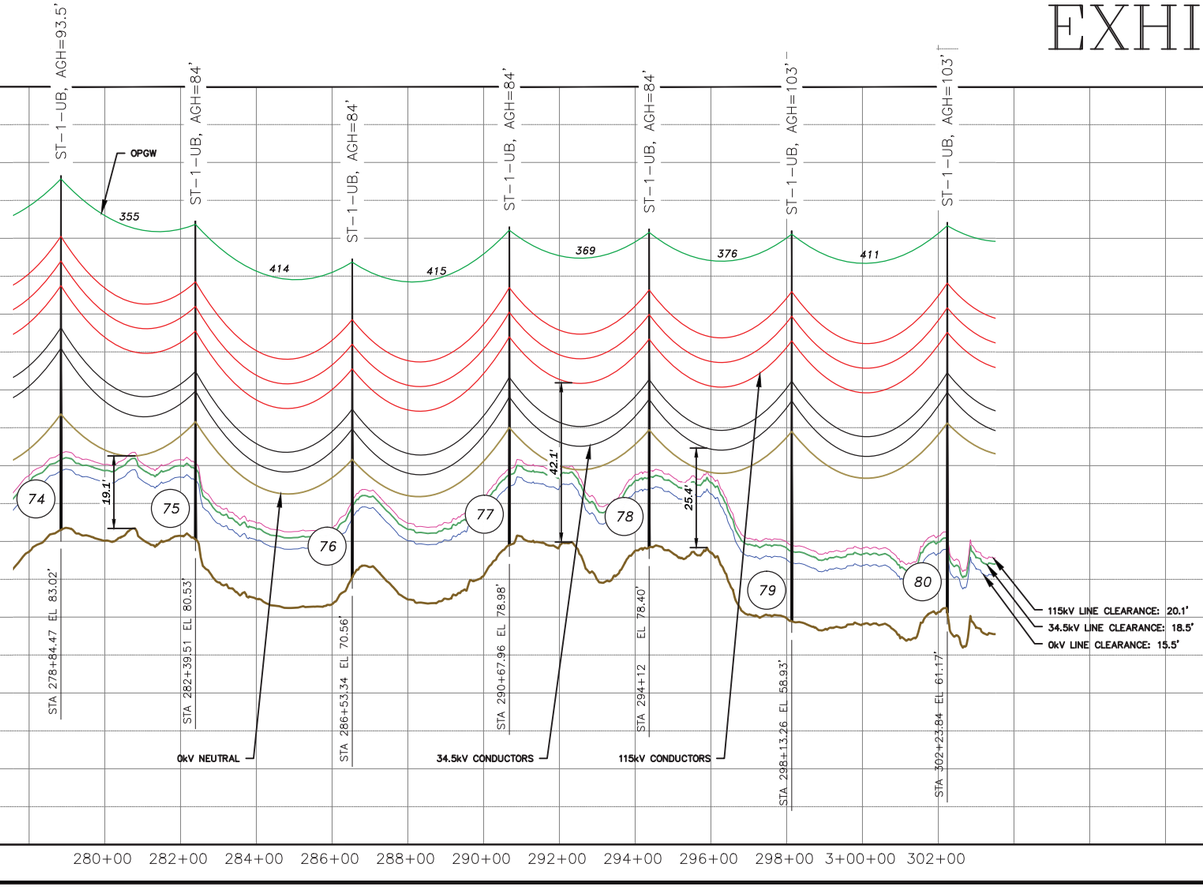
LEGEND

PROJECT LINE

PROJECT ROW

PARCEL BOUNDRY

EXHIBIT 5



NO.	REVISION	DATE	DRWN	CHKD	APPRV.
2	REVISED 30 PERCENT DESIGN	10/21/16	SCF	KMS	–
1	ISSUED FOR PERMITTING	7/4/16	CTS	JWC	–

EVERSOURCE ENERGY

T 2

SEACOAST RELIABILITY PROJECT
STRUCTURES #74-80
STATE OF NH PROPERTY CROSSING

DATE: 01/22/16

SCALE: H 1"=200', V 1"=20'

