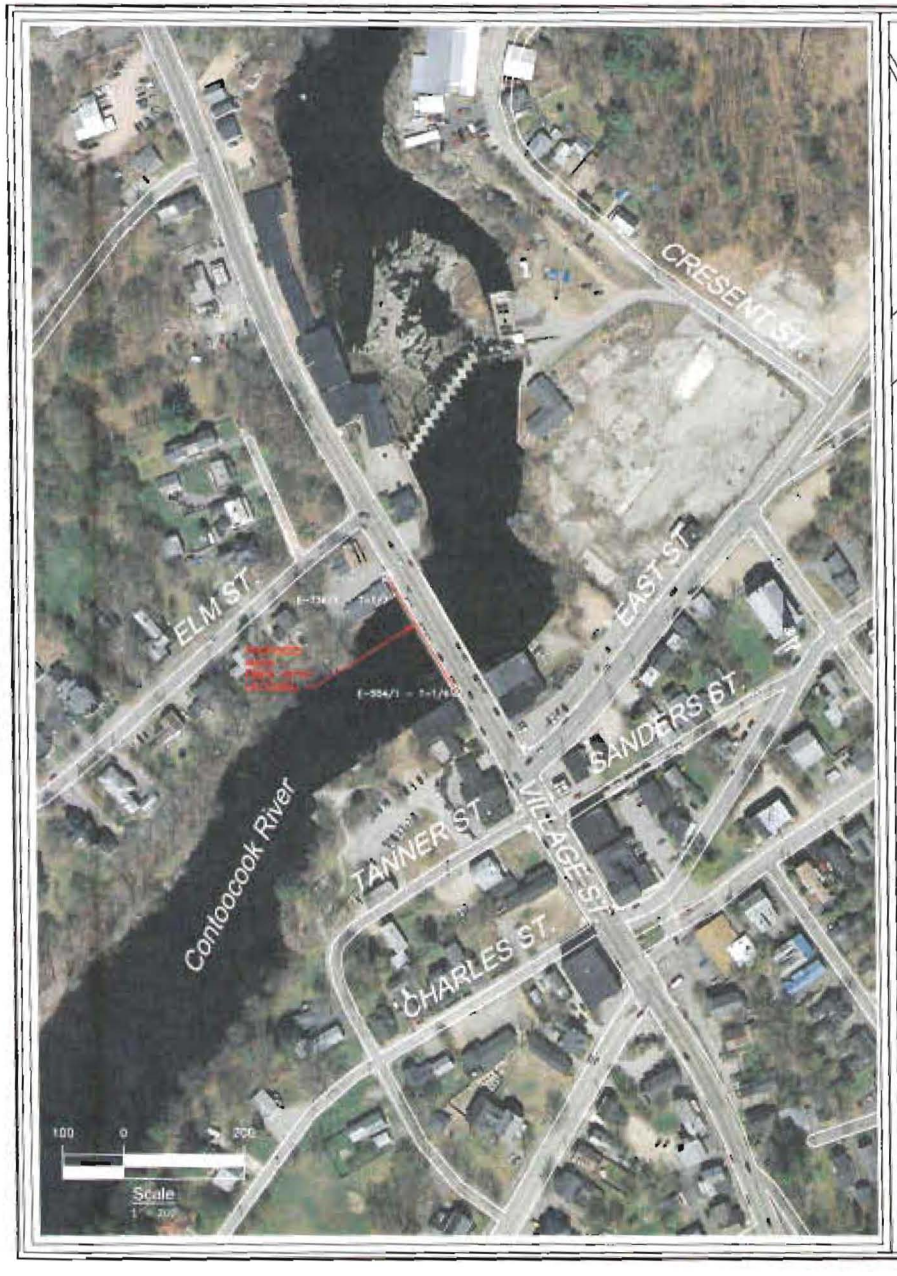

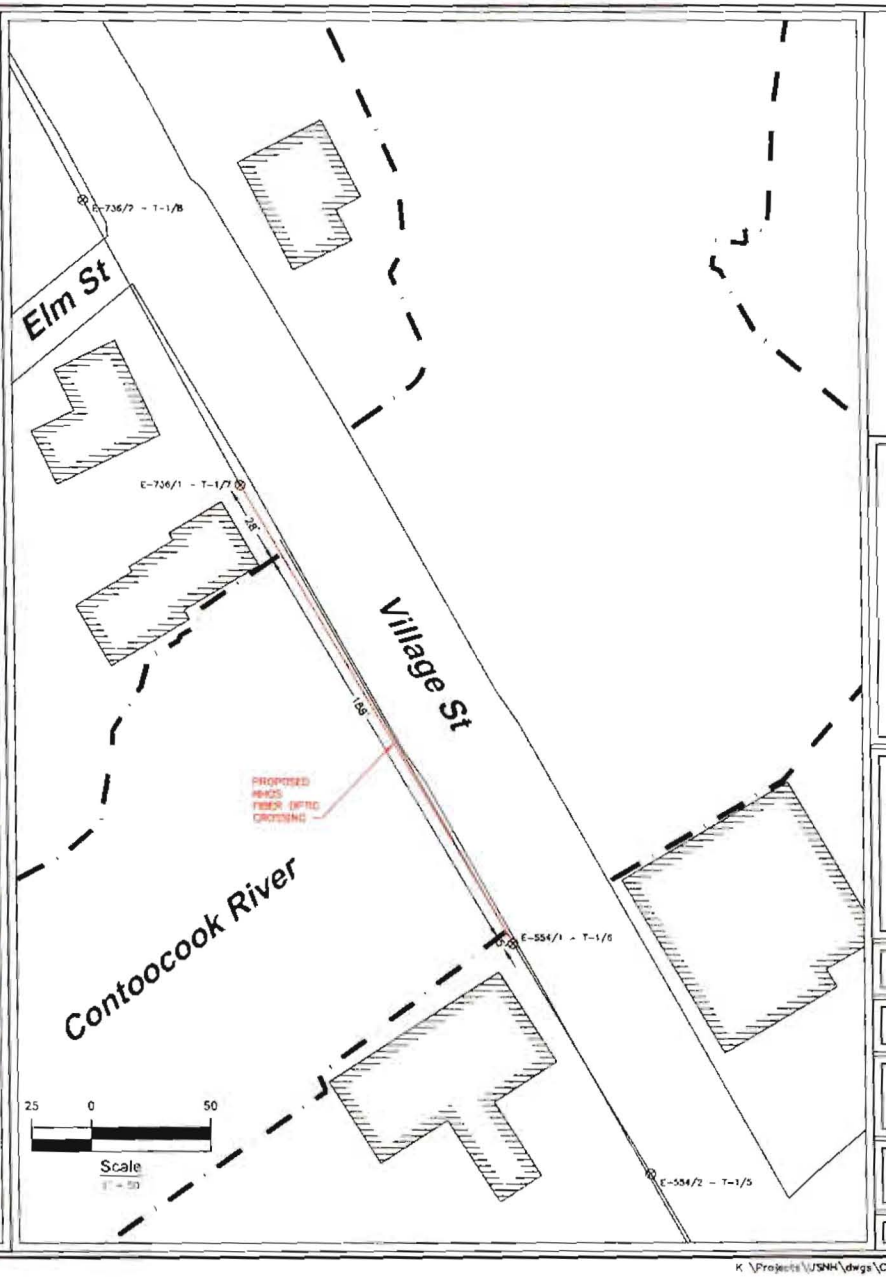

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NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
90 Pine Hill Rd.
Nashua, NH 03063
(603-821-6467)

Project #TID-8 - Primary 13
Drawing PAC-CON-RIV-1

Date: 10/14/11
Revision 2

Proposed
Stream Crossing
Concord, NH

Location:
Village St., Concord NH
Nearest cross street: Elm St.

Sheet 1 of 2

K:\Projects\USNH\dwgs\Concord\River-Xing\TID-8\TID-8.dwg

LOCUS MAP
(Not to Scale)

CommScope®

Spannmaster 8 Release 3.1 Sag / Tension Computations

Waveguide
River and Rail Crossing

	X-SECT AREA (sq in)	EFF MODULUS (ksi)	NOMINAL CHAR (in)	EFF/AP COEFF (1/F)	CABLE WEIGHT (lb/ft)	EFF LOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
Specified Cables							
1-475 BeBEHD	0.0702	2.60E+07	0.259	5.60E-06	0.1210	5[illegible]	[illegible]
OSP-12-288 LT	0.0760	2.78E+06	0.374	4.10E-05	0.1969	1[illegible]	401
Bundle			1.105		0.3179		

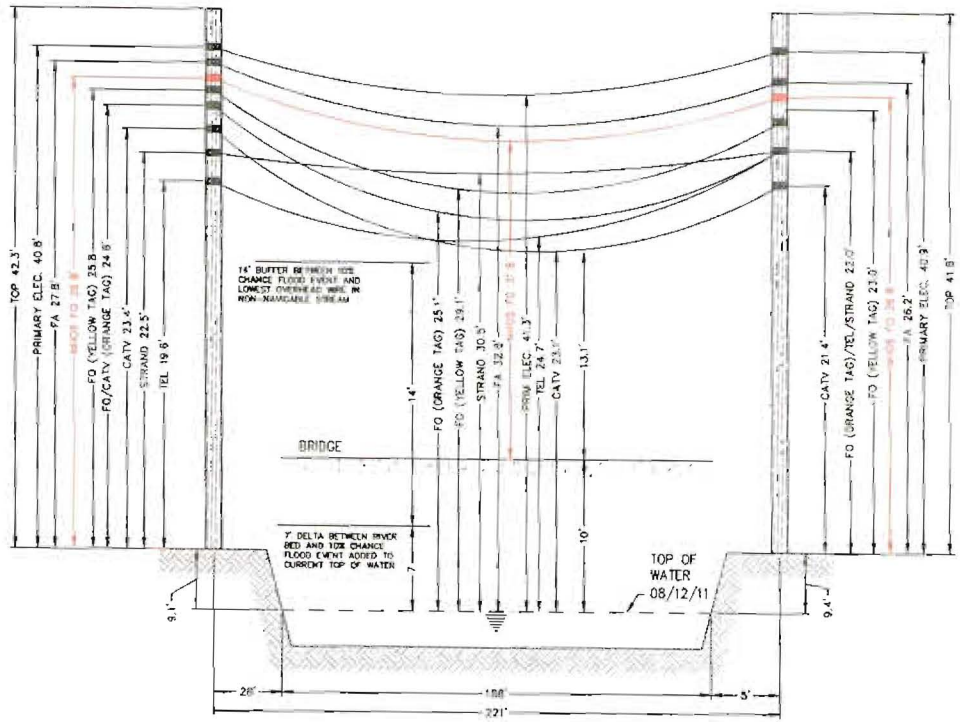
NESC RESULTS

Rule 250 - Heavy	0.0	1.188	30	0	4.0	1.781	4.00	2.675	0.01		4.00		2.33	4.30	28.1
232A1	120.0	0.088	60	0	8.0	0.337	2.00	7.20	0.01		0.68		0.00	2.00	0.0

Span Length = 221.0ft
Span Sag = 2.21 ft (26.5 in)
Span Tension = 470 lb
Max Load = 8,850 lb
Usable load (50%) = 3,960 lb
Catenary Length = 221.0ft
Stress Free Length 0ft
Installed Temperature = 209.545 F

Unloaded Strand
Sag = 1.67 ft (12.9 in) 0.49 %
Tension = 369 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
40.0	1.48	1,192	0.04	N/A
30.0	1.53	1,258	0.01	N/A
20.0	1.59	1,218	-0.01	N/A
10.0	1.64	1,174	-0.01	N/A
0	1.70	1,132	-0.01	N/A
-10.0	1.77	1,090	-0.01	N/A
-20.0	1.83	1,054	-0.01	N/A
-30.0	1.88	1,016	-0.01	N/A
-40.0	1.97	979	0.01	N/A
50.0	2.06	941	0.00	N/A
60.0	2.13	908	0.00	N/A
70.0	2.21	875	0.00	N/A
80.0	2.29	842	0.00	N/A
90.0	2.36	810	0.00	N/A
100.0	2.44	782	0.01	N/A
110.0	2.56	754	0.01	N/A
120.0	2.68	726	0.01	N/A
130.0	2.75	702	0.01	N/A
140.0	2.86	678	0.02	N/A



E-735/1 - T-1/7
(Existing joint owned utility pole (Fairpoint/Unitil) in existing Right-of-Way)

E-554/1 - T-1/6
(Existing joint owned utility pole (Fairpoint/Unitil) in existing Right-of-Way)

Notes

1. The heights of structures shown herein are based on field measurements taken with a Nikon Nx2 total station during a site survey on [illegible]
2. The horizontal distance between the nearest bridge edge and existing overhead wires ranges from [illegible]
3. Because of the close horizontal proximity to the existing bridge structure, the simplified drawing is submitted with some distances measured to the structure. This process simplifies the preparation and review of the crossing without jeopardizing its intent to protect the safe usage of the waterway.
4. The smallest vertical distance from the top of bridge deck to the lowest crossing overhead wires is 11.1'.
5. The vertical distance between the top of water and bridge deck is approximately 19'.
6. Based on the FEMA Flood Profile for the Contoocook River (Page 17P) the vertical distance between the stream bed and the 100 chance flood event is 7'.
7. Based on compiled information, the lowest overhead wire exceeds the minimum height required to be above the 100 chance flood event. A conservative approach was taken for our calculations. The delta between the river bed and 100 chance flood event was added to the current top of water and then the 14' buffer was added to that.
8. Vertical distances are approximate and are based on lowest heights, after utility make-ready moves are completed.

E-736/1 - T-1/7

Construction Notes.

NHOS proposes to install a 6 inch aerial supporting strand between the existing utility poles shown above that will traverse the river. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will lash a one inch diameter fiber optic cable (PVC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with license plate information at each pole clamp. NHOS will employ the proper safety personnel during the crossing installation. The proposed install will meet all proper clearances from other utilities (see above). Additional pole guys will be added per NESC Rule 264 and as directed by pole owners.

E-554/1 - T-1/6

NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
99 Pine Hill Rd.
Nashua, NH 03063
(603-821-6907)

Project: #TID-8 - Primary 13
Drawing: #AC-CON-JUV-1

Date: 10/14/11
Revision: #

Proposed
Stream Crossing
Concord, NH

LOCATION:
Village St., Concord NH
Nearest cross street - Elm St.

Sheet 2 of 2

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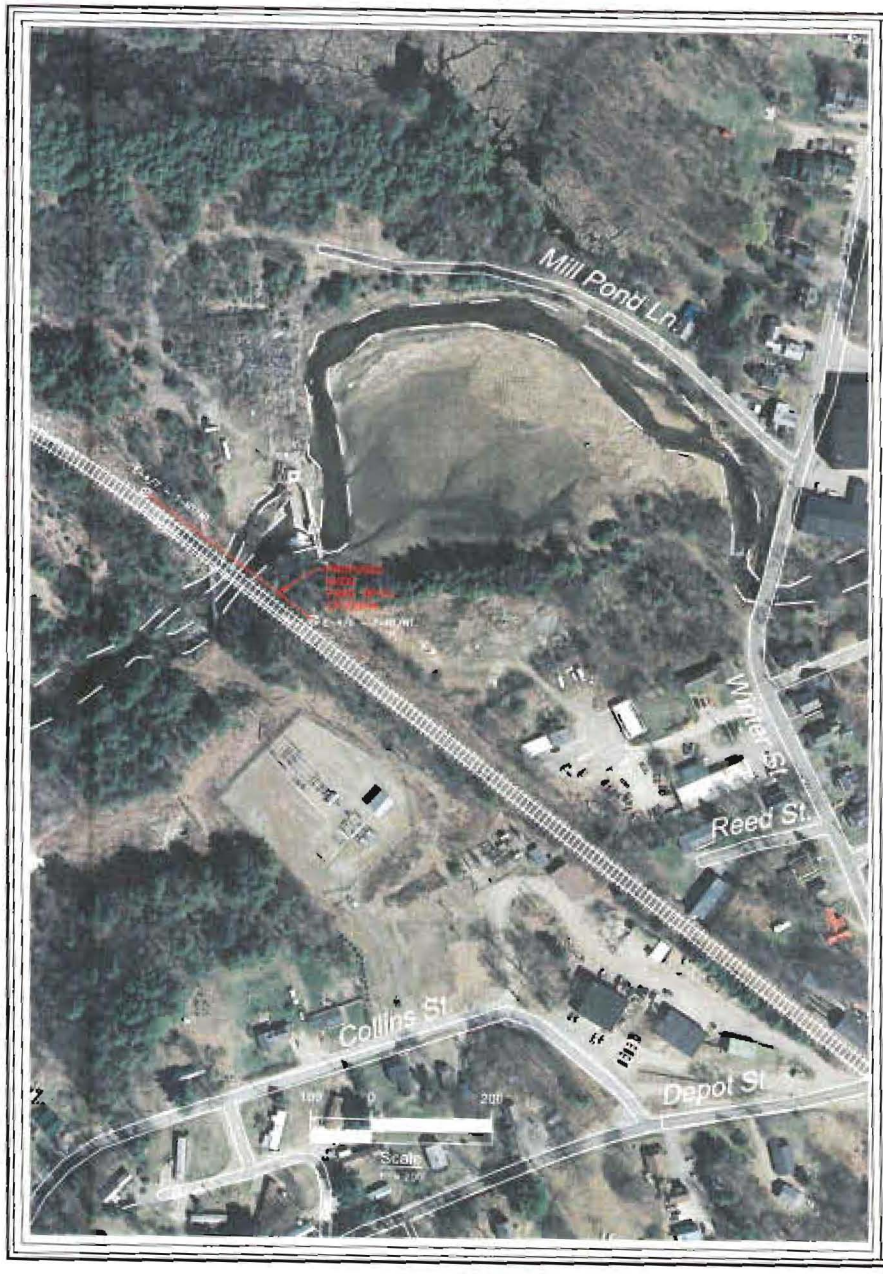

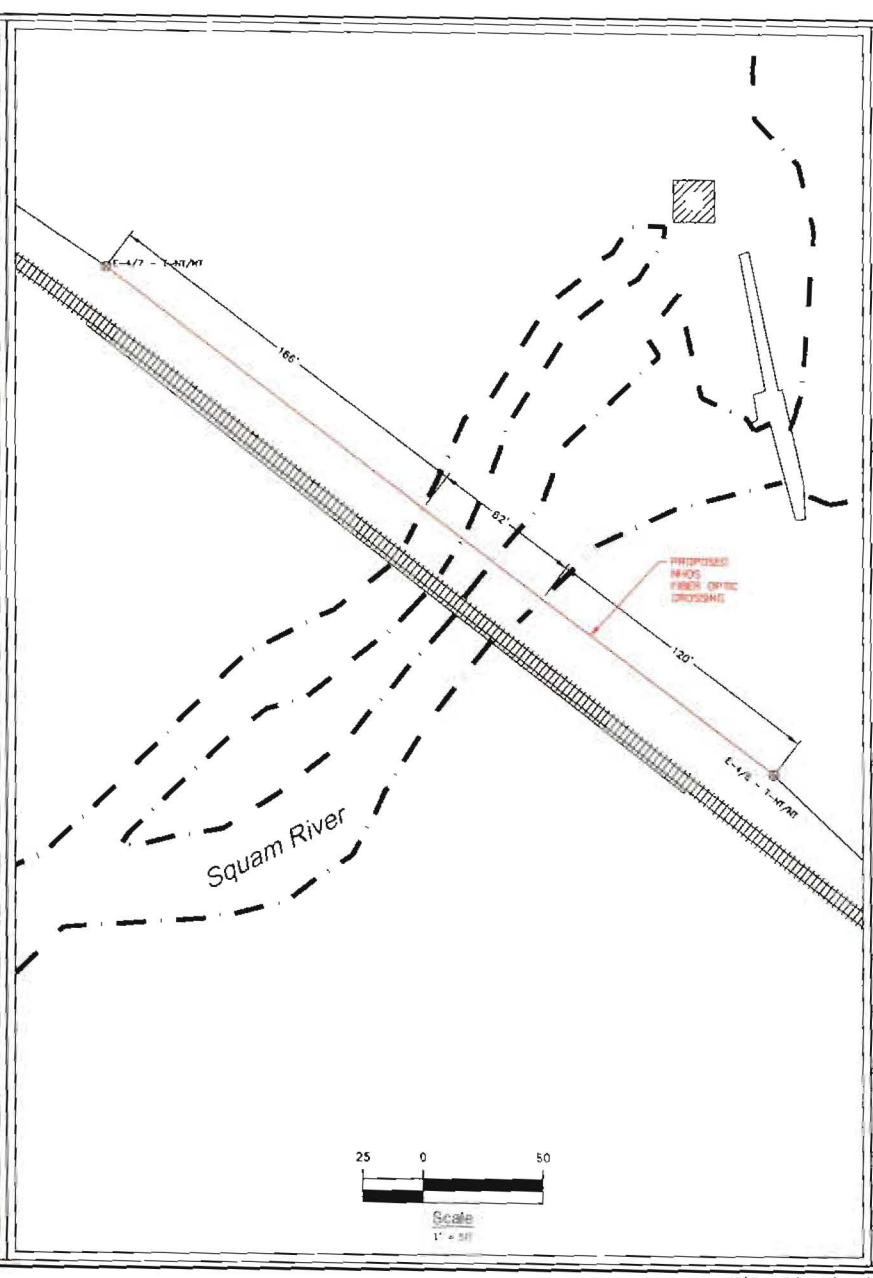

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NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
99 Pine Hill Rd
Nashua, NH 03063
(603-821-6487)

Project #TID-24-PRJ-15
Drawing #AC-ASH-R2W-2

Date: 10/24/11
Revision #

Proposed Crossing
Squam River
Ashland, NH

Location:
Reed St. Ashland, NH
Nearest cross street-Winter St.

Sheet 1 of 2

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LOCUS MAP
(Not to Scale)

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

Waterway
Road and Rail Crossings
09/01/11 Waterside

	CSECT AREA (SQ IN)	EFF MODULUS (GPA)	NOMINAL DIAM (IN)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	FAILOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
Selected Cables:							
SATR Rel-HS	0.0356	2.86E+01	0.250	5.83E-06	0.1210	14480	4830
DRF-0-208-LM	0.5783	2.70E+05	0.858	1.13E-05	0.1960	35000	863
Bundle			1.108		0.3170		

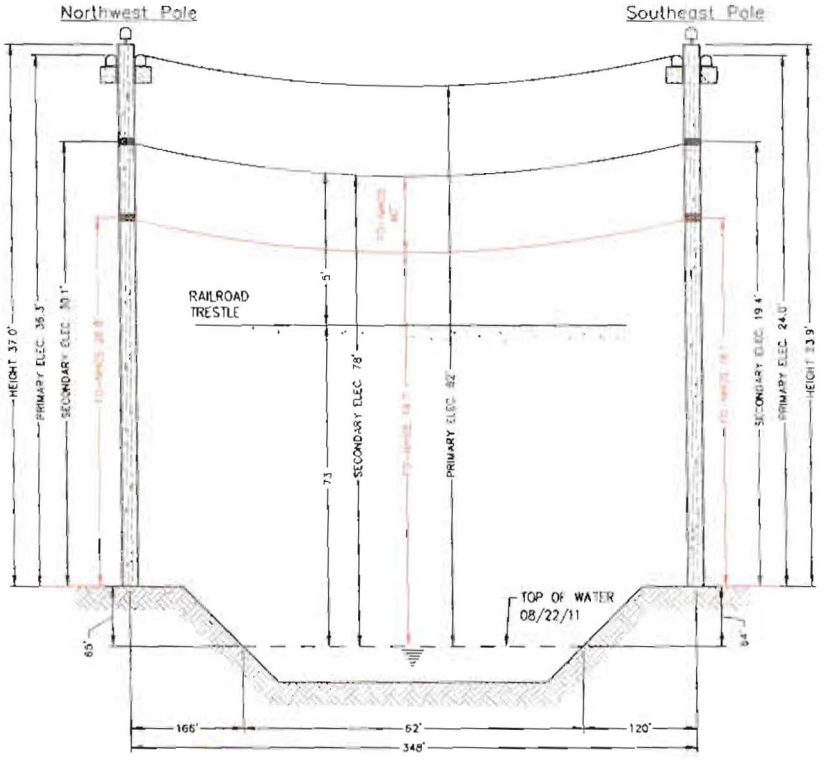
NESC RESULTS

Rule 251 - Heavy	0.0	1.000	58	3	4.0	1.703	0.54	3089	0.15	8.87	4.15	7.80	28.1
232A1	120.0	0.000	80	6	6.0	0.317	4.00	1198	0.01	4.01	6.00	4.00	9.0

Span Length = 348.00 ft
Span Sag = 3.46 ft (41.5 in)
Span Tension = 1,329 lb
Max Load = 6,650 lb
Usable load (80%) = 1,990 lb
Catenary Length = 348.08 ft
Stress Free Length @
Installed Tension/sum = 367.98 ft

Unloaded Strand
Sag = 3.55 ft (18.6 in) 0.44 %
Tension = 1,193 lb

Span (ft)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
40.0	2.61	1,837	-0.01	N/A
50.0	2.76	1,798	-0.01	N/A
60.0	2.74	1,743	-0.01	N/A
70.0	2.61	1,689	-0.01	N/A
80.0	2.69	1,657	-0.01	N/A
90.0	2.88	1,615	-0.01	N/A
100.0	3.08	1,573	-0.01	N/A
110.0	3.12	1,532	-0.01	N/A
120.0	3.21	1,492	0.00	N/A
130.0	3.30	1,452	0.00	N/A
140.0	3.39	1,414	0.00	N/A
150.0	3.48	1,376	0.00	N/A
160.0	3.58	1,339	0.00	N/A
170.0	3.68	1,302	0.00	N/A
180.0	3.78	1,266	0.00	N/A
190.0	3.89	1,232	0.01	N/A
200.0	4.00	1,198	0.01	N/A
210.0	4.11	1,165	0.01	N/A
220.0	4.23	1,133	0.01	N/A



E-4/7 - T-NT/NT
(Existing joint owned utility pole (Ashland Elec.) in existing Right-of-Way)

E-4/6 - T-NT/NT
(Existing joint owned utility pole (Ashland Elec.) in existing Right-of-Way)

Notes

1. The heights of structures shown hereon are based on field measurements taken with a Nikon 352 total station using a rod survey on 08/22/11.
2. The horizontal distance between the bearing railroad trestle edge and the existing overhead wires is approximately 10'.
3. Because of the close horizontal proximity to the existing bridge structure, the supplied drawing is submitted with vertical distances measured to the structure. This process simplifies the preparation and review of the crossing, without jeopardizing its intent to protect the safe usage of the waterway.
4. The smallest vertical distance from the top of existing bridge deck to the lowest existing overhead wire is approximately 5'.
5. The vertical distance between the top of water and railroad trestle deck is approximately 14'.
6. Vertical distances are representative of attachment heights after state make-ready issues are completed.

NHOS
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Nashua, NH 03063
(603-821-8987)

Project #TID-24-FR1-15
Drawing #AC-ASH-WW-2

Date: 10/24/11
Revision 0

Proposed Crossing
Squam River
Ashland, NH

Location:
Rand St, Ashland, NH
Nearest cross street-Winter St.

Sheet 2 of 2

E4/7 - T-NT/NT

Construction Notes:

NHOS proposes to install a 6 inch metal supporting strand between the existing utility poles shown above that will traverse the existing river. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will lash a one inch diameter fiber optic cable (FOC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with twenty four fiber contact information at each pole (Tamp NHOS will employ the proper safety personnel during the crossing installation. The proposed install will meet all proper clearances from other utilities (see above). Additional pole guys will be added per NESC Rule 261 and as directed by pole owners.

E-4/6 - T-NT/NT

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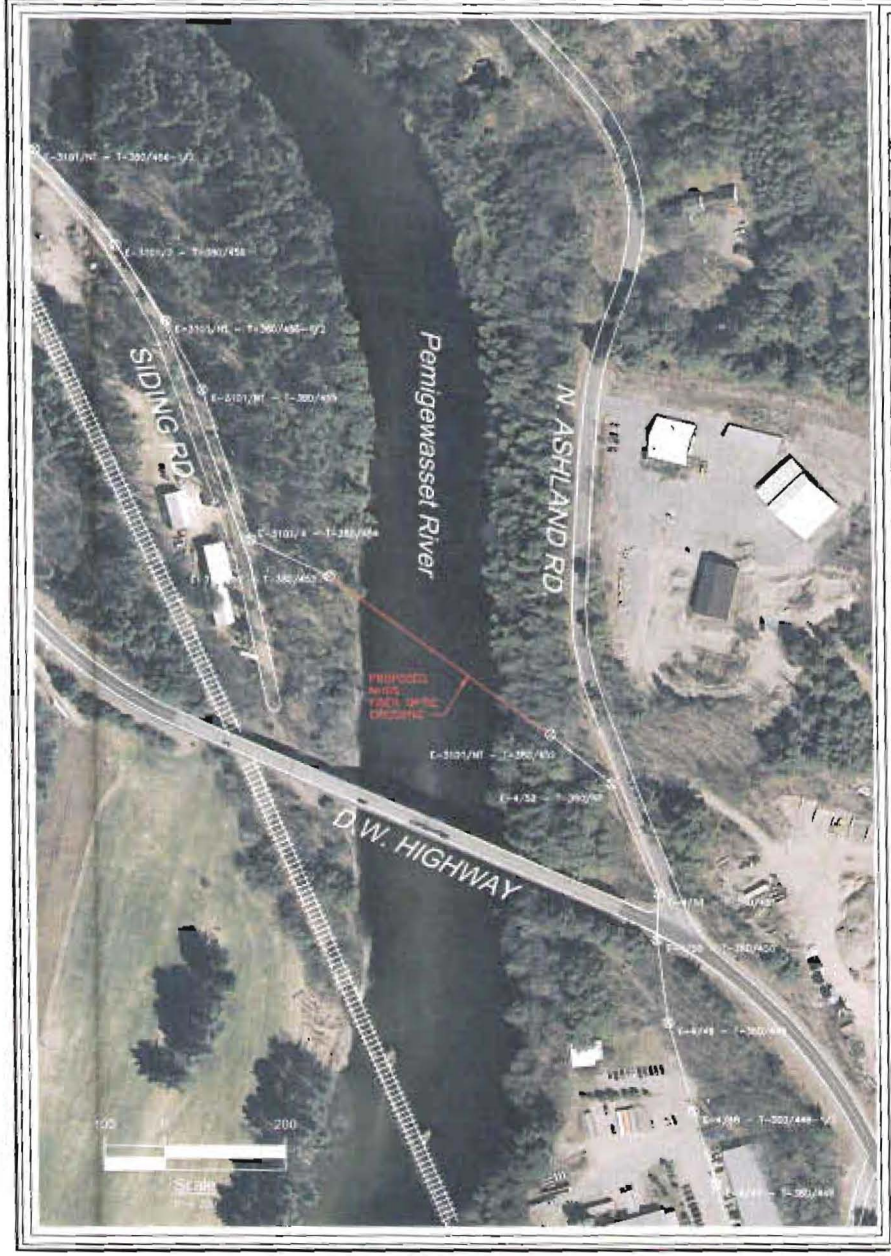

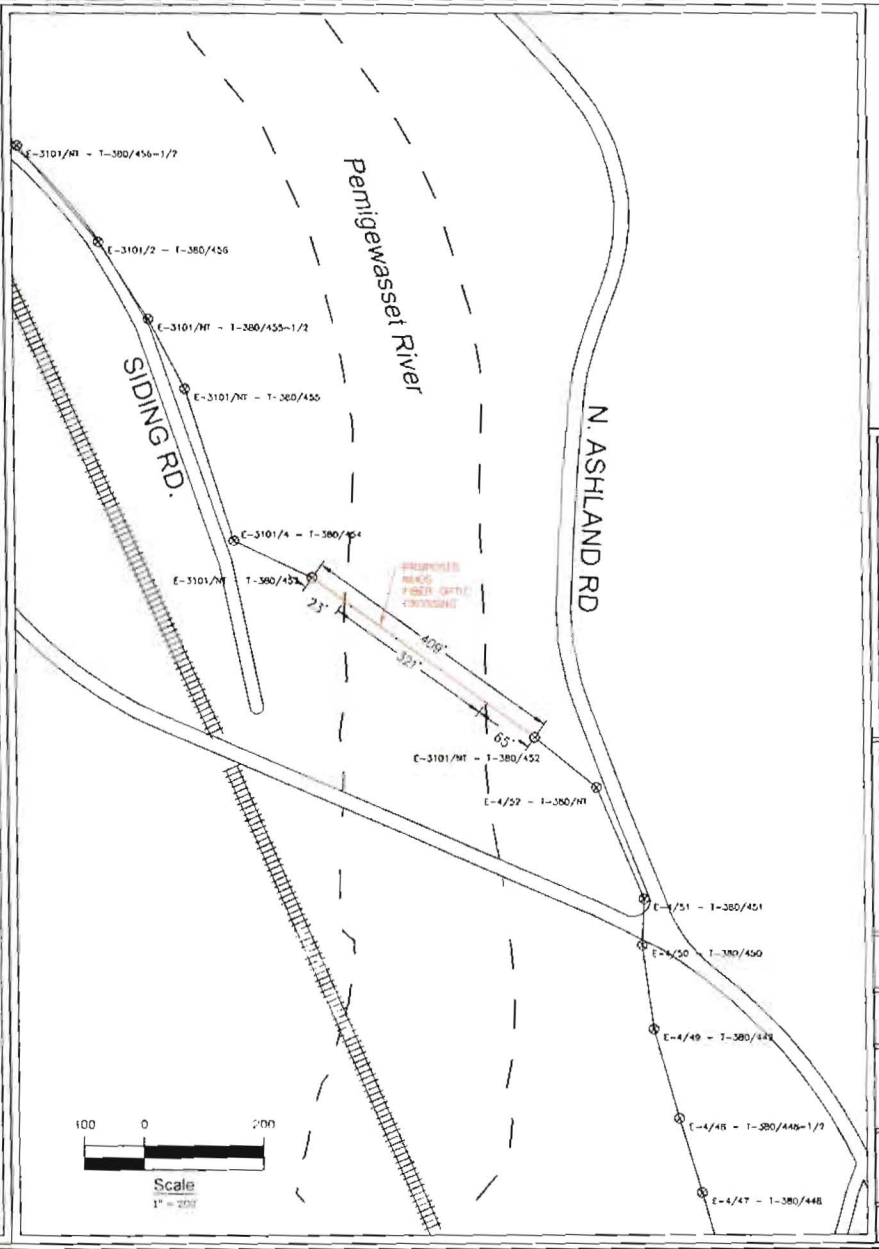

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NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
99 Pine Hill Rd.
Nashua, NH 03063
603-821-8167

Project #TID-27
Drawing #AC-ASHRIV-1

Date: 12/19/11
Revision #

Proposed Crossing
Pemigewassèt River
Ashland, NH

Location:
N. Ashland Rd., Bridgewater NH
Nearest cross street-Siding Rd.

Sheet 1 of 2

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LOCUS MAP
(Not to Scale)

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

Waveguide
River and Rail Crossings

	X SECT AREA (sq.in)	ERF MODULUS (psi)	NOMINAL DIAM (in)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	EIA LOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
Selected Cables							
1/4" 8x19 EHS	0.0362	2.80E+07	0.250	5.60E-06	0.1210	910940	NAM
ORF-O-288 LM	0.3782	2.70E+06	0.652	1.13E-05	0.2980	155842	80%
Bundle			1.148		0.5170		

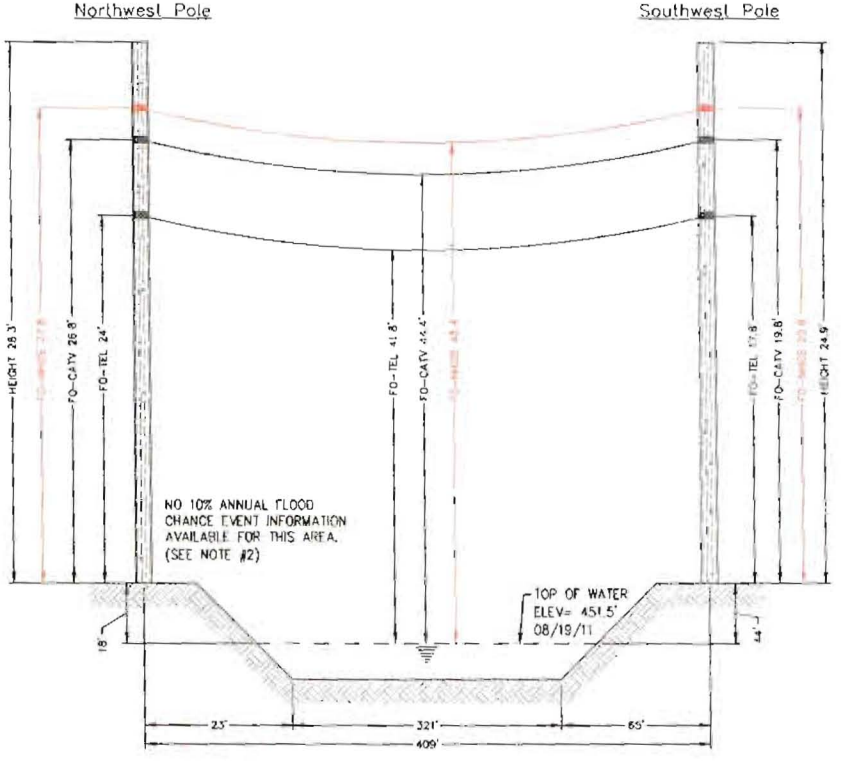
NESC RESULTS

Rule 211 - Heavy	0.0	1.000	50	3	4.0	1.793	10.65	3842	0.10		10.99	8.81	9.67	28.1
232A1	120.0	0.000	00	0	0.0	0.317	4.65	3429	0.01		4.64	0.00	4.63	0.0

Span Length = 409.00 ft
Span Sag = 8.98 ft (108.0 in)
Span Tension = 1,621 lb
Max Loss = 0.000 in
Usable load (60%) = 3,990 lb
Catenary Length = 409.189 ft
Stress Free Length @
Installed Temperature = 408.388 ft

Installed Strand
Sag = 1.79 ft (21.5 in) 0.43 %
Tension = 9,423 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	3.17	2,880	0.01	N/A
-30.0	3.24	2,816	0.01	N/A
-20.0	3.32	2,751	0.01	N/A
-10.0	3.39	2,687	0.01	N/A
0.0	3.47	2,624	0.01	N/A
10.0	3.55	2,561	0.01	N/A
20.0	3.63	2,519	0.01	N/A
30.0	3.72	2,477	0.00	N/A
40.0	3.81	2,436	0.00	N/A
50.0	3.90	2,395	0.00	N/A
60.0	3.99	2,355	0.00	N/A
70.0	4.09	2,316	0.00	N/A
80.0	4.19	2,277	0.00	N/A
90.0	4.29	2,239	0.00	N/A
100.0	4.39	2,202	0.00	N/A
110.0	4.50	2,165	0.01	N/A
120.0	4.60	2,129	0.01	N/A
130.0	4.71	2,094	0.01	N/A
140.0	4.82	2,060	0.01	N/A



E-3101/NT - T-380/453
(Existing joint owned utility pole (NHEC/Foirpoint) in existing Right-of-Way)

E-3101/NT - T-380/452
(Existing joint owned utility pole (Ashland Elec/Fairpoint) in existing Right-of-Way)

Notes.

1. The heights of the cable above ground are based on field measurements taken with a Nikon 360 total station using a rod source on 08/19/11. The elevations shown below are based on NHDOT Geodetic link 4059 00100 found on the South West bridge abutment. This link has a published elevation of 500.00' (NAVD88).
2. The waterway is classified as suitable for rail boating and per NESC Table 232-1 a vertical clearance of 32' must be maintained between the lowest conductor and 10 year floodplain.
3. Based on the Mills Flood Stable for the Pemigewasset River page 1229, there is no 10% annual chance flood event information available for this location. As stated on the profile, "THE 0.2%, 2%, AND 10% ANNUAL CHANCE FLOOD DATA IS NOT AVAILABLE".
4. The horizontal distance between the nearest bridge and the existing overhead wires ranges from 23' to 28'.
5. The vertical vertical distance between the bridge deck and the lowest crossing overhead wire is 25'.
6. The vertical distance between the top of water and lowest crossing wire was approximately 42' at the time of survey.
7. Vertical distances are representative of attachment heights after utility make-ready moves are completed.

E-3101/NT - T-380/453

Construction Notes:

NHOS proposes to install a 5/8 inch metal supporting strand between the existing utility poles. Utility strand that will traverse the existing river. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will tag a one inch diameter fiber optic cable (FOC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with twenty foot loop contact information at each pole clamp. NHOS will employ the proper safety personnel during the crossing installation. The proposed install will meet all proper clearances from other utilities. See above. Additional pole guys will be added per NESC Rule 261 and as directed by pole owners.

E-3101/NT - T-380/452

NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
95 Pine Hill Rd.
Nashua, NH 03063
(802-821-6487)

Project #TID-27
Drawing #AC-ASH-RNV1

Date: 10/18/11
Revision #

Proposed Crossing
Pemigewasset River
Ashland, NH

Location:
N. Ashland Rd., Bridgewater NH
Nearest cross street-Riding Rd.

Sheet 2 of 2

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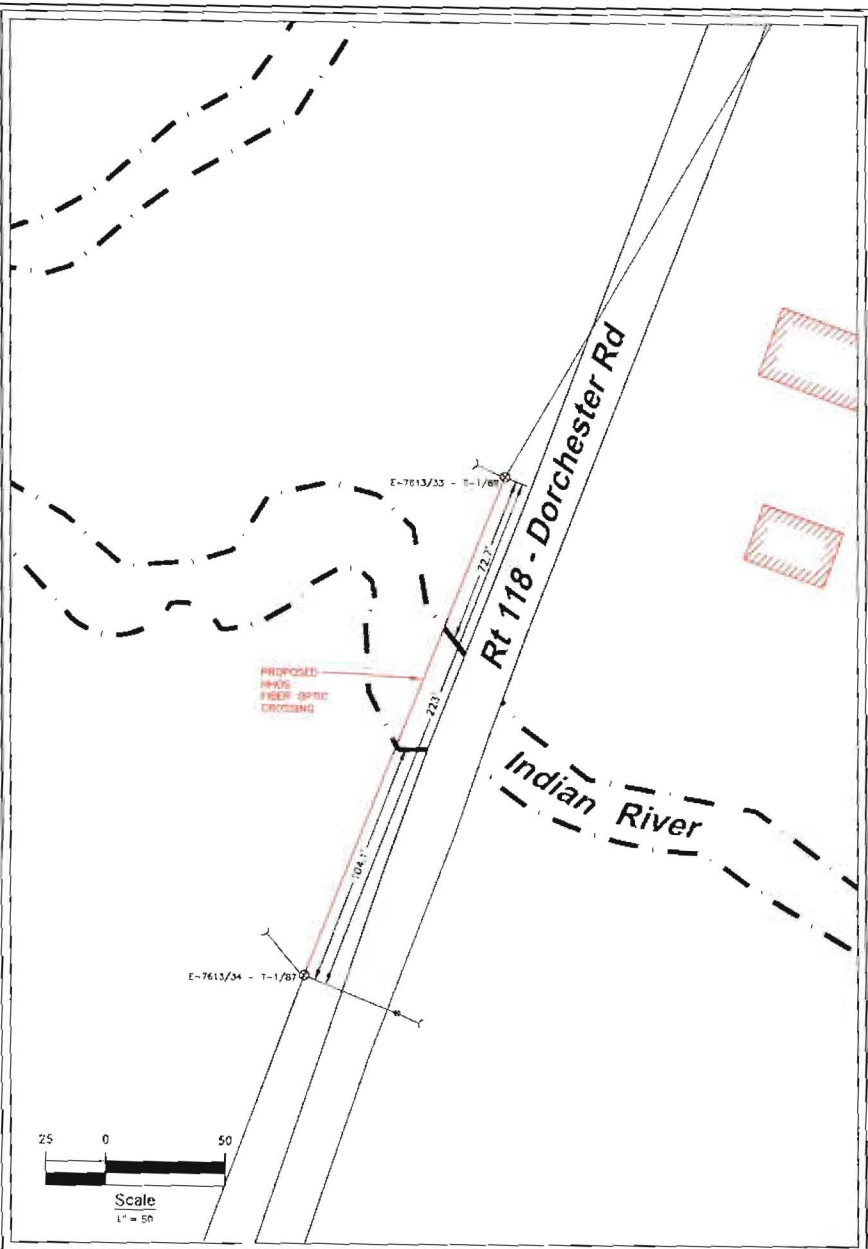

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NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
[illegible]
Nashua, NH [illegible]
([illegible])

Project #TID-31
Drawing #AI-CAN-RIV-1

Date: [illegible]
Revision: [illegible]

Proposed
Indian River Crossing
Canaan, NH

Location:
Route 118-Dorchester Rd, Canaan, NH
Nearest cross street:Hall Dr.