DES: – CHK: JRS
DRW: CTS APP: –

TOWN: DURHAM

TRANSMISSION LINE: F107

MILE NO: – –

DISCIPLINE/SHT NO. --

SHEET 1 OF 1

F10799004

10/20/2016 12:06 PM – sfisher – \\refs1\Vine\Projects\133005\00\DWG\03 Line\CROSSING\LAND CROSSING\F10799004.dwg – EXHIBIT 5

LINE LIST	OWNER	MANAGED BY	OWNER ADDRESS
1000	STATE OF NEW HAMPSHIRE	NH DEPARTMENT OF TRANSPORTATION	7 HAZEN DRIVE, CONCORD NH

200 100 0 200 400 600

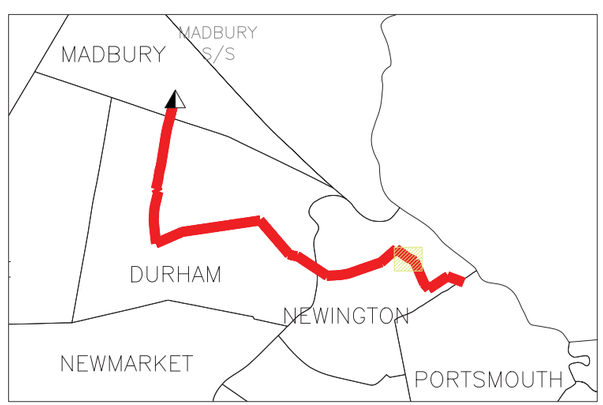
GRAPHIC SCALE
1" = 200'

EXHIBIT 6

LEGEND

PROJECT ROW

PARCEL BOUNDRY



NO.	REVISION	DATE	DRWN	CHKD	APPRV.
2	REVISED 30 PERCENT DESIGN	10/21/16	SCF	KMS	–
1	ISSUED FOR PERMITTING	1/22/16	CTS	JRS	–

EVERSOURCE ENERGY

T 2

SEACOAST RELIABILITY PROJECT
LINE LIST 1000
STATE OF NH PROPERTY CROSSING

DATE:01/22/16

SCALE: AS NOTED

DES: – CHK:JRS
DRW: CTS APR: –

TOWN: NEWINGTON

TRANSMISSION LINE: F107

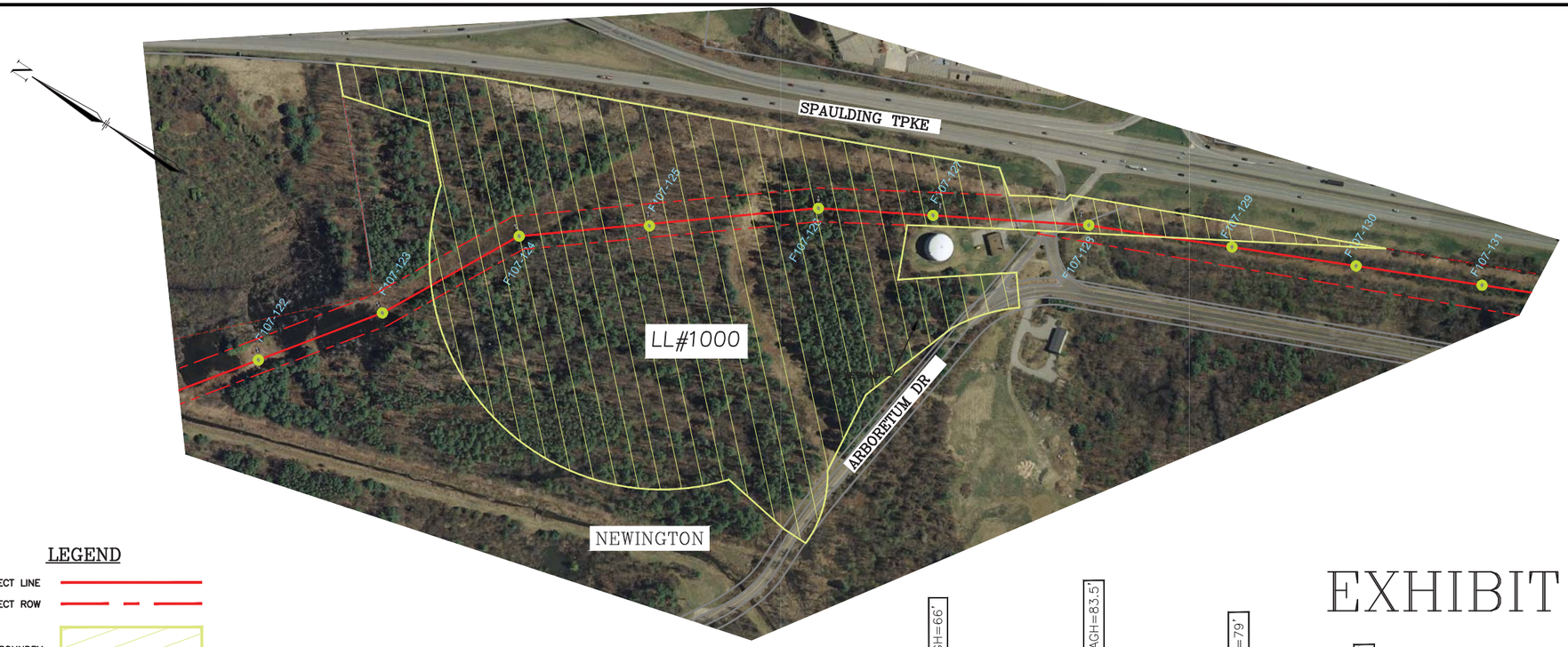
MILE NO: – –

DISCIPLINE/SHT NO. –

SHEET 1 OF 1

F10799005

ES VER: 11/2015



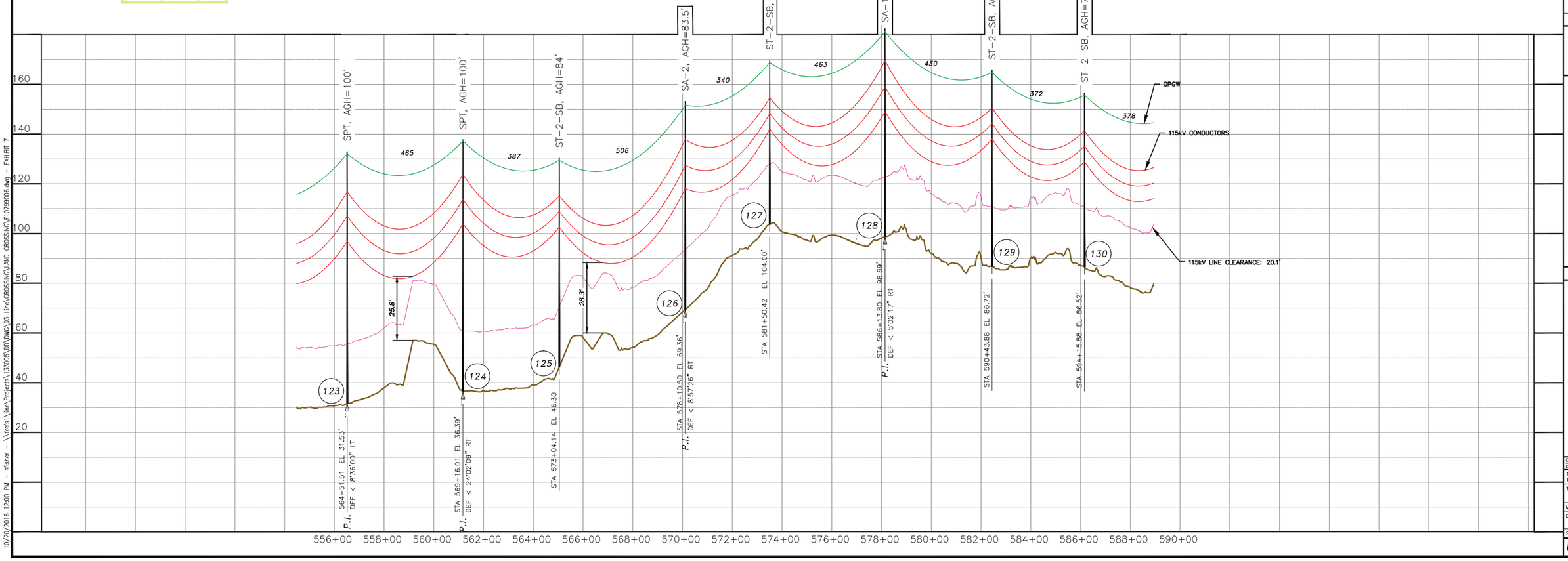
LEGEND

PROJECT LINE

PROJECT ROW

PARCEL BOUNDRY

EXHIBIT 7



NO.	ISSUED FOR PERMITTING / REVISION	DATE	DRWN	CHKD	APPRV.
2	REVISED 30 PERCENT DESIGN	10/21/16	SCF	KMS	–
1	ISSUED FOR PERMITTING	–	CTS	JKS	–

EVERSOURCE ENERGY

T | 2

SEACOAST RELIABILITY PROJECT
STRUCTURES #123–129
STATE OF NH PROPERTY CROSSING

DATE: 01/22/16

SCALE: H: 1"=200', V: 1"=20'

DES: – CHK: JKS
DRW: CTS APP: –

TOWN: NEWINGTON

TRANSMISSION LINE: F107

MILE NO: – –

DISCIPLINE/SHT NO. – –

SHEET 1 OF 1

F10799006