Sheet 1 of 2

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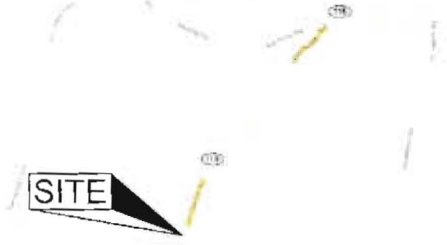


LOCUS MAP
(Not to Scale)

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

Waveguide
River and Rail Crossings

08/01/11 Waveguide

Selected Cables	X-SECT AREA (sq.in)	SH MODULUS (psi)	NOMINAL DIAM (in)	EFFEKP COEFF* (1/F)	CABLE WEIGHT (lb/ft)	ETALOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
1/4"6.6HDHS	0.0352	2.50E+07	0.255	1.06E-05	0.1218	914940	8650
DRP-D-144-LN	0.4307	1.50E+05	0.797	1.09E-05	0.1628	165729	648
Bundle			0.901		0.2700		

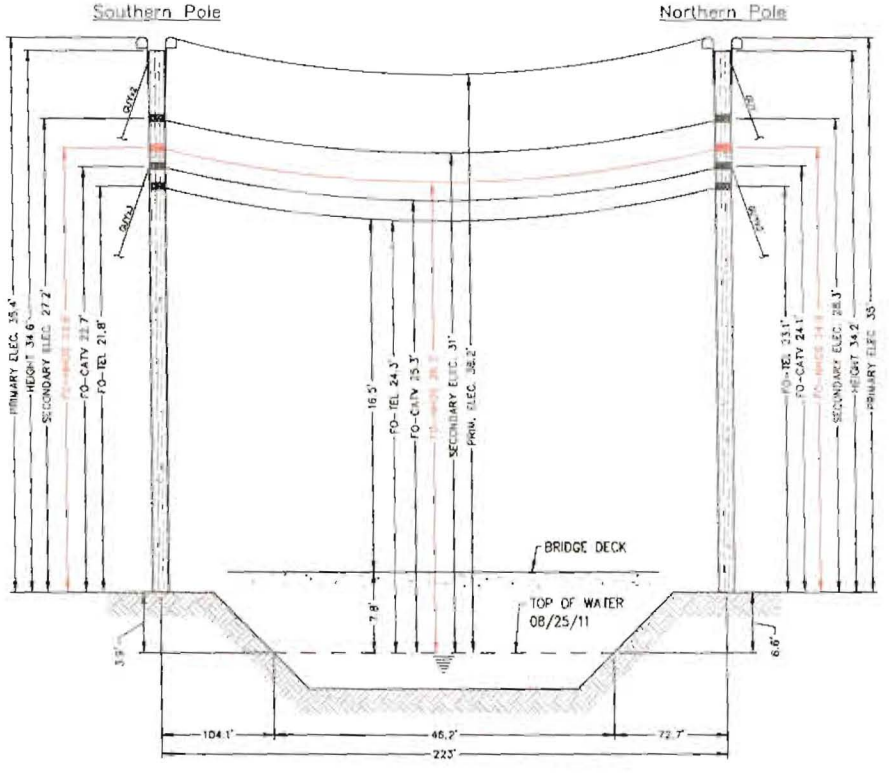
NESC RESULTS

Rule 250 - Heavy	0.0	0.927	00	3	4.0	1.671	4.97	2886	0.11	4.99	2.41	4.35	28.8	
232A1	120.0	0.000	00	0	0.0	0.273	2.72	675	0.01	2.72	0.00	2.72	0.0	

Span Length = 223.00 ft
Span Sag = 2.27 ft (26.8 in)
Span Tension = 701 lb
Max Load = 8,000 lb
(Design load (80%) = 3,995 lb
Catenary Length = 223.029 ft
Stress Free Length (ft)
Installed Temperature = 222.874 ft

Unloaded Strain
Sag = 1.26 ft (15.2 in) 0.67 %
Tension = 695 lb

Temp (F)	Midspan Sag (ft)	Tension (lbs)	% Length Change	Clearance
-40.0	1.44	1,182	-0.02	N/A
-30.0	1.49	1,136	-0.01	N/A
-20.0	1.55	1,094	-0.01	N/A
-10.0	1.61	1,052	-0.01	N/A
0	1.67	1,012	-0.01	N/A
10.0	1.74	972	-0.01	N/A
20.0	1.81	933	-0.01	N/A
30.0	1.88	896	-0.01	N/A
40.0	1.97	860	-0.01	N/A
50.0	2.05	825	0.00	N/A
60.0	2.14	792	0.00	N/A
70.0	2.23	760	0.00	N/A
80.0	2.32	730	0.00	N/A
90.0	2.42	701	0.00	N/A
100.0	2.52	673	0.01	N/A
110.0	2.62	646	0.01	N/A
120.0	2.72	621	0.01	N/A
130.0	2.82	601	0.02	N/A
140.0	2.93	579	0.02	N/A



E-7613/34 - T-1/87
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)

(Not to Scale)

E-7613/33 - T-1/88
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)

E-7613/34 - T-1/87

Construction Notes:

NHOS proposes to install a ½ inch metal supporting strand between the existing utility poles shown above that will traverse the river. The strand will be installed at the proposed attachment above).
The supporting strand will be secured to each pole using double dead end attachments to prevent any sag on the wire and maintain proper clearances.
NHOS will lash a one inch diameter fiber optic cable (FOC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with twenty foot hour contact information at each pole clamp. NHOS will employ the proper safety personnel during the crossing installation. The proposed and all will meet all proper clearances from other Utilities (see above). Additional pole guys will be added per NESC Rule 250 and as directed by pole owners.

E-7613/33 - T-1/88

Notes:

1. The heights of attachments shown hereon are based on field measurements taken with a Nikon DTM total station during a site survey on 08/25/11.
2. The horizontal distance between the existing bridge and the existing overhead wires ranges from 5.7 to 9.8'.
3. Because of the close horizontal proximity to the existing bridge structure, the supplied drawing is calculated with vertical distances measured to the structure. This process simplifies the preparation and review of the crossing without sacrificing its intent to protect the safe usage of the waterway.
4. The shortest vertical distance from the top of existing bridge deck to the lowest existing overhead wire is 16.5'.
5. The vertical distance between the top of the water and bridge deck at the time of survey is 7.8'.
6. Vertical distances are representative of attachment heights after utility make-ready moves are completed.

NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
90 Pine Hill Rd
Nashua, NH 03063
(603-821-8687)

Project #TID-31
Drawing #NC-COM-REV-1

Date: 09/27/11
Revision 0

Proposed
Indian River Crossing
Canaan, NH

Location:
Route 118-Dorchester Rd, Canaan, NH
Nearest cross street:Hall Dr.

Sheet 2 of 2

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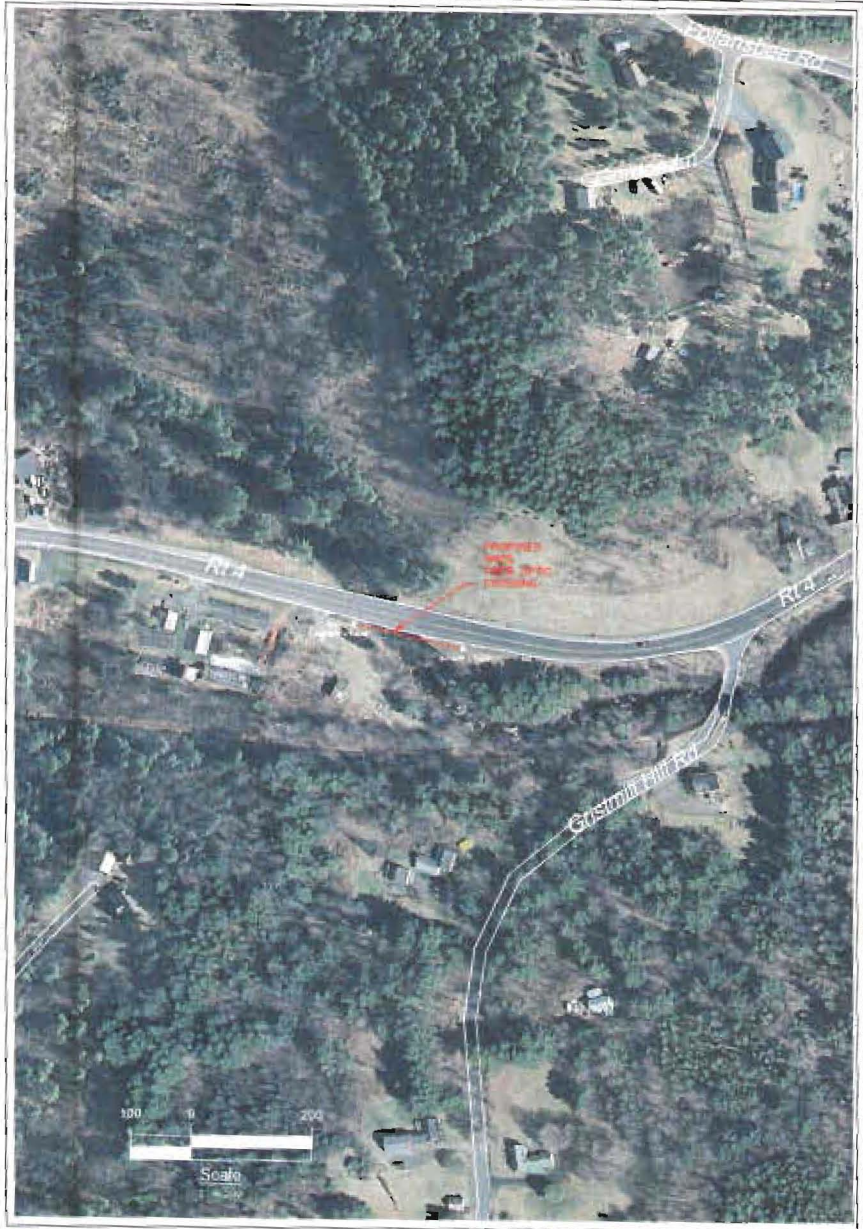

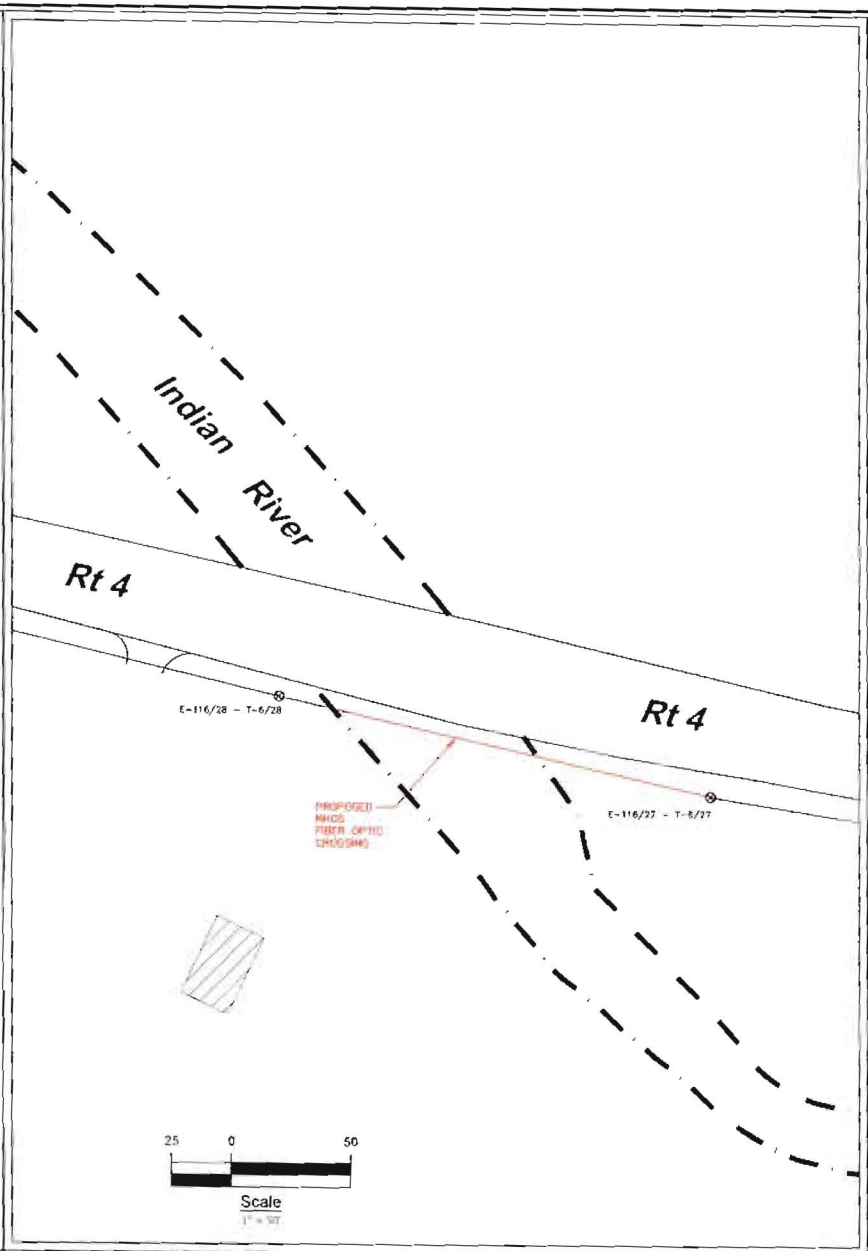

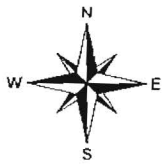

NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
98 Pine Hill Rd
Nashua, NH 03063
(603-821-6467)

Project #TID-32-PWI-19
Drawing #AC-CAN-RIV-2

Date: 10/14/11
Revision: 0

Proposed
Indian River Crossing
Canaan, NH

Location:
Route 4, Canaan, NH
Nearest cross street-Gristmill Hill Rd

Sheet 1 of 2

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LOCUS MAP
(Not to Scale)

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

Wiremaster
River And Rail Crossings

	X SECT AREA (sq in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	FULL LOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
Selected Cables							
SMFL6-in-FR45	0.0350	2.80E+07	0.250	3.49E-06	0.1210	814840	8850
DRF-0-288-024	0.1700	2.70E+06	0.594	1.13E-06	0.1980	150867	451
Bundle			1.106		0.3170		

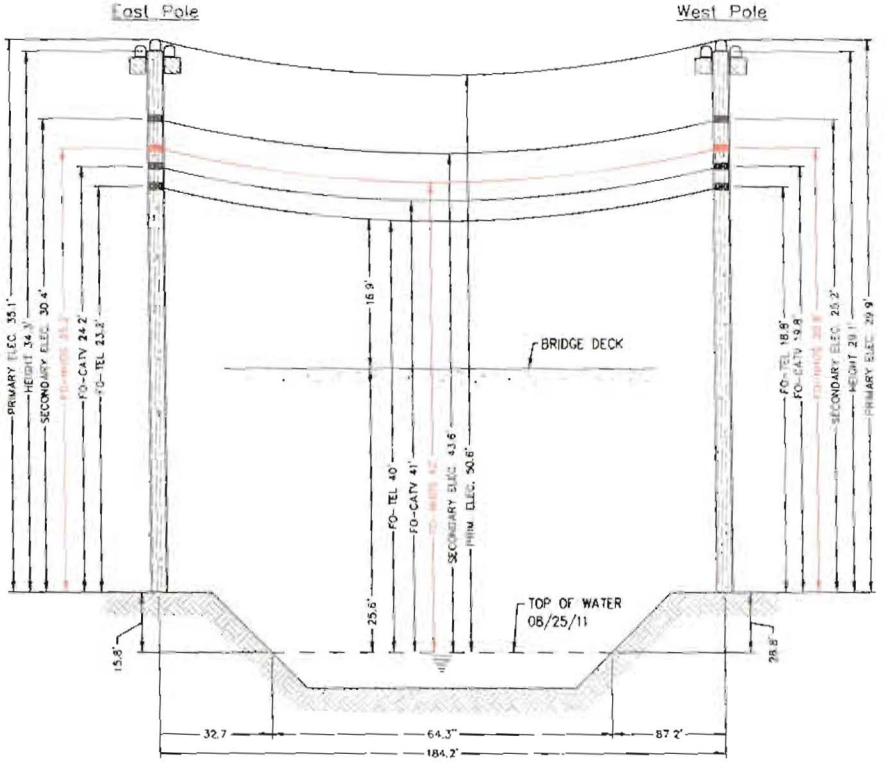
NESC RESULTS

Loading Condition	Temp (F)	Wind Pressure (psf)	Ice (in)	Wind Factor	Result Tension (lbs)	Result Sag (ft)	Clearance (ft)	Clearance Factor	Tension Factor %	Sag Factor %	Clearance Factor %
Rule 251 - Heavy	0.0	1.000	50	0	4.6	1.700	3.97	5941	0.08	3.42	1.08	3.45	28.1
232A1	120.0	0.000	00	0	0.0	0.217	2.26	596	0.0	2.26	0.00	2.26	0.0

Span Length = 184.20 ft.
Span Sag = 1.84 ft (22.1 in)
Span Tension = 730 lb
Max Load = 6,650 lb
Usable load (80%) = 5,000 lb
Catenary Length = 184.249 ft
Stress Free Length @
Installed Temperature = 184.152 ft

Unloaded Strand
Sag = 94.9 (11.2 in) 9.61 %
Tension = 549 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	1.17	1,148	-0.02	N/A
-30.0	1.23	1,093	0.02	N/A
-20.0	1.27	1,060	-0.01	N/A
-10.0	1.32	1,019	-0.01	N/A
0	1.37	978	0.01	N/A
10.0	1.43	939	0.01	N/A
20.0	1.48	901	0.01	N/A
30.0	1.53	864	-0.01	N/A
40.0	1.62	826	-0.01	N/A
50.0	1.69	793	0.00	N/A
60.0	1.77	761	0.00	N/A
70.0	1.84	729	0.00	N/A
80.0	1.92	699	0.00	N/A
90.0	2.00	671	0.00	N/A
100.0	2.09	644	0.01	N/A
110.0	2.17	619	0.01	N/A
120.0	2.26	596	0.01	N/A
130.0	2.34	573	0.02	N/A
140.0	2.43	553	0.02	N/A



E-116/28 - T-6/28
(Existing joint owned utility pole (National Grid/Fairpoint) in existing Right-of-Way)

E-116/27 - T-6/27
(Existing joint owned utility pole (National Grid/Fairpoint) in existing Right-of-Way)

E-116/28 - T-6/28

Construction Notes:

NHOS proposes to install a 6 inch metal capacitor strand between the existing utility poles shown above that will cross over the river. The strand will be installed at the proposed height (see above). The capacitor strand will be secured to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will lash a one half diameter fiber optic cable (FO cable) to the strand using a dual lash method to provide security of the fiber over the right-of-way. The fiber will be tagged with twenty four hour contact information at each pole clamp. NHOS will employ the proper safety personnel during the crossing installation. The proposed install will meet all proper clearances from other utilities (see above). Additional pole guys will be added per NESC Rule 261 and as directed by pole owners.

E-116/27 - T-6/27

Notes:

1. The heights of structures shown above are based on field measurements taken with a Nikon 302 total station during a pre survey on 08/25/11.
2. The horizontal distance between the existing bridge and the existing overhead wires ranges from 7.8' to 10.2'.
3. Because of the close horizontal proximity to the existing bridge structure, the supplied drawing is submitted with vertical distances measured to the structure. This process simplifies the preparation and review of the crossing without jeopardizing its intent to protect the safe usage of the waterway.
4. The smallest vertical distance from the top of existing bridge deck to the lowest existing overhead wires is 16.9'.
5. The vertical distance between the top of water and bridge deck is approximately 25.6'.
6. Vertical distances are representative of attachment heights after utility make ready moves are completed.

NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
99 Pine Hill Rd
Nashua, NH 03063
(603-821-4487)

Project: #TID-32-PNI-11
Drawing: FAC-CAN-R10-2

Date: 10/24/11
Revision: 0

Proposed
Indian River Crossing
Canaan, NH

Location:
Route 4, Canaan, NH
Nearest cross street-Gilstrap Hill Rd

Sheet 2 of 2

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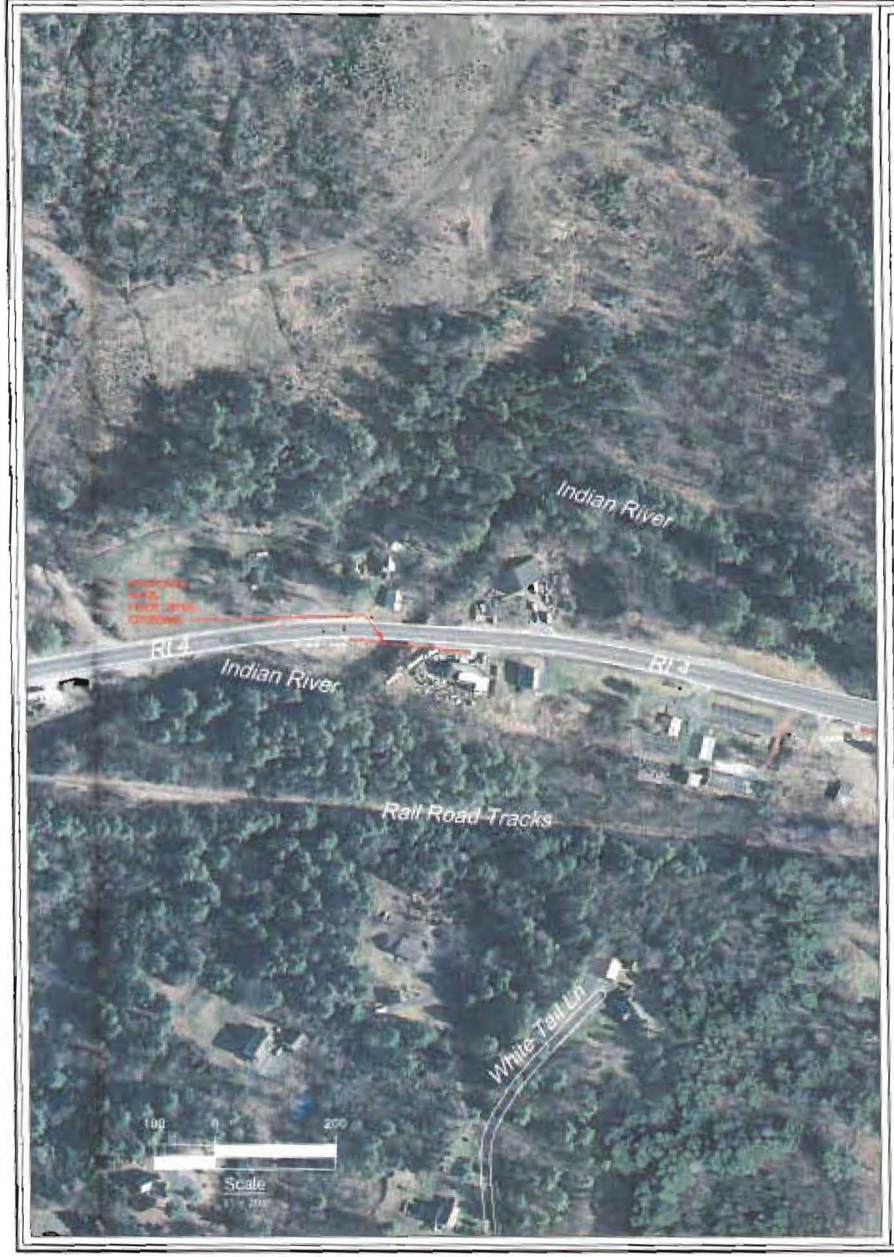