10/20/2016 12:00 PM – sfisher – \\refs1\Line\Projects\133005\00\DWG\03 Line\CROSSING\LAND CROSSING\F10799006.dwg – EXHIBIT 7

LINE LIST	OWNER	MANAGED BY	OWNER ADDRESS
1001	STATE OF NEW HAMPSHIRE	NH DEPARTMENT OF TRANSPORTATION	7 HAZEN DRIVE, CONCORD NH

200 100 0 200 400 600

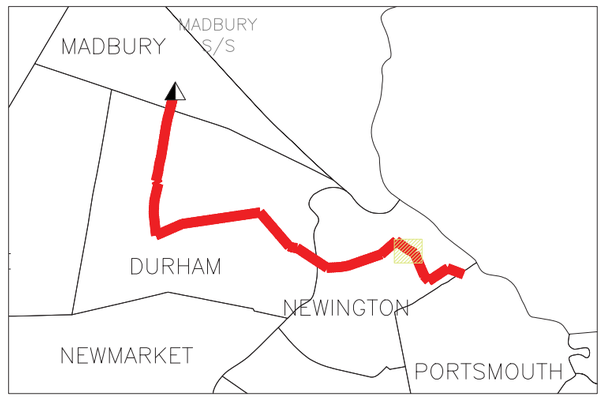
GRAPHIC SCALE
1" = 200'

EXHIBIT 8

LEGEND

PROJECT ROW

PARCEL BOUNDRY



NO.	REVISION	DATE	DRWN	CHKD	APPRV.
2	REVISED 30 PERCENT DESIGN	10/21/16	SCF	AMS	–
1	ISSUED FOR PERMITTING	1/22/16	CTS	JRS	–

EVERSOURCE ENERGY

7 2

SEACOAST RELIABILITY PROJECT
LINE LIST 1001
STATE OF NH PROPERTY CROSSING

DATE: 01/22/16
SCALE: AS NOTED

DES: – CHK: JRS
DRN: CTS APR: –

TOWN: NEWINGTON
TRANSMISSION LINE: F107
MILE NO: – –
DISCIPLINE/SHT NO. --
SHEET 1 OF 1

F10799007

ES VER: 11/2015

10/11/2016 2:03 PM – spenset – \\fref1\line\Projects\133005\DD\DWG\03 Line\CROSSING\LAND CROSSING\F10799007.dwg – LOCATION MAP 4

ES VER: 11/2015

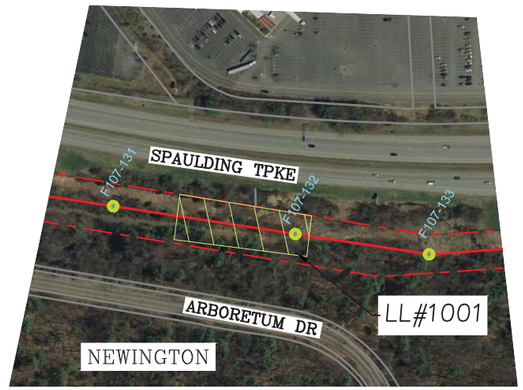


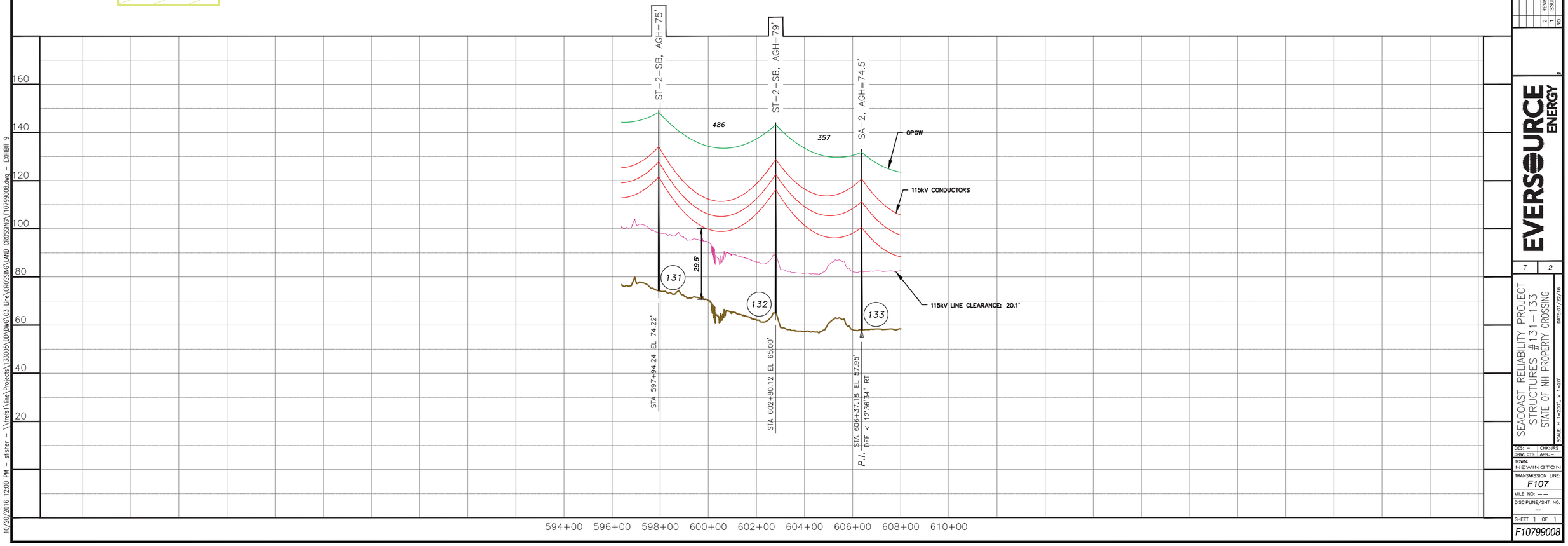
EXHIBIT 9

LEGEND

PROJECT LINE

PROJECT ROW

PARCEL BOUNDRY



NO.	REVISION	DATE	DRWN	CHKD	APPRV.
1	ISSUED FOR PERMITTING	10/21/16	SCF	KMS	–
2	REVISED 30 PERCENT DESIGN		CTS	KMS	–

EVERSOURCE ENERGY

T 2

SEACOAST RELIABILITY PROJECT
STRUCTURES #131–133
STATE OF NH PROPERTY CROSSING

DATE: 01/22/16

SCALE: H 1"=200' V 1"=20'