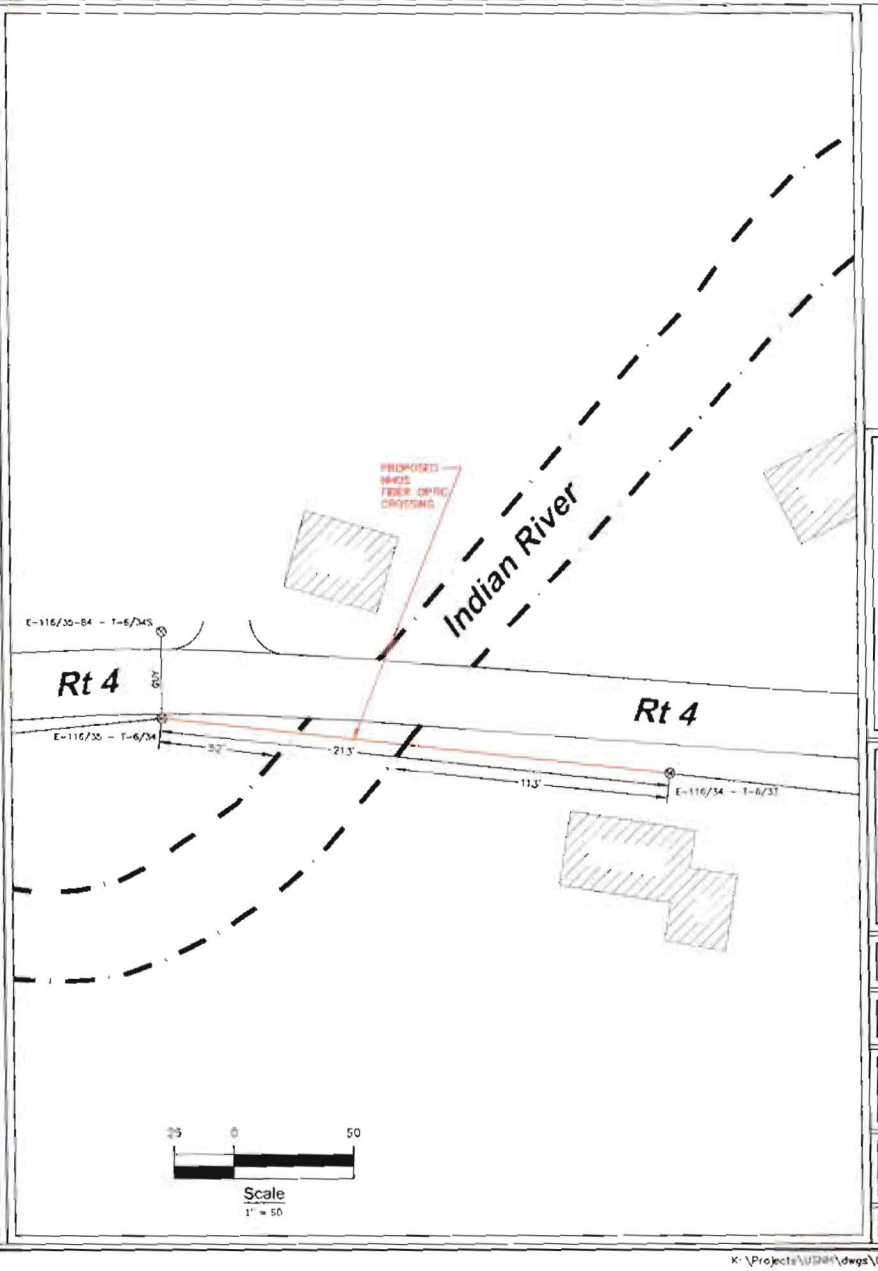

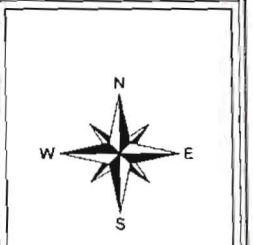

NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems Inc.
99 Pine Hill Rd.
Nashua, NH 03063
(603-821-6407)

Project #TID-33-PRI-13
Drawing #NO-CAN-RIV-1

Date: 08/19/11
Revision: 0

Proposed
Indian River Crossing
Canaan NH

Location:
Route 4, Canaan, NH
Nearest cross street-Gristmill Hill Rd

Sheet 1 of 2

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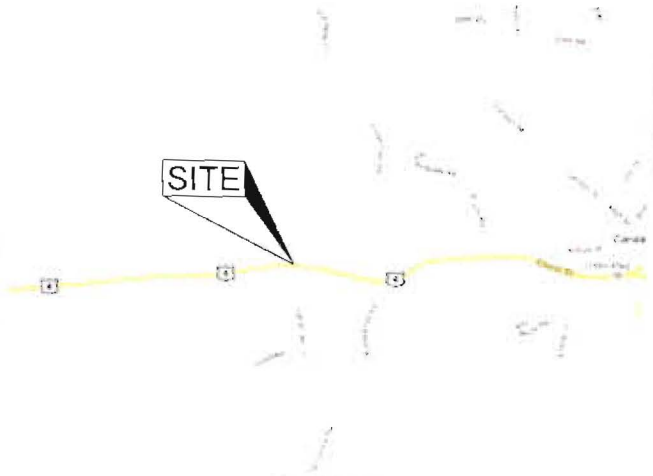


LOCUS MAP
(Not to Scale)

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

Waveguide
River and Rail Crossings

Selected Cables	X-SECT AREA (sq in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	EFA LOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
18/8 AmEHS	0.0262	2.80E+07	0.196	9.44E-06	0.0210	614.9NG	0650
ORF-D-144 LR	0.4307	2.88E+05	0.741	1.08E-05	0.4520	1507.20	640
Bundle			0.901		0.2739		

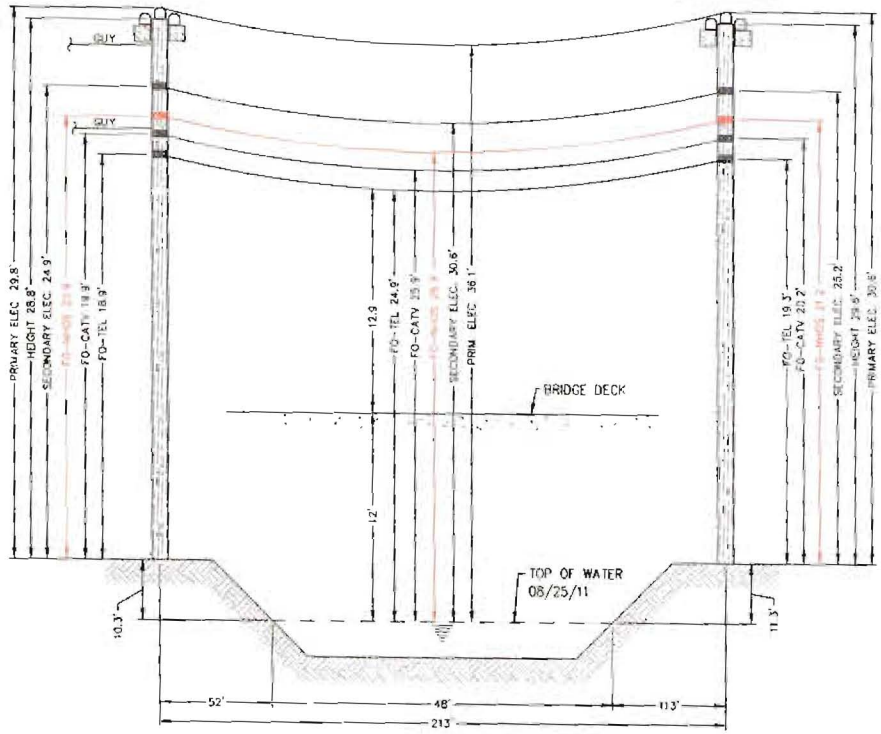
NESC RESULTS

Rule 251	Heavy	0.0	0.007	56	3	4.0	1.471	4.68	2019	3.18	4.68	2.37	4.91	28.6
230A1		120.0	0.000	00	0	0.0	0.273	3.61	991	2.01	2.41	0.01	2.41	0.0

Span Length = 273.00 ft
Sag = 2.12 ft (25.4 in)
Span Tension = 727 lb
Max Load = 6,650 lb
Usable load (90%) = 5,985 lb
Catenary Length = 273.057 ft
Stress Free Length (S)
Installed Temperature = 212.888 ft

Unloaded Strand
Sag = 1.22 ft (14.6 in) 0.57 %
Tension = 563 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	1.35	1,143	-0.02	N/A
-30.0	1.40	1,100	-0.02	N/A
-20.0	1.46	1,057	-0.01	N/A
-10.0	1.52	1,016	-0.01	N/A
0	1.58	976	-0.01	N/A
10.0	1.65	938	-0.01	N/A
20.0	1.72	901	-0.01	N/A
30.0	1.80	866	-0.01	N/A
40.0	1.87	835	-0.01	N/A
50.0	1.96	799	0.00	N/A
60.0	2.04	767	0.00	N/A
70.0	2.13	736	0.00	N/A
80.0	2.22	706	0.00	N/A
90.0	2.32	678	0.00	N/A
100.0	2.41	651	0.01	N/A
110.0	2.51	626	0.01	N/A
120.0	2.61	603	0.01	N/A
130.0	2.71	581	0.01	N/A
140.0	2.81	560	0.02	N/A



E-116/35 - T-6/34
(Existing joint owned utility pole (National Grid/Fairpoint) in existing Right-of-Way)

Not to Scale

E-116/34 - T-6/33
(Existing joint owned utility pole (National Grid/Fairpoint) in existing Right-of-Way)

E-116/35 - T-6/34

Construction Notes

NHOS proposes to install a 5 inch metal supporting strand between the existing utility poles shown above that will traverse the river. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will lash a one inch diameter fiber optic cable (FOC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with twenty four fiber contact information at each pole clamp. NHOS will employ the proper safety personnel during the crossing installation. The proposed install will meet all proper clearances from other utilities (see above). Additional pole guys will be added per NESC Rule 264 and as directed by pole owners.

E-116/34 - T-6/33

Notes:

1. The heights of structures shown herein are based on field measurements taken with a Zeiss ELTA total station during a pole survey on 08/25/11.
4. The horizontal distance between the existing bridge and the existing overhead wires ranges from 6.5' to 8.5'.
5. Because of the close horizontal proximity to the existing bridge structure, the simplified drawing is submitted with vertical distances measured to the structure. This process simplifies the preparation and review of the crossing without jeopardizing its intent to protect the safe usage of the waterway.
4. The smallest vertical distance from the top of existing bridge deck to the lowest existing overhead wires is 12.9'.
5. The vertical distance between the top of water and bridge deck is approximately 12'.
6. Vertical distances are representative of attachment heights after utility make ready moves are completed.

NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
99 Pine Hill Rd.
Nashua, NH 03063
(603) 821-8401

Project #TID-33-RRJ-15
Drawing # AC-CAN-RIV-3

Date: 10/14/11
Revision 6

Proposed
Indian River Crossing
Canaan, NH

Location:
Route 4, Canaan, NH
Nearest cross street-Grisinolli Hill Rd

Sheet 2 of 2

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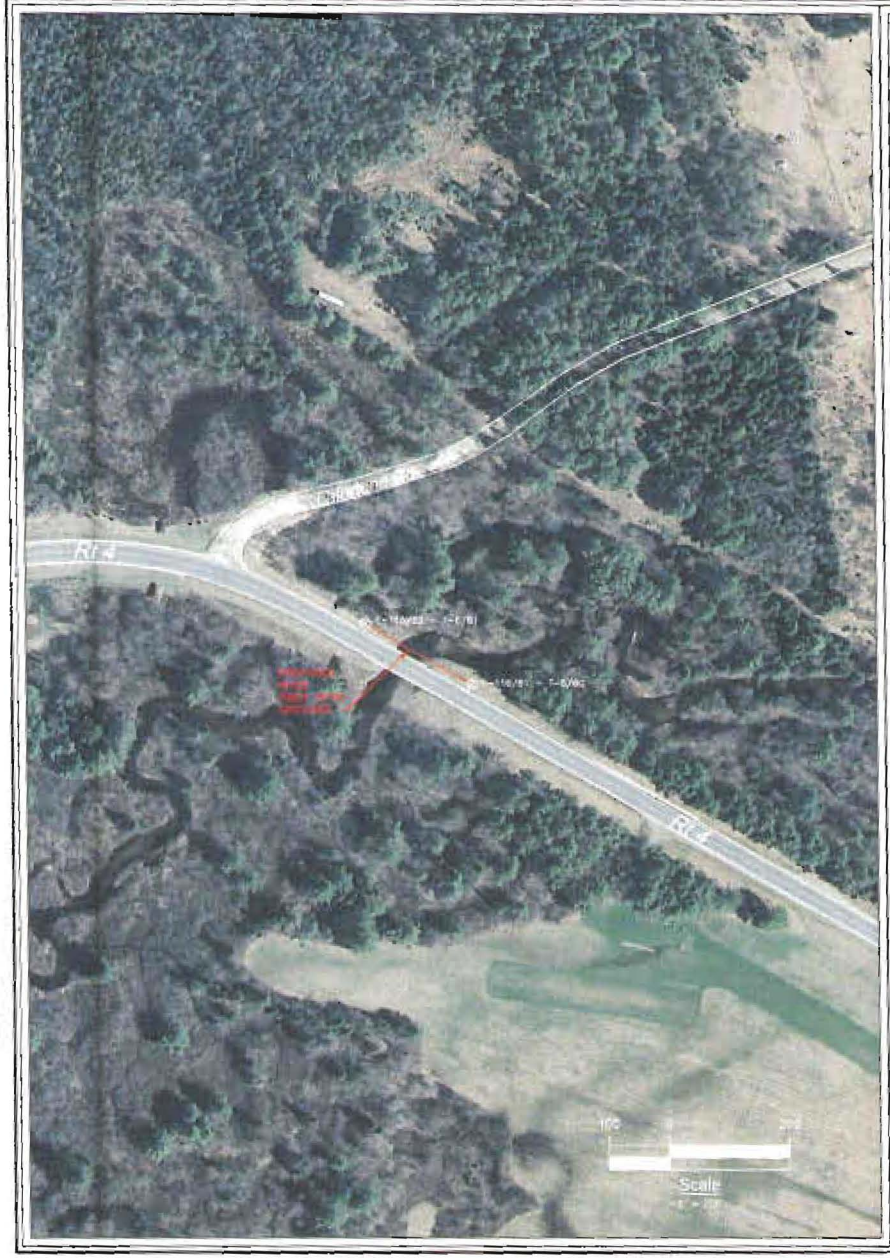

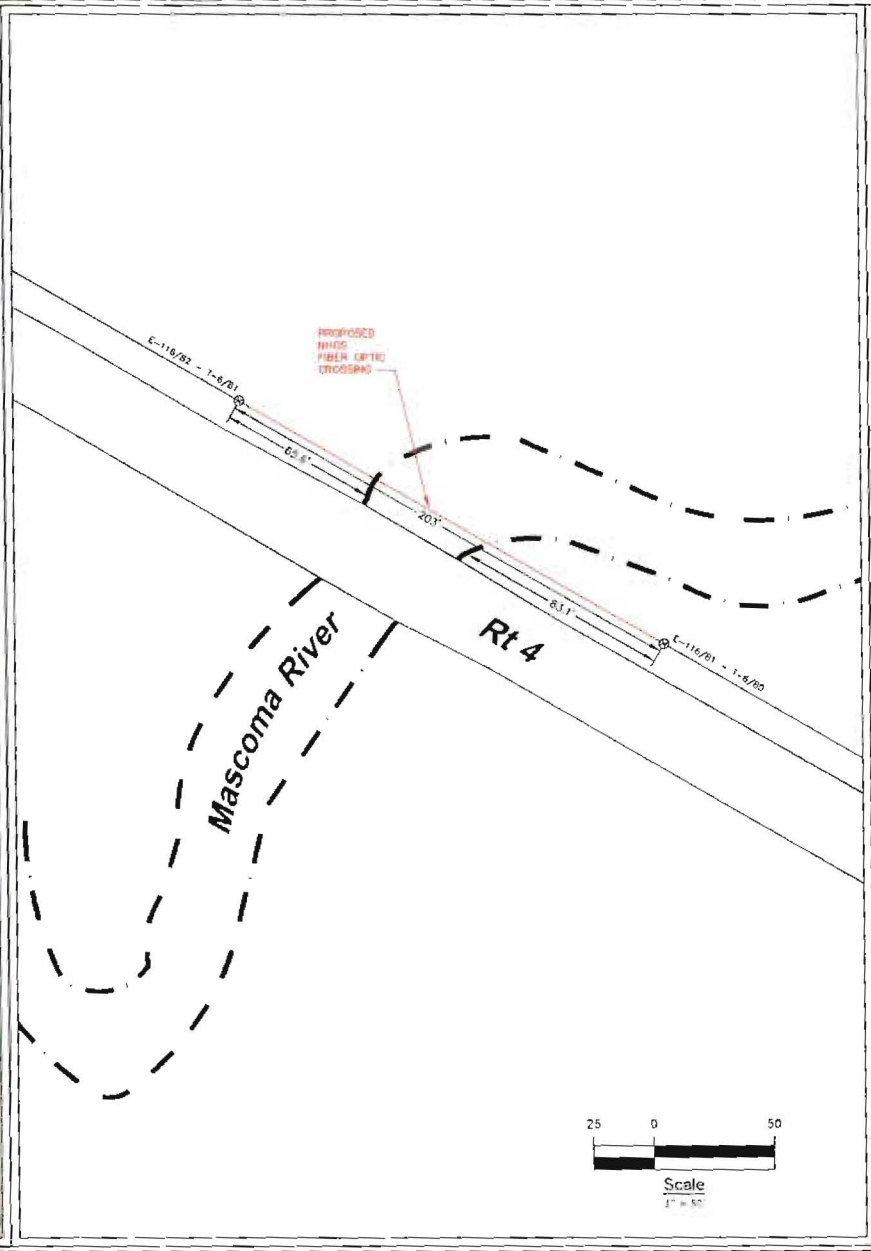

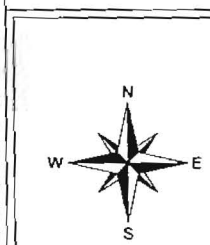

NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
99 Pine Hill Rd.
Nashua, NH 03063
(603-821-8187)

Project # TID-34
Drawing #AC-CAN-RJV-4

Date: 09/27/11
Revision: 0

Proposed
Mascoma River Crossing
Canaan, NH

Location:
Route 4, Canaan, NH
Nearest cross street-Lafortune Rd

Sheet 1 of 2

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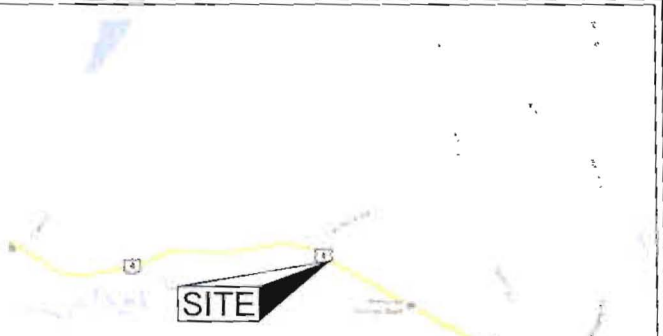


LOCUS MAP
(Not to Scale)

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

Wiresgate
River and Rail Crossings

Selected Cables	X-SECT AREA (sq in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	EIA LOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
1&1/2 SmEHS	0.6352	2.00E+07	0.230	5.92E-06	0.7215	94940	0650
QBF-D-288LN	0.5152	2.70E+05	0.656	1.13E-05	0.1963	156562	661
Bundle			1.NA		0.9178		

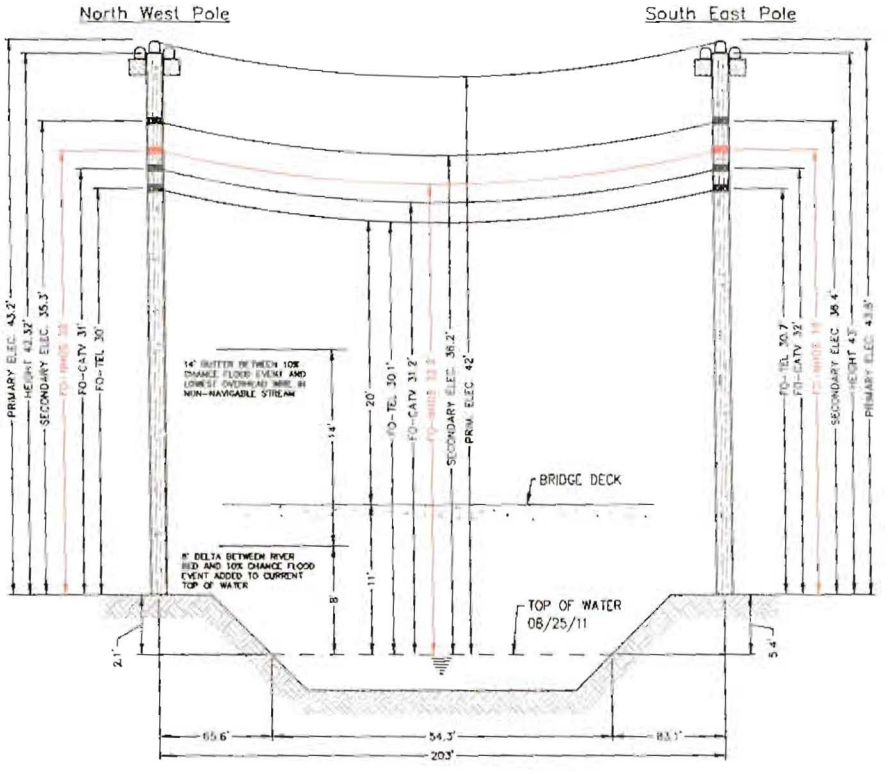
NESC RESULTS

Rule 251 - Heavy	0.0	1.000	30	0	4.0	1.703	4.47	2179	8.10		4.44		2.09	3.91	28.1
232A1	120.0	0.000	00	0	0.0	0.317	2.48	660	9.01		2.48		8.00	2.48	0.0

Span Length = 203.00 ft
Span Sag = 2.03 ft (24.4 in)
Initial Tension = 894 lb
Max Load = 6,650 lb
Usable load (50%) = 3,000 lb
Catenary Length = 203.064 ft
Stress Free Length (ft)
Installed Temperature = 20.0 deg F

Unloaded Sound
Sag = 1.01 ft (12.1 in) 0.50 %
Tension = 626 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	1.33	1,226	-0.02	N/A
-30.0	1.38	1,180	-0.01	N/A
-20.0	1.43	1,140	0.01	N/A
-10.0	1.48	1,099	0.03	N/A
0	1.54	1,054	0.01	N/A
10.0	1.60	1,016	-0.01	N/A
20.0	1.66	979	-0.01	N/A
30.0	1.73	941	0.01	N/A
40.0	1.80	905	0.01	N/A
50.0	1.87	870	0.00	N/A
60.0	1.95	830	0.00	N/A
70.0	2.03	853	0.00	N/A
80.0	2.11	772	0.00	N/A
90.0	2.20	743	0.00	N/A
100.0	2.29	715	0.01	N/A
110.0	2.37	688	0.01	N/A
120.0	2.46	663	0.01	N/A
130.0	2.55	639	0.02	N/A
140.0	2.65	616	0.02	N/A



E-116/82 - T-6/81
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)

(Not to Scale)

E-116/81 - T-6/80
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)

Notes

1. The heights of structures shown hereon are based on field measurements taken with a Nikon 362 total station during a site survey on 08/25/11.
2. The horizontal distance between the nearest bridge edge and the existing overhead wires is approximately 14'.
3. The smallest vertical distance from the top of existing bridge deck to the lowest existing overhead wires is 20'.
4. The vertical distance between the top of water and bridge deck is approximately 11'.
5. The waterway is classified as not suitable for rail hauling and per NESC Table 232.1 a vertical clearance of 18' must be maintained between the lowest conductor and 10 year floodplain.
6. Using data from FEMA Flood Profiles for the Mascoma River, Page 0.07, a conservative 10 year flood elevation was calculated by adding the delta between the river bed and the 10 year flood elevation to the surveyed water level.
7. Vertical distances are representative of attachment heights after utility make ready processes completed.

NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
69 Pine Hill Rd.
Nashua, NH 03063
(603-821-6487)

Project # TID-34
Drawing #AC-CAN-RIV-4

Date: 09/27/11
Revision #

Proposed
Mascoma River Crossing
Canaan, NH

Location:
Route 4 Canaan, NH
Nearest cross street-Lafortune Rd

Sheet 2 of 7

E-116/82 - T-6/81

Construction Notes

NHOS proposes to install a 1 inch metal supporting strand between the existing utility poles shown above that will traverse the river. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double dead end with elements to prevent any sag in the wire and maintain proper clearances. NHOS will lash a one inch diameter fiber optic cable (FOC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with twenty foot loop contact information at each pole clamp. NHOS will employ the proper safety personnel during the crossing installation. The proposed install will meet all proper clearances from other utilities. (see above). All strand pole guys will be added (per NESC Rule 261) and as directed by pole owners.

E-116/81 - T-6/80

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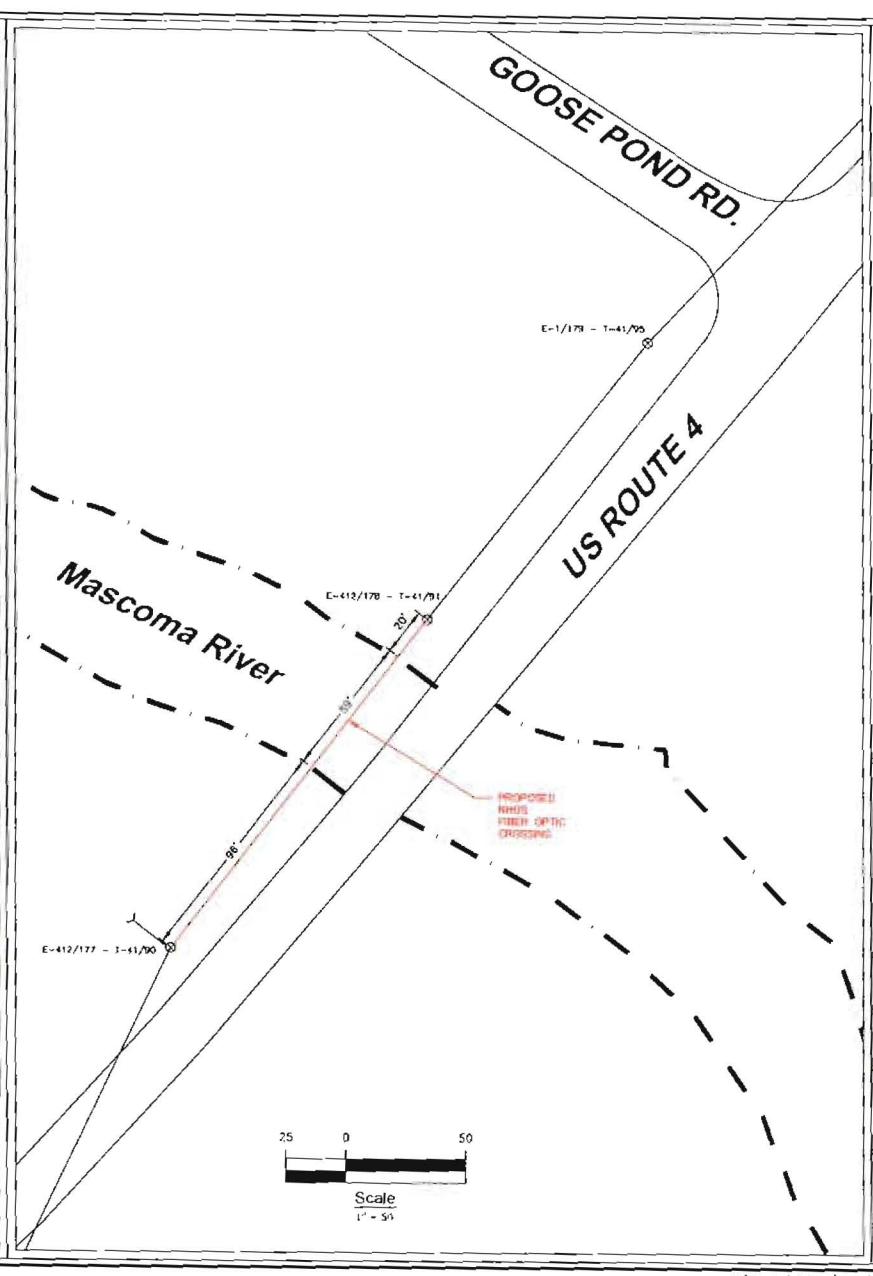

N
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NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
98 Pine Hill Rd.
Nashua, NH 03063
(603-821-4467)

Project # TID-35-TKL-15
Drawing: TAC-CAN-RIV-5

Date: 10/23/15
Revision #

Proposed
River Crossing
Canaan, NH

Location:
Route 4, Canaan, NH
Nearest cross street-Goose Pond Rd.

Sheet 1 of 2

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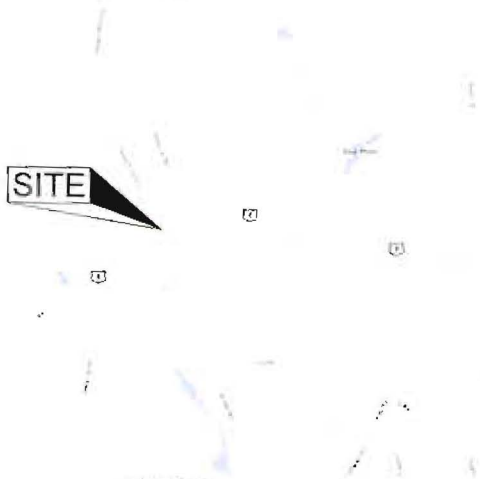


LOCUS MAP
(Not to Scale)

CommScope®

Spanmaster® Release 3.1 Sag / Tension Computations

Waterpipe
River and Rail Crossings

Selected Cables	X-SECT AREA (sq in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	ST/LOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
14/16 BnEHS	0.0352	2.96E+07	0.250	3.80E-06	0.0278	814940	8890
ORF-D 288 LN	0.0102	2.79E+07	0.650	1.13E-06	0.1900	555992	931
Bundle			1.108		0.3178		

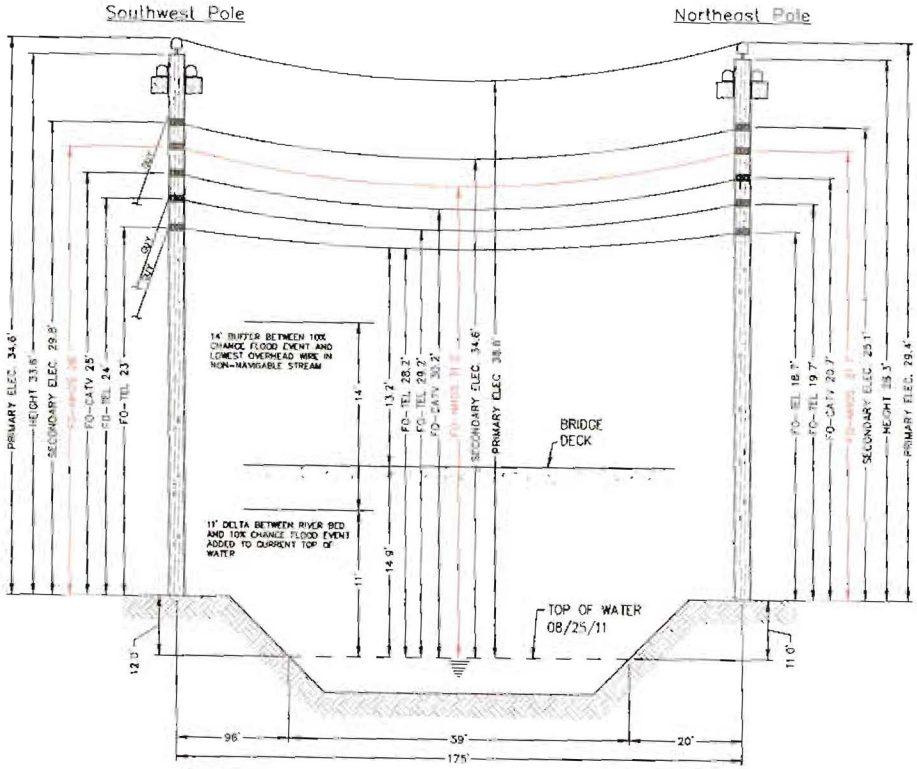
NESC RESULTS

Rule 251 - Heavy	0.0	1.000	60	0	4.0	1.793	2.06	1872	0.00	2.98	1.72	3.23	28.1		
232A1	120.0	0.000	60	0	0.9	0.317	2.15	563	0.01	2.98	0.00	2.16	0.0		

Span Length = 175.00 ft
Span Sag = 1.75 ft (21.0 in)
Span Tension = 563 lb
Max Load = 8.56 lb/ft
(Ultimate load (80%) = 2.86 lb)
Catenary Length = 175.042 ft
Stress Free Length @
Installed Temperature = 174.914 ft

Unloaded Strand:
Sag = 30 ft (18.8 in) 0.57 %
Tension = 514 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	1.00	1,197	0.02	N/A
-30.0	1.14	1,063	-0.00	N/A
-20.0	1.19	1,021	-0.01	N/A
-10.0	1.24	980	-0.01	N/A
0	1.29	939	-0.01	N/A
10.0	1.36	880	-0.01	N/A
20.0	1.41	842	-0.01	N/A
30.0	1.47	805	-0.01	N/A
40.0	1.53	769	-0.01	N/A
50.0	1.60	734	0.00	N/A
60.0	1.68	724	0.00	N/A
70.0	1.75	693	0.00	N/A
80.0	1.83	664	0.00	N/A
90.0	1.91	636	0.00	N/A
100.0	1.99	610	0.01	N/A
110.0	2.07	586	0.01	N/A
120.0	2.15	563	0.01	N/A
130.0	2.24	542	0.02	N/A
140.0	2.33	522	0.02	N/A



E-412/177 - T-41/90
(Existing joint owned utility pole (Notional Grid/Fairpoint) in existing Right-of-Way)

Not to Scale

E-412/178 - T-41/91
(Existing joint owned utility pole (National Grid/Fairpoint) in existing Right-of-Way)

E-412/177 - T-41/90

Construction Notes:

NHOS proposes to install a 4 inch conduit supporting strand between the existing utility poles shown above that will traverse the river. The strand will be installed at the proposed height (see above). The supporting strand will be lashed to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will lash a one inch diameter fiber optic cable (FOC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be capped with twenty foot loops (extra slack) at each pole clamp. NHOS will employ the proper safety personnel during the crossing installation. The proposed install will meet all proper clearances from other utilities (see above). Additional pole gear will be added per NESC Rule 261 and as directed by pole owners.

E-412/178 - T-41/91

Notes

1. The heights of the poles are shown (approximate) are based on field measurements taken with a Nikon TM total station during a site survey on 08/25/11.
2. The horizontal distance between the bridge and the existing overhead wires ranges from 17.7' to 19.4'.
3. The smallest vertical distance from the top of existing bridge deck to the lowest existing overhead wires is 13.2'.
4. The vertical distance between the top of water and bridge deck is approximately 14.9'.
5. The waterway is classified as not navigable for canoeing and per NESC Table 232-1 a vertical clearance of 14' must be maintained between the lowest conductor and 10 year flood line.
6. Based on the FEMA Flood Profile for the Blackwater River (Page 9.29) the vertical distance between the stream bed and the 10% chance flood event is 11'. A conservative 10 year flood elevation was calculated by adding the delta between the channel bed and the 10 year flood elevation to the current water level and then adding the 11' to the non navigable stream in that.
7. Vertical distances are approximation of attachment heights after utility pole ready moves are completed.

NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc
99 Pine Hill Rd
Nashua, NH 03063
(603-921-6467)

Project #TID-35-RM-15
Drawing #AC-CAN-RM-5

Date: 10/21/11
Revision: 2

Proposed
River Crossing
Canaan, NH

Location:
Route 4, Canaan, NH
Nearest cross street-Goose Pond Rd.

Sheet 2 of 2

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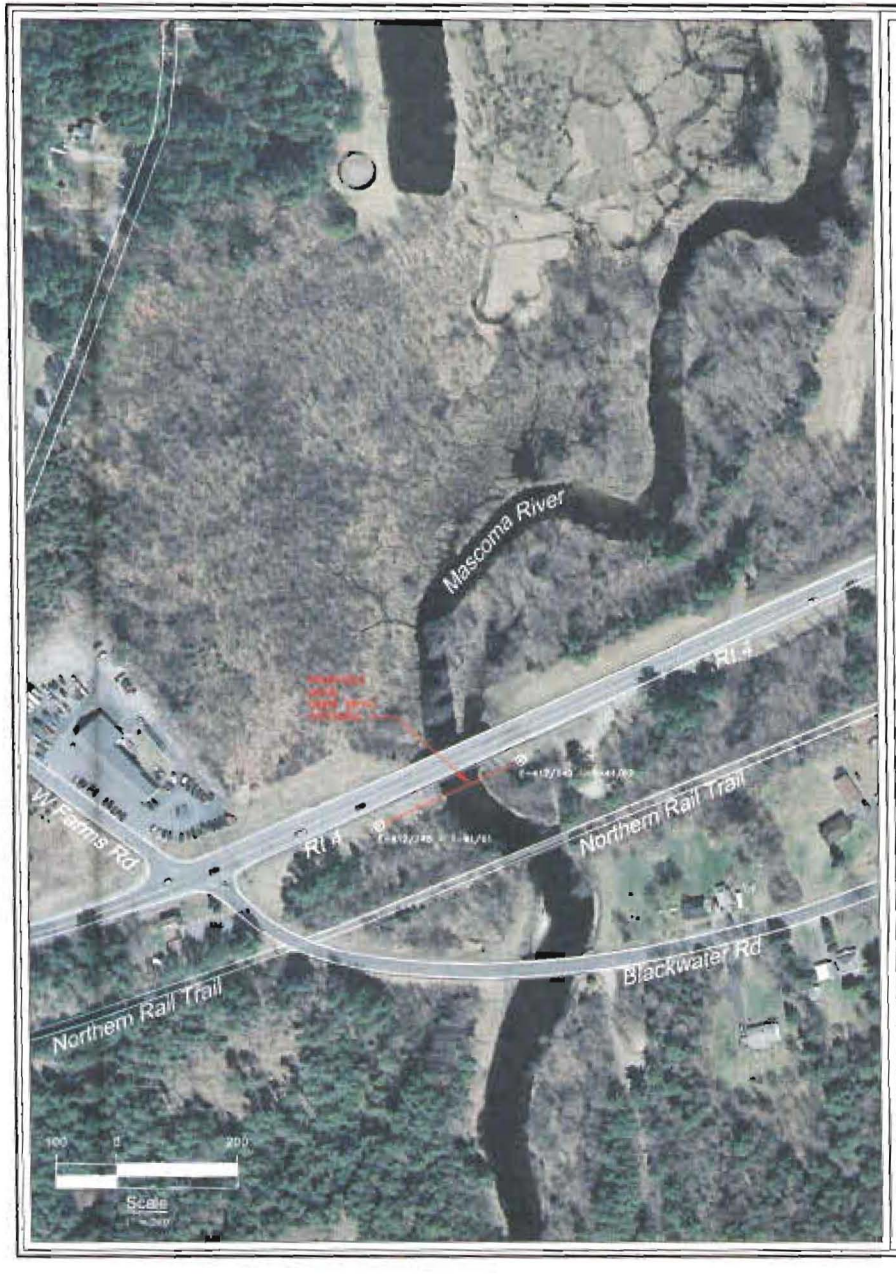

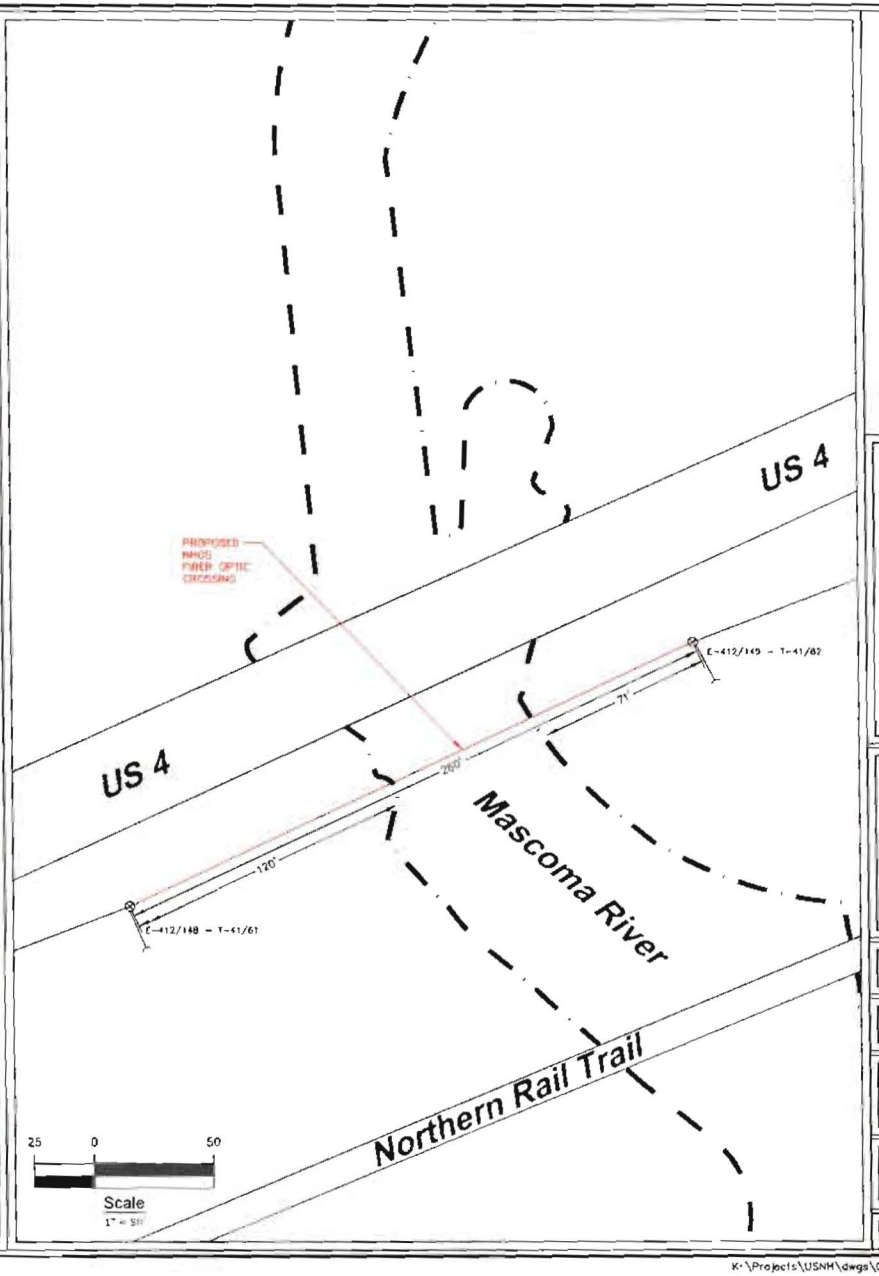

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NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
99 Pearl Hill Rd
Nashua, NH 03063
(603-821-6467)

Project: #TID-36-PRI-15
Drawing: FAC-CAN-RIV-6

Date: 12/19/11
Revision: 4

Proposed
Mascoma River Crossing
Canaan, NH

Location:
Route 4, Canaan, NH
Nearest cross street-Blackwater Rd

Sheet 1 of 2

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LOCUS MAP
(Not to Scale)

CommScope®

Spanmaster® Release 3.1 Sag / Tension Computations

Waveguide
River and Rail Crossings

	K-SECT AREA (sq.in)	EFF MODULUS (Msi)	NOMINAL DIAM (in)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	FAILOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
Selected Cables							
MS-6HEHS	0.0552	2.60E+07	0.261	1.00E-06	0.1210	954940	6658
DRF-C-144-LM	0.4007	2.00E+05	0.701	1.00E-06	0.1520	158739	640
Bundle				0.99x	0.2730		