DES: – CHK: JRS
DRW: CTS APP: –

TOWN: NEWINGTON

TRANSMISSION LINE: F107

MILE NO: – –

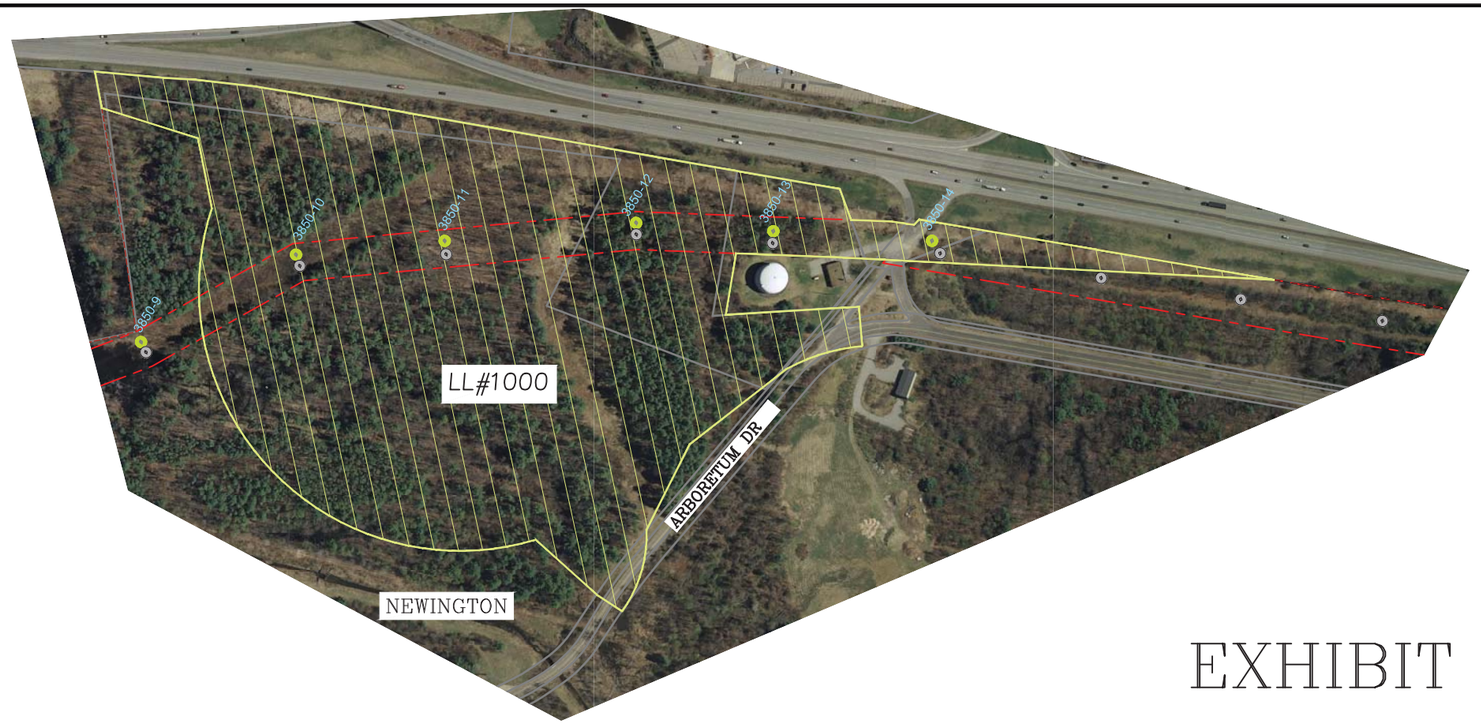
DISCIPLINE/SHT NO. --

SHEET 1 OF 1

F10799008

10/20/2016 12:00 PM – sfisher – \\refs1\Vne\Projects\133005\DDWG\03 Line\CROSSING\LAND CROSSING\F10799008.dwg – EXHIBIT 9

ES VER: 11/2015



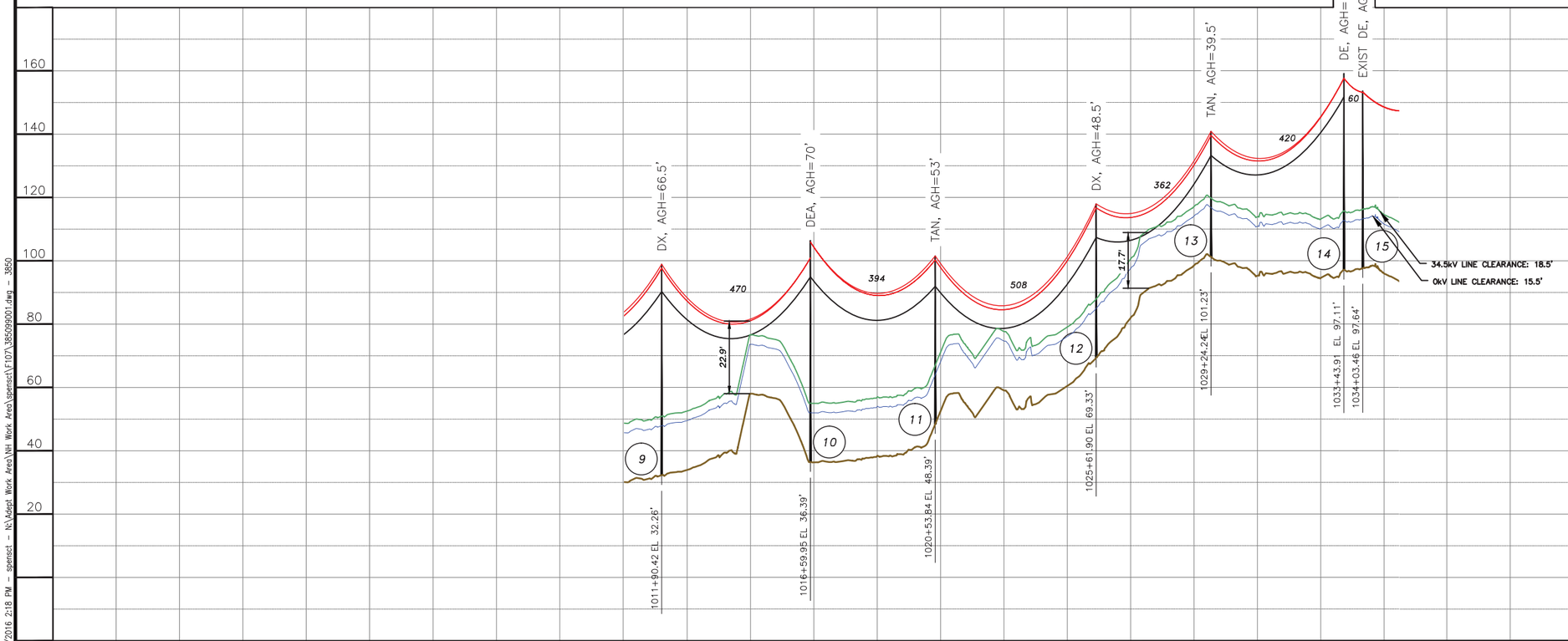
LEGEND

PROJECT LINE

PROJECT ROW

PARCEL BOUNDRY

EXHIBIT 10



NO.	ISSUED FOR PERMITTING REVISION	DATE	DRWN	CHKD	APPRV.
1			CTS	JPC	

EVERSOURCE ENERGY

T 1

SEACOAST RELIABILITY PROJECT
STRUCTURES #9–14
STATE OF NH PROPERTY CROSSING

SCALE: H 1"=200', V 1"=20' DATE: 01/22/16

DES: – CHK: JRS
DRW: CTS APR: –

TOWN: NEWINGTON

TRANSMISSION LINE: 3850

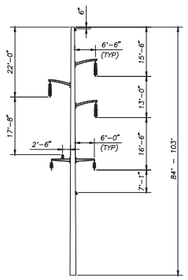
MILE NO: – –

DISCIPLINE/SHT NO. --

SHEET 1 OF 1

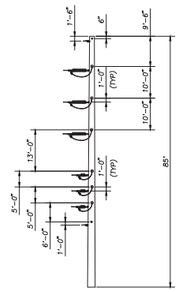
385099001

2/24/2016 2:18 PM – spenscr – N:\Adept Work Area\NH Work Area\spenscr\F107\ 385099001.dwg – 3850