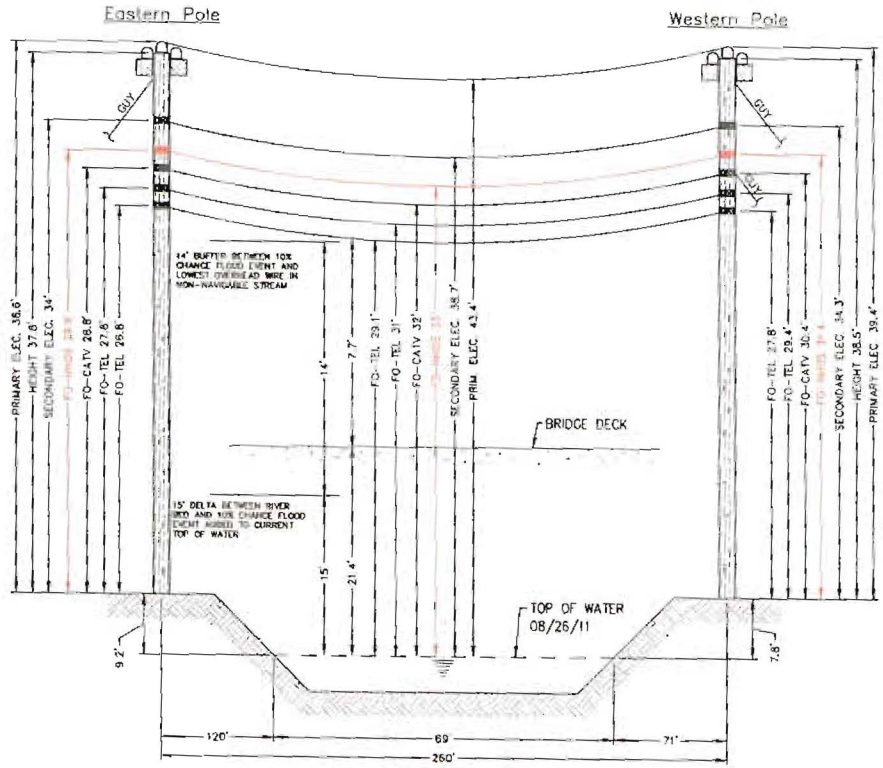
NESC RESULTS

Rule 251 - Heavy	0.0	0.927	50	1	4.0	1.671	6.08	2325	0.17	4.08		2.50	5.30	26.9
(232A)	120.0	0.000	00	0	0.0	0.773	3.12	739	0.01	3.13		0.00	3.12	0.0

Span Length = 260.00 ft
Span Sag = 2.00 ft (0.7 m)
Start Tension = 887 lb
Max Load = 5,656 lb
(Cable rated (80%) = 3,960 lb)
Catenary Length = 260.069 ft
Stress Free Length @
Unloaded Temperature = 259.817 ft

Unloaded Strand
Sag = 1.43 ft (17.1 in), 0.55 %
Tension = 717 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	1.79	1,345	-0.01	N/A
-30.0	1.83	1,271	-0.01	N/A
-20.0	1.87	1,225	-0.01	N/A
-10.0	1.94	1,167	-0.01	N/A
0	2.01	1,113	-0.01	N/A
10.0	2.08	1,065	-0.01	N/A
20.0	2.16	1,026	-0.01	N/A
30.0	2.24	1,028	-0.01	N/A
40.0	2.33	991	-0.01	N/A
50.0	2.41	954	0.00	N/A
60.0	2.50	920	0.00	N/A
70.0	2.60	886	0.00	N/A
80.0	2.70	854	0.00	N/A
90.0	2.80	823	0.00	N/A
100.0	2.91	793	0.01	N/A
110.0	3.01	765	0.01	N/A
120.0	3.12	738	0.01	N/A
130.0	3.23	713	0.01	N/A
140.0	3.35	689	0.02	N/A



E-412/148 - T-41/61
(Existing joint owned utility pole (National Grid/Fairpoint) in existing Right-of-Way)

Not to Scale

E-412/149 - T-41/62
(Existing joint owned utility pole (National Grid/Fairpoint) in existing Right-of-Way)

Notes:

1. The heights of structures shown herein are based on field measurements taken with a Nikon Ad total station during a site survey on 08/26/11.
2. The horizontal distance between the existing bridge and the existing overhead wires ranges from 28.0' to 28.5'.
3. Because of the close horizontal proximity to the existing bridge structure, the simplified drawing is oriented with vertical distances measured to the structure. This process simplifies the preparation and review of the crossing without jeopardizing its intent to protect the safe usage of the waterway.
4. The vertical distance from the top of existing bridge deck to the lowest existing overhead wires is 27'.
5. The vertical distance between the top of water and bridge deck is approximately 21.4.
6. The waterway is classified as not suitable for rail boating and per NESC Table 232-1 a vertical clearance of 14' must be maintained between the lowest conductor and 10 year flood plain.
7. Based on the FEMA flood profile for the Mascoma River (Page 9121) a conservative 10 year flood elevation was calculated by adding the delta between the river bed and the 10 year flood elevation to the current water level, and then the 14' buffer (the new navigable waterway was added to map).
8. Vertical distances are representative of attachment heights after utility make-ready moves are completed.

E-412/148 - T-41/61

Construction Notes:

NHOS proposes to install a ¼ inch metal suspension strand between the existing utility poles (shown above) that will traverse the river. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will pull a one inch diameter fiber optic cable (FOC) jacket to the strand using a duct tow rendered to provide security of the fiber over the right of way. The fiber will be tagged with twenty four fiber footage information at each pole clamp. NHOS will employ the proper safety personnel during the crossing installation. The proposed install will meet all proper clearances from other utilities (see above). Additional pole guys will be added per NESC Rule 250 and as directed by pole owners.

E-412/149 - T-41/62

NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
99 Pine Hill Rd
Nashua, NH 03063
(603-821-6001)

Project #TID-36-001-15
Drawing #AC-CAN-REV-5

Date: 10/19/11
Revision: 0

Proposed
Mascoma River Crossing
Canaan, NH

Location:
Route 4 Canaan, NH
Nearest cross street-Blackwater Rd

Sheet 2 of 2

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The State of New Hampshire
Before the
Public Utilities Commission
Docket No.

PETITION OF THE NEW HAMPSHIRE OPTICAL SYSTEMS INC. FOR LICENSE TO CONSTRUCT AND MAINTIAN FIBER OPTIC CABLES OVER AND ACROSS THE FOLLOWING NEW HAMPSHIRE WATERS:

- WINNIPESAUKEE RIVER IN FRANKLIN NH (2 TOTAL)
  - BETWEEN UTILITY POLE 1/22 AND POLE 1/23 (Ref. TID 11)
  - BETWEEN UTILITY POLE 1/43 AND POLE 1/42 (Ref. TID 14)
- WINNIPESAUKEE RIVER IN LACONIA NH BETWEEN UTILTIY POLE 180/17 AND POLE 180/16 (Ref. TID 21)
- MASCOMA RIVER IN LEBANON NH (4 TOTAL)
  - BETWEEN UTILTIY POLE 110D/14 AND POLE 110D/10 (Ref. TID 37)
  - BETWEEN UTILTIY POLE 203/2 AND POLE 203/3 (Ref. TID 41)
  - BETWEEN UTILTIY POLE 1/32 AND POLE 1/33 (Ref. TID 44)
  - BETWEEN UTILTIY POLE 119/1 AND POLE 225/3 (Ref. TID 47)
- MINK BROOK IN HANOVER NH BETWEEN (2 TOTAL)
  - BETWEEN UTILTIY POLE 197/3 AND POLE 197/2 (Ref. TID 43)
  - BETWEEN UTILTIY POLE 83/4 AND POLE 83/3 (Ref. TID 50)

TO THE PUBLIC UTILITIES COMMISSION:

New Hampshire Optical Systems Inc., a Competitive Local Exchange Carrier ("CLEC") in the State of New Hampshire, hereby petitions the Public Utilities Commission ("Commission"), pursuant to the RSA 371:17, for a license to construct and maintain fiber optic cables over and across the public waters of the aforementioned rivers at nine locations in the towns or cities of Franklin, Laconia, Lebanon, and Hanover.

New Hampshire Optical Systems, Inc. submits this petition in the interest of the public good as the fiber being placed over the river crossings is part of the Network New Hampshire Now (NNHN) Middle Mile Fiber network. The project will extend the availability of Internet access and broadband communications to areas of New Hampshire that heretofore had limited or no service. In adherence with the Federal Broadband Technology Opportunities Program (BTOP) grant, NHOS will build and maintain an open access, non-discriminatory network offering broadband providers the ability to economically expand their services areas, companies the opportunity to build private networks they own and control, and users more choice and affordability in their Internet access and communications products.

In support of its petition New Hampshire Optical Systems states as follows:

1. In order to meet reasonable requirements of service to the public, New Hampshire Optical Systems Inc. is proposing to construct a new fiber optic cable, to expand it fiber network, which

is used for the purpose of providing telecommunications services to customer in New Hampshire.

2. Each the applicable segments of the river crossings are listed as public lakes and ponds, public rivers and streams and tidal bodies in the NH DES *"Official List of Public Waters"* dated March 2011

3. A separate engineering package is provided for each of the nine crossing with location maps detailing where and how the new line will cross each body of water.

4. The design and proposed construction of each crossing is shown on the attached profile drawings. Based on the research and field inspection of the consulting engineer, it has been determined that the crossings are classified as waterways not suitable for sailboating per NESC, Table 232-1.

5 Each proposed crossing will be placed between two existing utility poles in the existing public right-of-way. The attached diagrams provide exact distances between poles and the height of each pole. Vertical distances are representative of attachment heights after the completion of all moves deemed necessary by the pole owner's during their make-ready assessments.

6. The New Hampshire Optical Systems Inc. attachment will be made up of two materials; strand (nominal diameter ¼ in. 7-strand steel EHS) and one non-selfsupporting fiber optic cable. A 288 count Pureband (ZWP) single-mode fiber optic cable will be placed across the rivers in the towns or cities of Franklin, Laconia, and Hanover (TID 11, TID 14, TID 21, TID 43, TID 50). A 144 count Pureband (ZWP) single-mode fiber optic cable will be placed across the Mascoma River in the town of Lebanon (TID 37, TID 41, TID 44, TID 47). Sag and tension calculations were done per NESC articles 232.A1 and 251 and the results are included in the attachments. In all cases the calculations for Article 251 using the heavy load conditions (0° F, pounds 4.0 psf wind loading and ½" radial ice) were found to be the governing condition for both sag and tension. The maximum tension under heavy load conditions was shown not to exceed the 60% usable strand load of 3990 lbs.

7. Vertical clearances are calculated from the FEMA 10 year flood profile. The location of data referenced for the drawing is provided in the attachments. For most crossings a conservative flood elevation was calculated by adding the delta between the river bed and the 10 year flood elevation to the surveyed water level.

8. Where the crossing is within 10 feet horizontally of an existing bridge structure that may already have an impact on the use of the waterway, a simplified drawing is submitted with vertical distances measured to that structure. This process simplifies the preparation and review of the crossing without jeopardizing its intent to protect the safe usage of the waterway.

9. There are no NHDES or NHDOT permits necessary for the construction of each crossing.

10. The proposed crossings have been designed and will be constructed, maintained and operated by New Hampshire Optical Systems, its affiliates and contractors, in accordance with the NESC.

11. New Hampshire Optical Systems submits that the license petition for herein may be exercised without affecting the rights of the public in the public waters of each river. Minimum safe line clearances above the water surface and affected shorelines will be maintained at all times. The use and enjoyment by the public of each waterway will not be diminished in any material respect as a result of the overhead line crossing.

WHEREFORE, NEW HAMPSHIRE OPTICAL SYSTEMS respectfully requests that the Commission:

A. Find that the license petitioned for herein may be exercised without affecting the public rights in the public waters which are the subject of this petition.

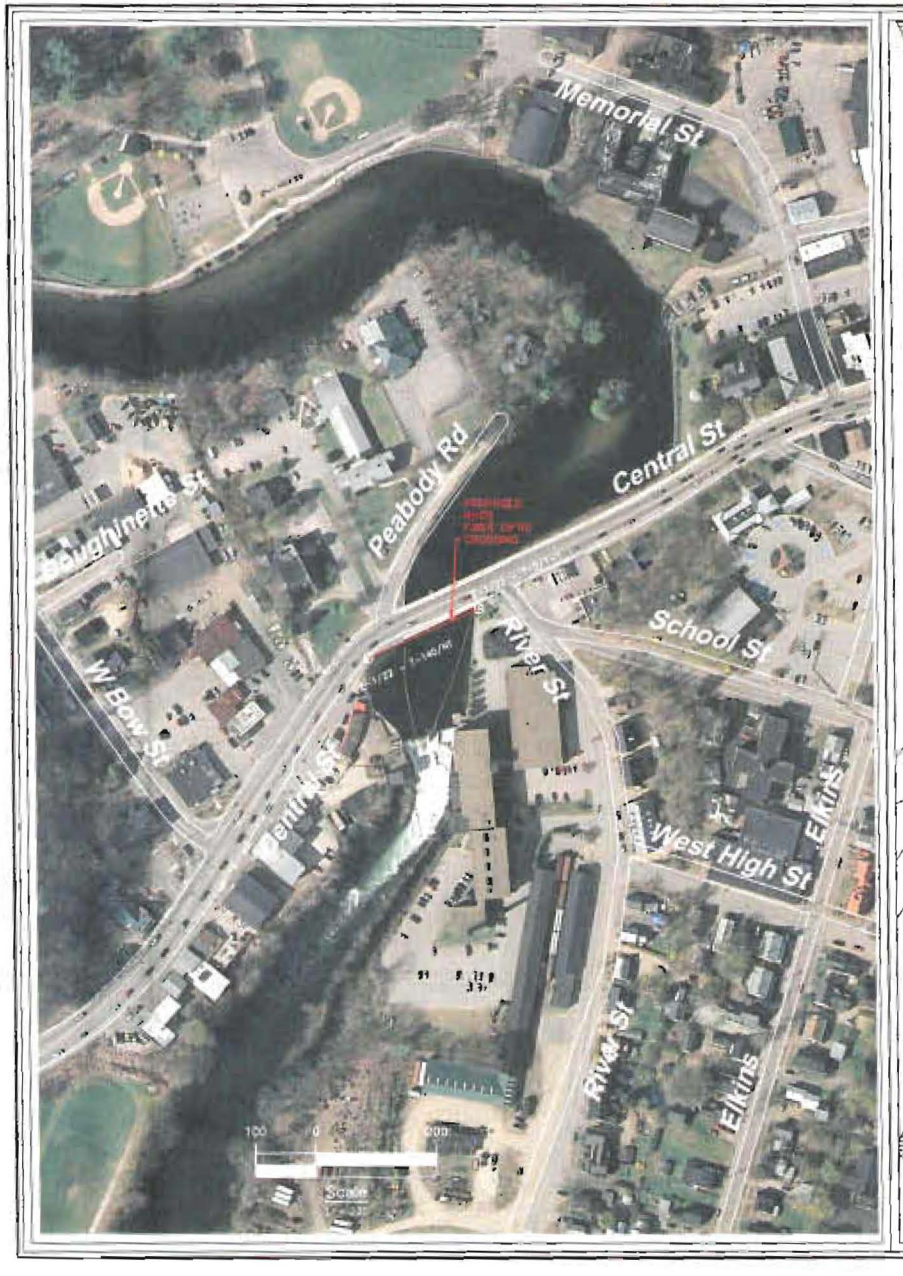
B. Grant New Hampshire Optical Systems, Inc. a license to construct and maintain fiber optic cables over and across the public waters of each river as specified in this petition; and

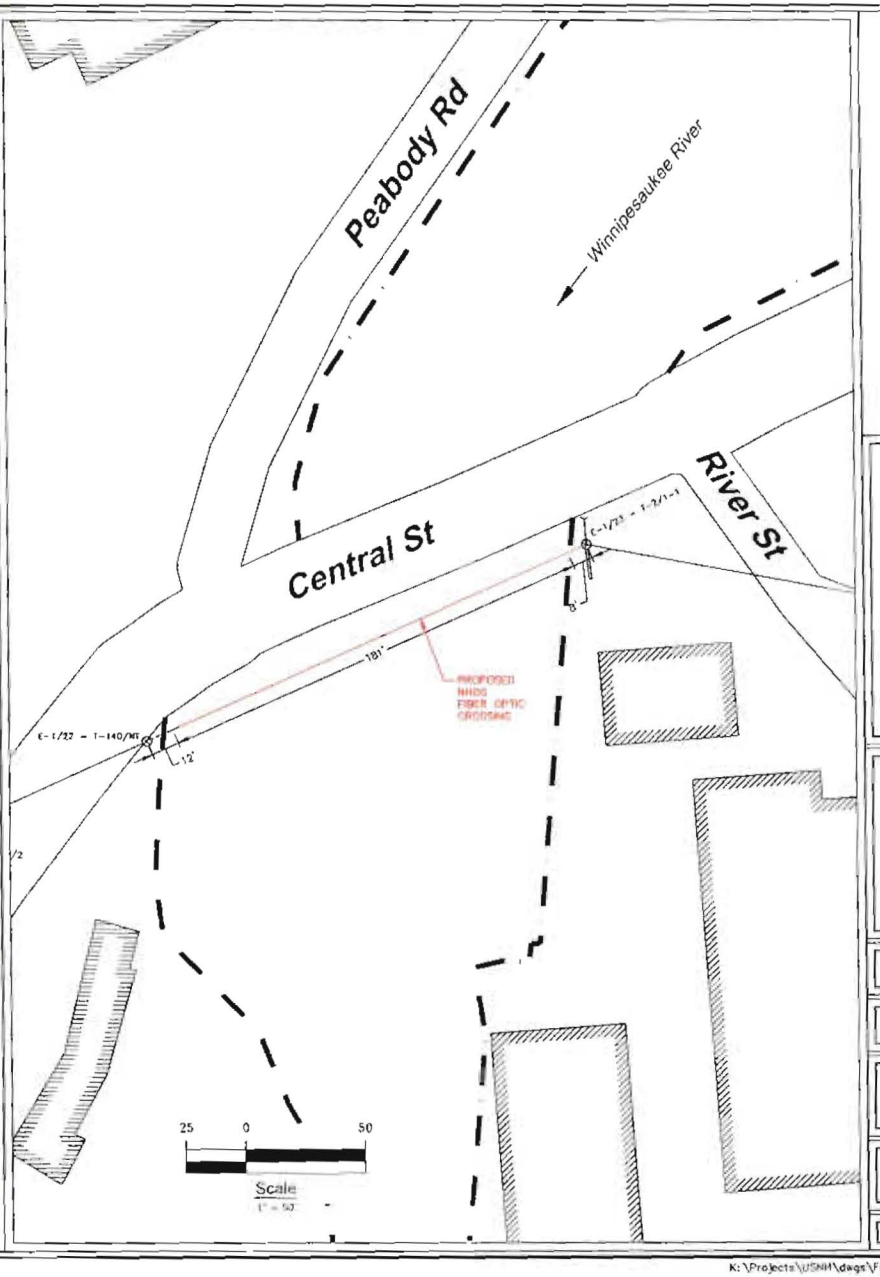
C. Issue an Order Nisi and orders for its publication.

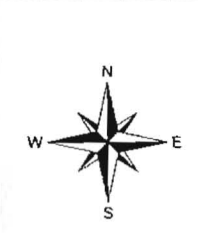
Dated at Nashua the 19th day of December, 2011.

Respectfully submitted
New Hampshire Optical Systems Inc.
By Its President

Rob Carmichael
New Hampshire Optical Systems, Inc.
99 Pine Hill Rd.
Nashua, NH 03063
(603)821-6467







NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
99 Pine Hill Rd
Nashua, NH 03063
(603-821-8487)

Project: 4TID-11 - Primary 15
Drawing: FAC-18A-RDV-1

Date: 09/29/11
Revision: 4

Proposed
Stream Crossing
Franklin, NH

Location:
Central St, Franklin NH
Nearest cross street-Peabody Pl.

Sheet 1 of 2

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LOCUS MAP
(Not to Scale)

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

Waviguide
River and Rail Crossings

	X-SECT AREA (sq in)	STF MODULUS (psi)	NOMINAL DIAM (in)	EFFICIENT COEFF (SF)	CABLE WEIGHT (lb/ft)	EFFLOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
Selected Cables							
144W Steel HS	0.0352	2.90E+07	0.250	5.80E-06	0.1219	914848	8850
OPF-D 288-LN	0.4782	2.79E+05	0.800	1.13E-05	0.1968	155982	181
Bundle			1.459		0.3187		

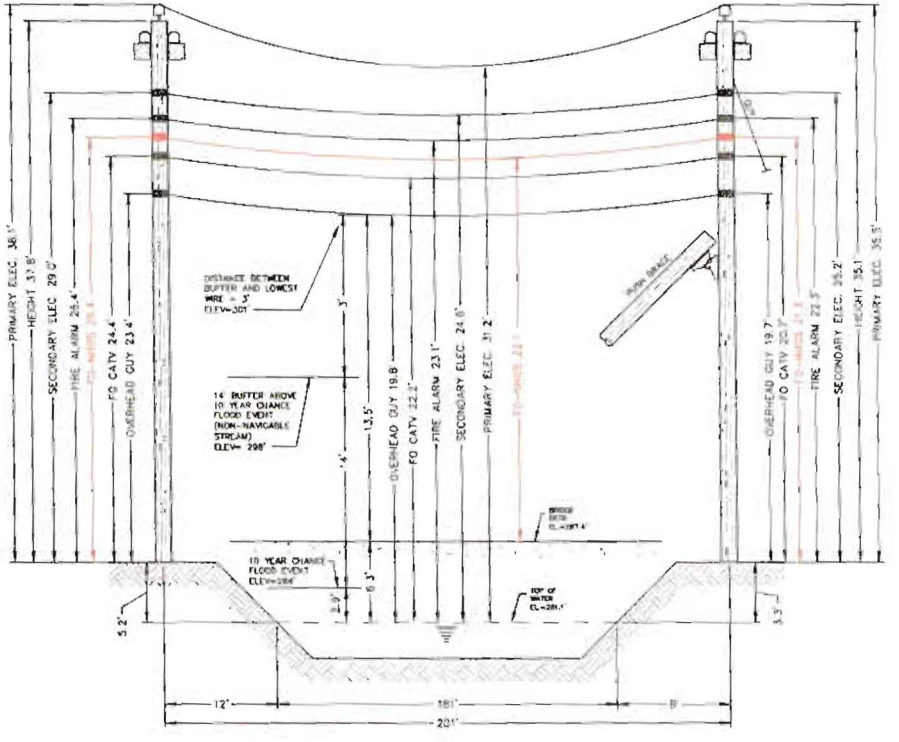
NESC RESULTS

Note 251 - Heavy	0.0	1.000	50	3	4.0	1.750	4.38	2000	0.10		4.38		2.00	3.00	28.1
250W1	1200	0.800	50	0	0.0	0.317	2.44	855	0.01		2.44		9.00	2.44	0.0

Span Length = 201.00 ft
Span Sag = 2.04 ft (29.1 in)
Span Tension = 796 lb
Max Load = 0.800 lb
Usable load (95%) = 2.900 lb
Catenary Length = 201.064 ft
Stress Free Length (ft)
Installed Temperature = 200.370 ft

Unloaded Span:
Sag = 1.93 ft (12.0 in) 0.50 %
Tension = 610 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	1.31	1,218	0.02	N/A
-30.0	1.36	1,124	-0.01	N/A
-20.0	1.42	1,032	-0.01	N/A
-10.0	1.47	1,090	-0.01	N/A
0	1.52	1,049	-0.01	N/A
10.0	1.58	1,010	-0.01	N/A
20.0	1.65	971	-0.01	N/A
30.0	1.71	935	-0.01	N/A
40.0	1.78	897	0.01	N/A
50.0	1.86	862	0.00	N/A
60.0	1.93	829	0.00	N/A
70.0	2.01	798	0.00	N/A
80.0	2.09	768	0.00	N/A
90.0	2.18	735	0.00	N/A
100.0	2.26	707	0.01	N/A
110.0	2.35	681	0.01	N/A
120.0	2.44	655	0.01	N/A
130.0	2.53	632	0.02	N/A
140.0	2.63	610	0.02	N/A



E-1/22 - T-140/NT
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)

E-1/23 - T-2/1-1
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)

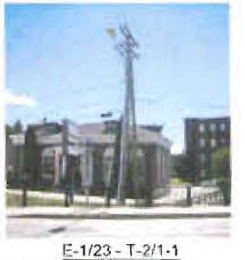
Notes:

1. Heights of attachments shown herein are based on field measurements taken with a Nikon HR-302 total station on August 11, 2011 using
2. The elevations shown herein are based on NAVD88 Geodetic Bench Mark (BM) found on the north wall of Soldiers Memorial Hall located northeast of the intersection of Central St and Church St. This BM has a published elevation of 339.16' (NAVD88)
3. Based on the FEMA Flood profile for the Winnipesaukee River (page 17P) the elevation for the 10% Chance flood event is 284' (NAVD88)
4. The horizontal distance between the bridge and the existing overhead wire ranges from 6' to 10'
5. The vertical distance between the 10% chance flood event and the lowest overhead wire = 17'
6. Vertical distances are representative of attachment heights after utility make-ready issues are completed

E-1/22 - T-140/NT

Construction Notes:

NHOS proposes to install a guyed suspending strand between the existing utility poles shown that will traverse the river. The strand will be installed at the proposed height (see sketch). The suspending strand will be secured to each pole using double-sized rod attachments to prevent sag in the wire and maintain proper clearances. NHOS will lash a one-inch diameter fiber optic cable (FOC jacket) to the strand using a dual-lash method to provide security of the fiber over the right-of-way. The fiber will be tagged with heavy duty heat contract information at each pole clamp. NHOS will employ the proper safety personnel during the aerial installation. The proposed install will meet all proper clearances from other Utilities (see above). Additional pole guys will be added per NESC Rule 264 and as directed by pole owners.