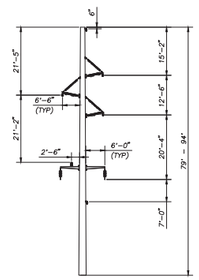
TYPE ST-1-UB

STEEL SINGLE POLE
TANGENT
115 KV WITH 34.5 KV UNDERBUILD
DIRECT EMBED FOUNDATION



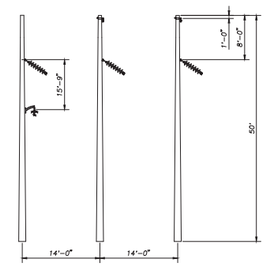
TYPE SPDE-VUB

SELF SUPPORTING STEEL
DEADEND
115 KV WITH 34.5 KV UNDERBUILD
DRILLED PIER FOUNDATION



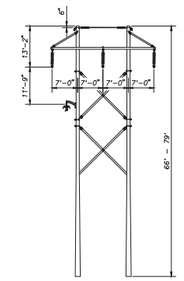
TYPE ST-2-UB-SB

STEEL SINGLE POLE
BRACED POST TANGENT
115 KV WITH 34.5 KV UNDERBUILD
DIRECT EMBED FOUNDATION



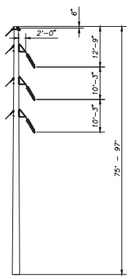
TYPE C-UB

STEEL H-FRAME
12° - 50° ANGLE
115 KV W/ 34.5 KV UB
DRILLED PIER FOUNDATION



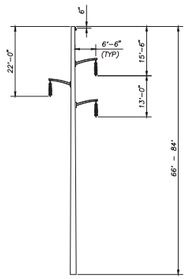
TYPE SRAX-UB

STEEL H-FRAME
TANGENT
115 KV W/ 34.5 KV UB
DIRECT EMBED FOUNDATION



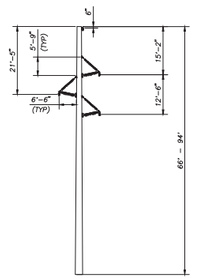
TYPE SA-2

STEEL GUYED SINGLE POLE
8° - 20° ANGLE
115 KV
DIRECT EMBED FOUNDATION



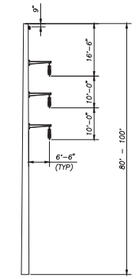
TYPE ST-1

STEEL SINGLE POLE
TANGENT
115 KV
DIRECT EMBED FOUNDATION



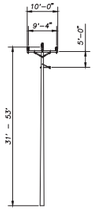
TYPE ST-2-SB

STEEL SINGLE POLE
BRACED POST TANGENT
115 KV
DIRECT EMBED FOUNDATION



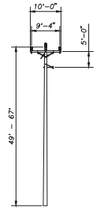
TYPE SPT

SELF SUPPORTING STEEL
TANGENT
115 KV
DRILLED PIER FOUNDATION



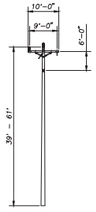
TYPE TAN

ROUNDWOOD OR STEEL SINGLE POLE
TANGENT
34.5 KV
DIRECT EMBED FOUNDATION



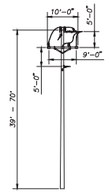
TYPE DX

ROUNDWOOD OR STEEL SINGLE POLE
0° - 12° ANGLE
34.5 KV
DIRECT EMBED FOUNDATION



TYPE DE

ROUNDWOOD OR STEEL SINGLE POLE
0° - 15° DEADEND ANGLE
34.5 KV
DIRECT EMBED FOUNDATION



TYPE DEA

ROUNDWOOD OR STEEL SINGLE POLE
15° - 90° DEADEND ANGLE
34.5 KV
DIRECT EMBED FOUNDATION

EXHIBIT 11

REV	DESCRIPTION	ENG/PE#	DATE	DRN	CHKD	APPR
2	REVISED 30 PERCENT DESIGN		10/21/16	SCF	KMS	–
1	ISSUED FOR PERMITTING		1/25/16	CTS	JRS	–
DWG REV	EPN/DESCRIPTION	CONT/PE#	DATE	DRN	CHKD	APPR

CONTRACT SERVICES

EVERSOURCE ENERGY

TYPE 115 KV STANDARD
SECTION F107 STRUCTURE INDEX

T	2
DRAWN	CTS
ENGINEER	–
CHECKED	JRS
APPROVED	–
DATE	01/25/16
SCALE	NTS
FILE:	F10799009.DWG
IMAGE:	
DRAWING NO.	F10799009