E-1/23 - T-2/1-1

NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
99 Pine Hill Rd
Nashua, NH 03063
(603-821-6487)

Project #TID-11 - Primary 11
Drawing #AC-TRA-RIV-1

Date 09/20/11
Revision #

Proposed
Stream Crossing
Franklin, NH

Location:
Central St, Franklin NH
Nearest cross street-Peabody Pl.

Sheet 2 of 2

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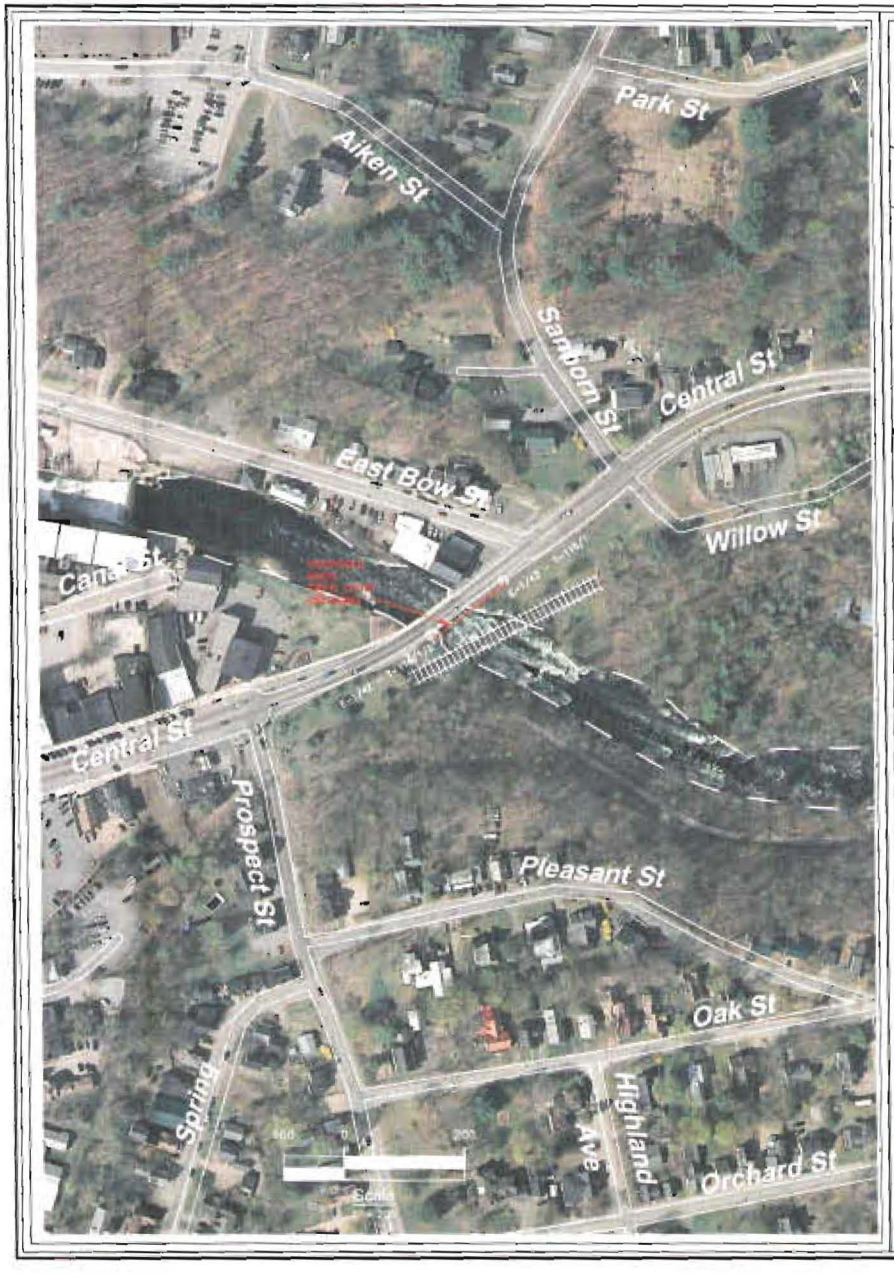

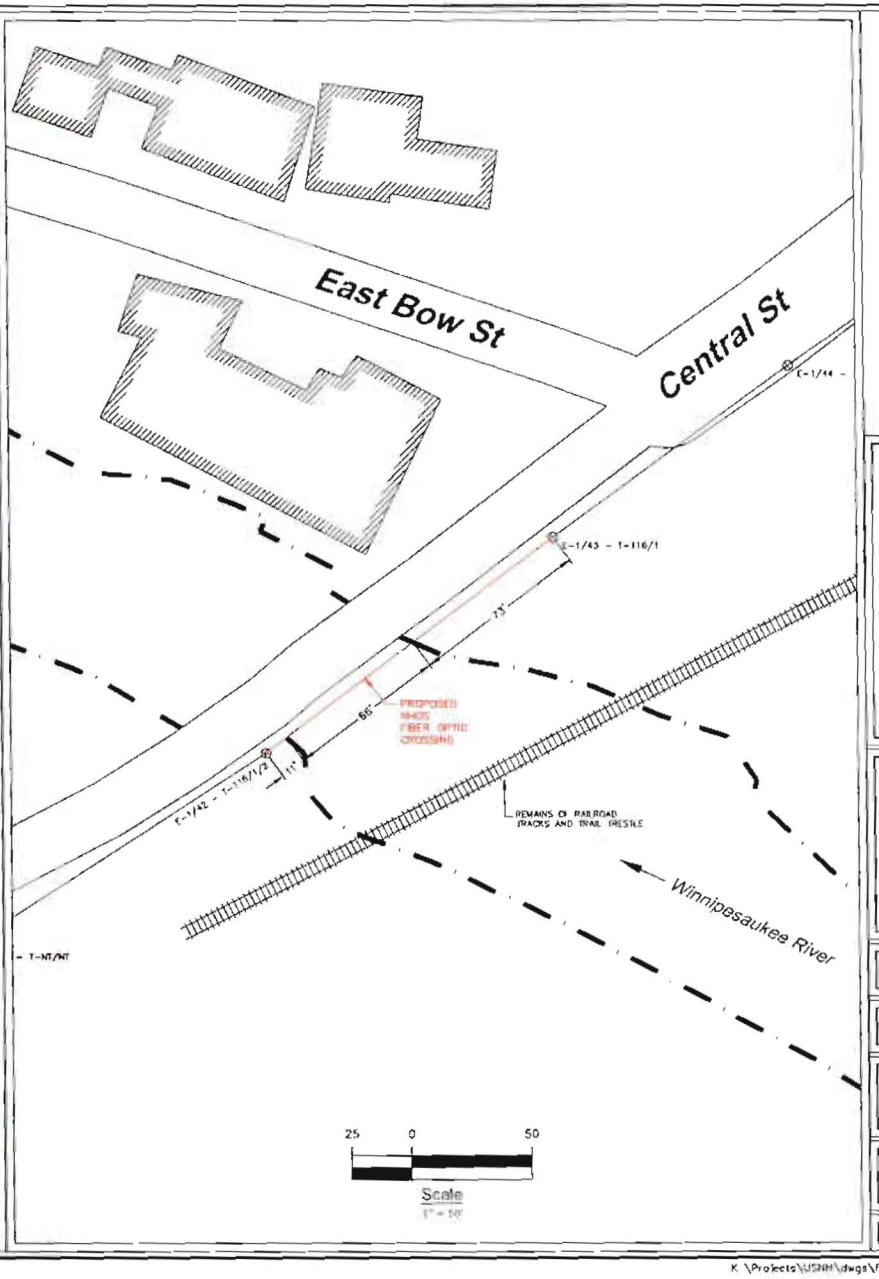

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NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
90 Pine Hill Rd.
Nashua, NH 03063
(603-821-4667)

Project #TID-14
Drawing #AC/PRA-RDV-2

Date 09/28/11
Revision 0

Proposed
Stream Crossing
Franklin, NH

Location:
Central St. Franklin, NH
Nearest cross street-East Bow St.

Sheet 1 of 2

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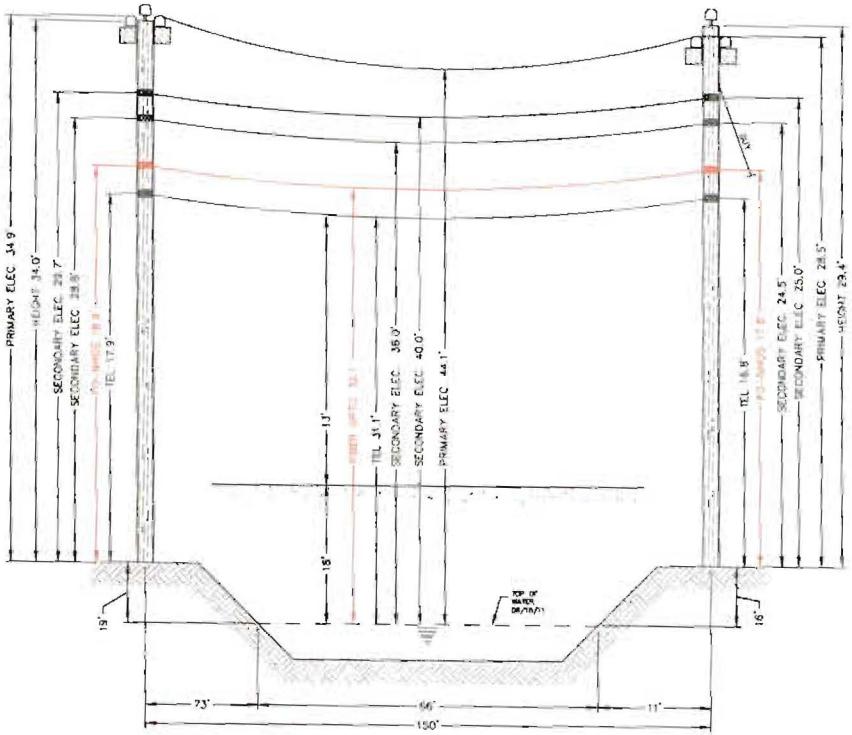
LOCUS MAP
(Not to Scale)



E-1/43 - T-116/1
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)

E-1/42 - T-116/½
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)

Notes:

1. The heights of structures shown herein are based on field measurements taken with a Nikon 302 total station during a site survey on 08/18/11.
2. The horizontal distance between the nearest bridge edge and the existing overhead wires ranges from 6' to 7'.
3. Because of the close horizontal proximity to the existing bridge structure, the simplified drawing is submitted with critical distances measured to the structure. This process simplifies the paperwork and review of the crossing without compromising distances to protect the safe usage of the waterway.
4. The smallest vertical distance from the nearest existing bridge deck to the lowest existing overhead wires is 19'.
5. The vertical distance between the top of water and bridge deck is approximately 18'.
6. Vertical distances are representative of attachment heights after utility make-ready work has completed.

E-1/43 - T-116/1

Construction Notes:

NHOS proposes to install a Kevlar metal supporting strand between the existing utility poles shown above that will traverse the river. The strand will be installed at the proposed heights (see above). The supporting strand will be secured to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will lash a non-conductive fiber optic cable (FW jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with twenty feet have contact information at each pole clamp. NHOS will employ the proper safety personnel during the crossing installation. The proposed install will meet all power clearances from other utilities (see above). Additional pole guys will be added per NESC Rule 264 and as directed by pole owners.

E-1/42 - T-116/½

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Spanmaster® Release 3.1 Sag / Tension Computations

Wavegrade
Poles and Rail Crossings

Selection Cables	X SECT AREA (sq in)	EFF MODULUS (psi)	NOMINAL TEMP (°F)	EFF EXP COEFF (1/°F)	CABLE WEIGHT (lb/ft)	EFF LOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
NHS 6xEHS	3.0332	2.00E+07	0.250	9.00E-06	0.3241	919.08	0656
NHF 4x3984-N	3.8700	7.20E+05	0.000	1.0E-05	0.1000	1159.82	651
Bundle			0.100		0.3110		

NESC RESULTS

Rule 251 - Heavy	0.0	1.000	50	3	4.0	1.700	1.00	1400	9.00		3.00		1.41	2.64	20.1	
37250	128.0	0.000	28	6	3.0	0.317	1.00	44%	0.00		1.00		0.00	1.00	0.0	

Span Length = 150.00 ft
Span Sag = 1.50 ft (18.0 in)
Span Tension = 694 lb
Max Load = 6,650 lb
Usable load (90%) = 5,985 lb
Catenary Length = 150.0001 ft
Stress Free Length @
Installed Temperature = 249.0419 ft

Unloaded Strand
Sag = 31.8 (2.7 m) 0.64 %
Tension = 421 lb

Temp (°F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Cumulative
-40.0	1.85	908	0.02	N/A
-30.0	1.70	900	0.02	N/A
-20.0	1.77	911	0.02	N/A
-10.0	1.72	877	0.01	N/A
0	1.67	832	0.01	N/A
10.0	1.62	791	0.01	N/A
20.0	1.58	758	0.01	N/A
30.0	1.54	730	0.01	N/A
40.0	1.50	696	0.01	N/A
50.0	1.46	664	0.00	N/A
60.0	1.43	623	0.00	N/A
70.0	1.50	594	0.00	N/A
80.0	1.57	567	0.00	N/A
90.0	1.65	541	0.01	N/A
100.0	1.72	518	0.01	N/A
110.0	1.80	495	0.01	N/A
120.0	1.88	475	0.02	N/A
130.0	1.96	456	0.02	N/A
140.0	2.03	438	0.02	N/A

NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
99 Pine Hill Rd.
Nashua, NH 03063
(603-821-8487)

Project: FTO-14
Drawing: NHO-FRA-R/W-2

Date: 09/20/11
Revision: 0

Proposed
Stream Crossing
Franklin, NH

Location:
Central St, Franklin, NH
Nearest cross street-East Bow St.

Sheet 2 of 2

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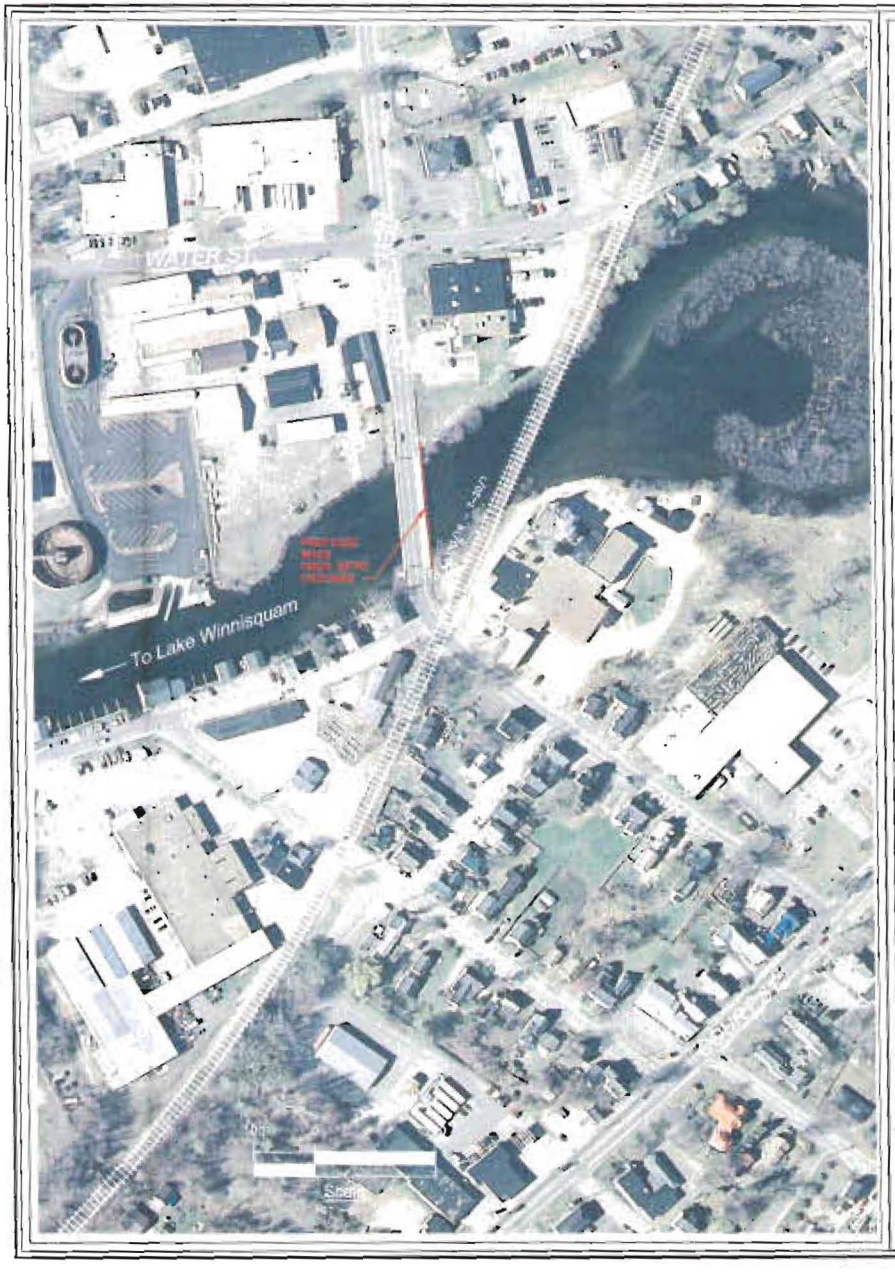

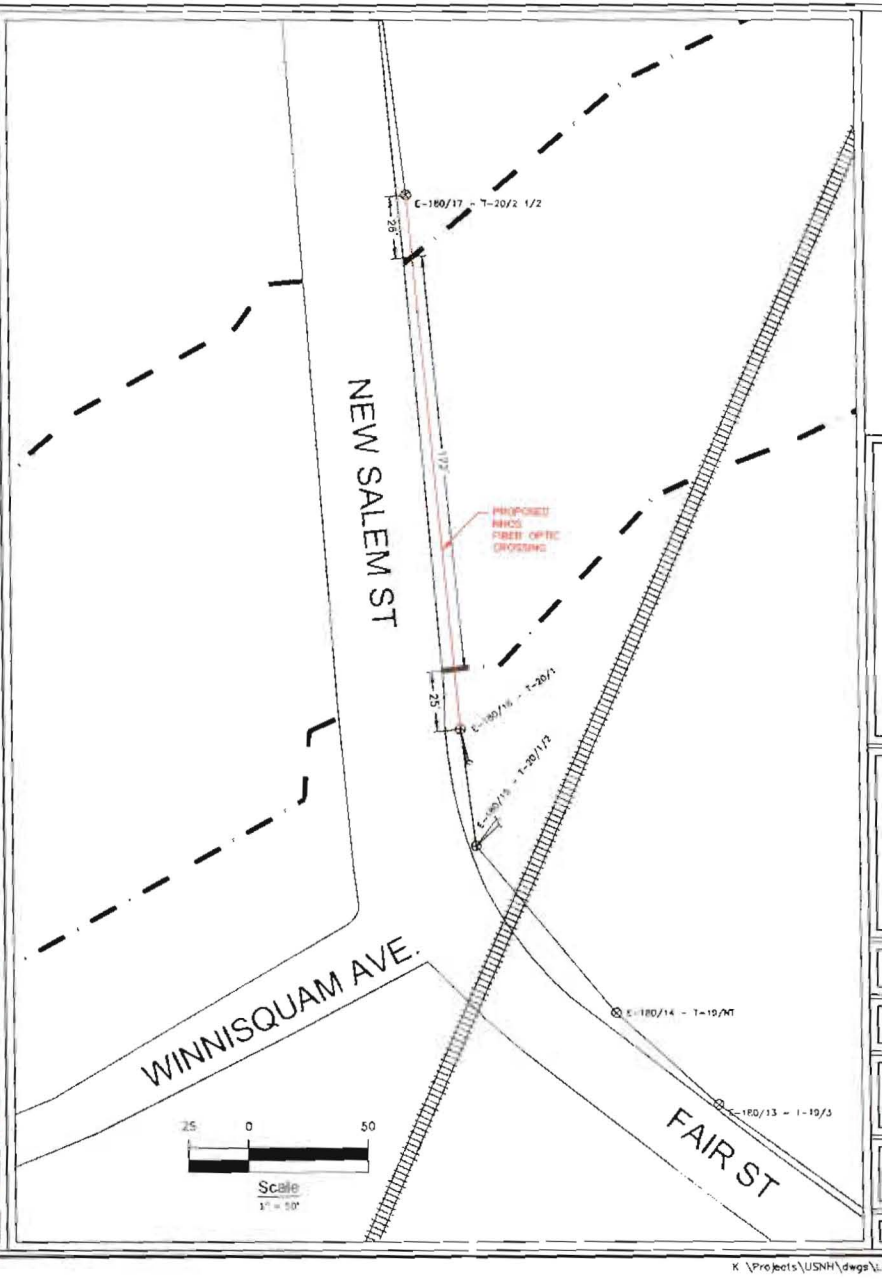

NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
99 Pine Hill Rd
Nashua, NH 03063
(603-883-8487)

Project # TID-21
Drawing #AC-LAC-RXX-1

Date 10/12/11
Revision 2

Proposed
Stream Crossing
Laconia, NH

Location:
New Salem St, Laconia, NH
Nearest cross street-Winnisquam Ave.

Sheet 1 of 2

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LOCUS MAP
(Not to Scale)

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

Wawipside
River and Rail Crossings

09/01/11 Wawipside

Selected Cables	X-SECT AREA (sq in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	EIA LOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
WFB GridHS	0.0352	2.90E+07	0.250	5.90E-06	0.1230	919940	9890
DRF-G-288-LN	0.0192	2.70E+06	0.206	1.13E-05	0.1060	165462	931
Bundle			1.109		0.3170		

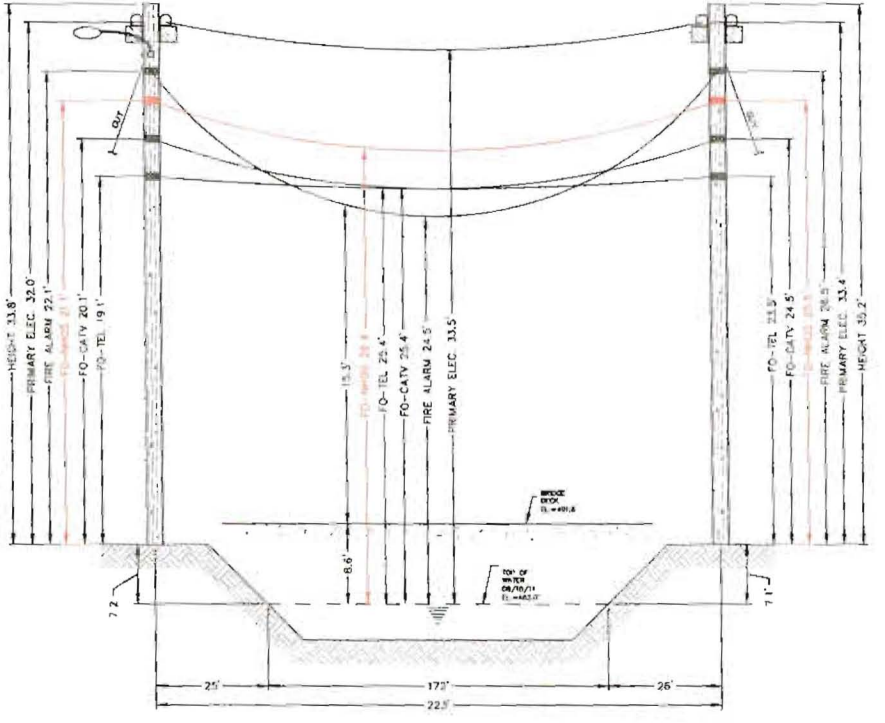
NESC RESULTS

Rule 251—Heavy	0.0	1.000	30	0	4.0	1.000	5.08	2229	0.11		5.01		2.35	4.41	20.1
250A1	120.0	0.000	0F	0	0.0	0.337	2.08	730	0.01		2.08		0.00	2.08	0.0

Span Length = 223.08 ft
Span Sag = 2.23 ft (26.8 in)
Total Tension = 844 lb
Max Load = 5,890 lb
Usable load (60%) = 3,900 lb
Catenary Length = 223.559 ft
Stress Free Length @
Installed Temperature = 272.844 ft

Unloaded Strand
Sag = 1.98 ft (23.8 in) 0.48 %
Tension = 697 lb

Temp (F)	Midspan Sag (ft)	Tension (lbs)	% Length Change	Clearance
40.0	1.86	1,331	0.01	N/A
30.0	1.93	1,267	-0.01	N/A
20.0	1.99	1,225	-0.01	N/A
10.0	1.00	1,183	-0.01	N/A
5	1.72	1,157	-0.01	N/A
32.0	1.79	1,031	-0.01	N/A
20.0	1.85	1,002	-0.01	N/A
30.0	1.92	1,004	-0.01	N/A
40.0	1.99	987	-0.01	N/A
50.0	2.07	961	0.00	N/A
60.0	2.15	916	0.00	N/A
70.0	2.23	882	0.00	N/A
80.0	2.31	848	0.00	N/A
90.0	2.40	819	0.00	N/A
100.0	2.49	790	0.00	N/A
110.0	2.58	762	0.01	N/A
120.0	2.68	735	0.01	N/A
130.0	2.78	710	0.01	N/A
140.0	2.87	685	0.02	N/A



E-180/17 - T-20/2 1/2
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)

E-180/16 - T-20/1
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)

Notes

1. The heights of structures shown herein are based on GPS measurements taken with a Nikon dual total station during a site survey on August 18, 2011.
2. The elevations shown herein are based on NHDOT Geodetic Disk BM-606-12 located on the southeast bridge abutment. The disk has a published elevation of 493.7 (NGVD29). Converted elevation = 491.59 (NAVD88).
3. The horizontal distance between the bridge and the existing overhead wire, ranges from 8 and 5.
4. The smallest vertical distance between the bridge deck and the lowest existing overhead wire is 15.3'.
5. Because of the close horizontal proximity to the existing bridge structure, the completed drawing is submitted with vertical distances measured to the structure. This process simplifies the preparation and review of the crossing without exceeding the point to protect the safe usage of the waterway.
6. Vertical distances are representative of attachment heights after utility make ready moves are completed.

E -180/17 - T- 20/2 1/2

Construction Notes:

NHOS proposes to install a 12 fiber aerial supporting strand between the existing utility poles shown above that will traverse the river. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will lash a one inch diameter fiber optic cable (FOC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with twenty five foot contact information at each pole clamp. NHOS will employ the proper safety personnel during the crossing installation. The proposed work will meet all proper clearances from other utilities (see above). Additional guy guys will be added per NESC Rule 250 and as directed by pole owners.

E-180/16 - T-20/1

NHOS
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(855-421-6467)

Project #TID-21
Drawing #NC-LAC-RIV-1

Date 09/12/11
Revision 4

Proposed
Stream Crossing
Laconia, NH

Location:
New Salem St, Laconia, NH
Nearest cross street-Winnisquam Ave.

Sheet 2 of 2

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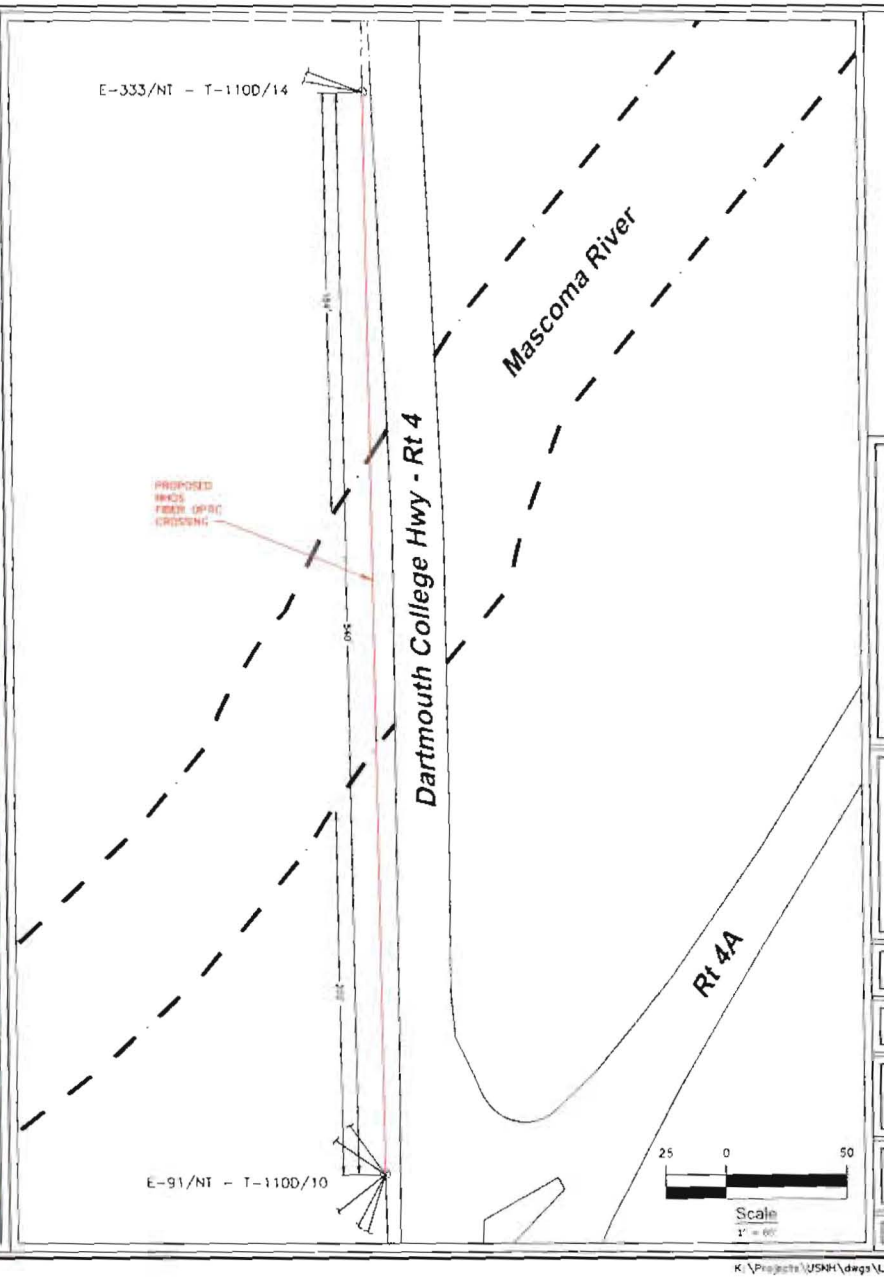

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NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
55 Pine Hill Rd.
Nashua, NH 03063
(603-621-6467)

Project # TID-37
Drawing RAC-LEB-RIV-1

Date: 10/07/14
Revision 2

Proposed Mascoma
River Crossing
Lebanon, NH

Location:
Dartmouth College Hwy - Rt 4, Lebanon, NH
Nearest cross street-Hill Rd & Rt 4A

Sheet 1 of 2

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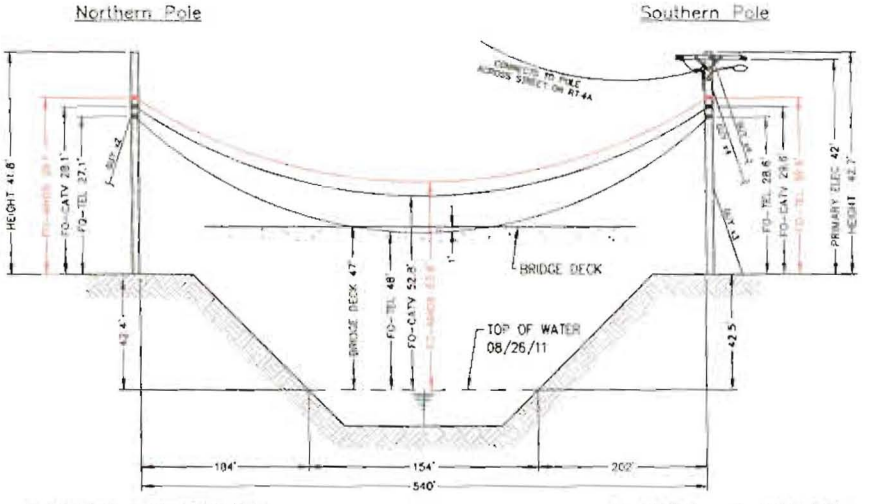
LOCUS MAP
(Not to Scale)



E-333/NT - T-110D/14
(Existing telco utility pole (Fairpoint) in existing Right-of-Way)

(Not to Scale)

E-91/NT - T-110D/10
(Existing joint owned utility pole (National Grid/Fairpoint) in existing Right-of-Way)

Notes:

1. The heights of structures shown hereon are based on field measurements taken with a Nikon 362 total station during a pole survey on 08/26/11.
2. The horizontal distance between the existing bridge and the existing overhead wires ranges from 5.5' to 6.0'.
3. Because of the close horizontal proximity of the existing bridge structure, the simplified drawing is submitted with vertical distances measured to the structure. This process simplifies the presentation and review of the crossing without impacting its intent to protect the safe usage of the waterway.
4. The minimum vertical distance from the top of existing bridge deck to the lowest existing overhead wire is 1'.
5. The vertical distance between the top of water and bridge deck is approximately 6'.
6. Vertical distances are representative of attachment heights after utility make ready moves are completed.

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Waveguide
River and Rail Crossings

08/27/11 Waveguide

Selected Cables	X SECT AREA (sq in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	CALLOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
1x19 SHIELD	0.0352	2.90E+07	0.250	1.00E-06	0.1210	944840	8000
DRF O 144 LN	0.4307	3.58E+06	0.741	1.00E-05	0.1505	155728	640
Bundle			0.991		0.2730		

NESC RESULTS

Rule 251 - Heavy	0.0	0.00	58	3	4.0	1.671	15.42	3358	0.19	15.48	7.48	15.48	23.0
232A1	120.0	0.000	60	0	0.0	0.275	6.04	1943	0.01	6.06	0.00	6.04	0.0

Span Length = 540.00 ft
Span Sag = 5.40 ft (64.8 in)
Span Tension = 1,843 lb
Max Load = 8,600 lb
Usable load (68%) = 5,900 lb
Catenary Length = 540.144 ft
Stress Free Length @
Installed Temperature = 530.058 ft

Unloaded Shield
Sag = 2.06 ft (31.9 in) 0.49 %
Tension = 1,858 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	4.21	2,307	0.01	N/A
-30.0	4.38	2,242	-0.01	N/A
-20.0	4.47	2,216	0.01	N/A
-10.0	4.66	2,174	-0.01	N/A
0	4.85	2,130	-0.01	N/A
10.0	4.75	2,097	0.01	N/A
20.0	4.95	2,044	-0.01	N/A
30.0	4.95	2,051	0.00	N/A
40.0	5.08	1,999	0.00	N/A
50.0	5.17	1,970	0.00	N/A
60.0	5.26	1,977	0.00	N/A
70.0	5.40	1,936	0.00	N/A
80.0	5.52	1,899	0.00	N/A
90.0	5.64	1,861	0.00	N/A
100.0	5.77	1,818	0.00	N/A
110.0	5.90	1,880	0.01	N/A
120.0	6.04	1,843	0.01	N/A
130.0	6.18	1,806	0.01	N/A
140.0	6.32	1,870	0.01	N/A

E-333/NT - T-110D/14

Construction Notes:

NHOS proposes to install a 1/4 inch metal supporting strand between the existing utility poles shown above that will traverse the river. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will tether a one inch diameter fiber optic cable (FOC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with twenty foot hour contact information at each pole clamp. NHOS will employ the proper safety personnel during the crossing installation. The proposed install will meet all proper clearances from other utilities (see above). Additional pole guys will be added per NESC Rule 250.A and as directed by pole owners.

E-91/NT - T-110D/10

NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
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Nashua, NH 03063
(603-821-8487)

Project # TID-37
Drawing # NO-UB-RW-2

Date: 10/07/11
Revision #

Proposed Mascoma River Crossing
Lebanon, NH

Location:
Dartmouth College Hwy - Rt 4, Lebanon, NH
Nearest cross street-Mill Rd & Rt 4A

Sheet 2 of 2

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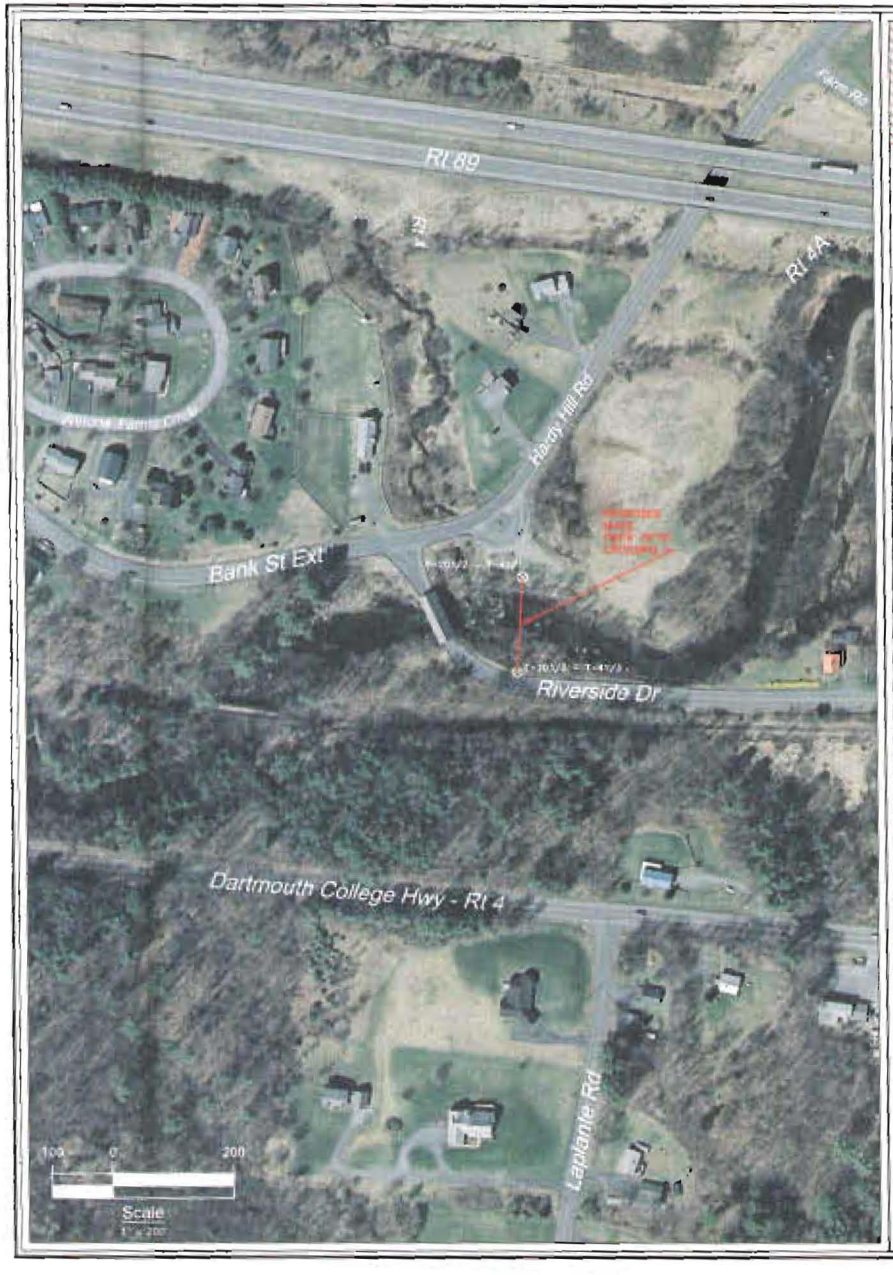

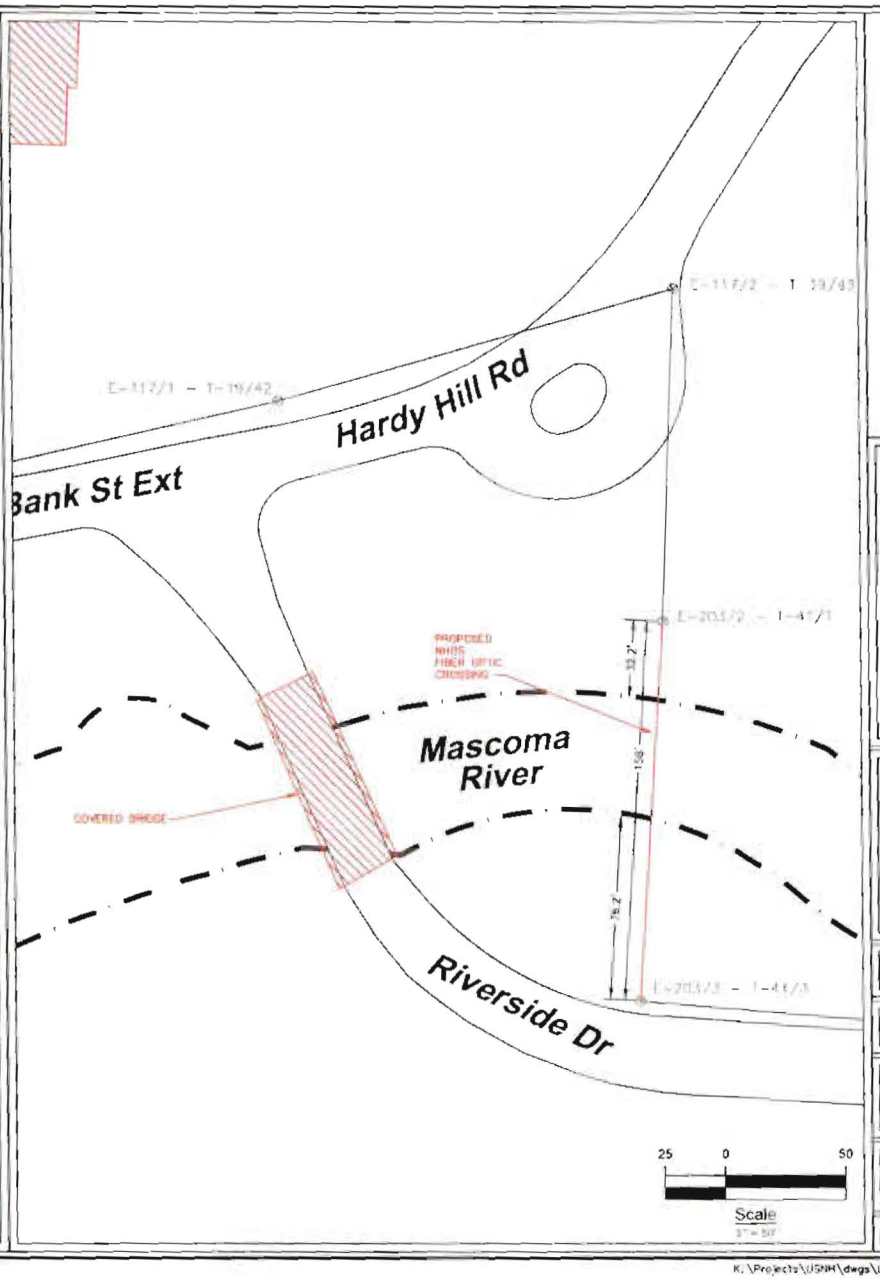

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NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
90 Pine Hill Rd
Nashua, NH 03063
(603)-821-6607

Project # TID-41
Drawing FAC-458-RIV-1

Date: 10/11/11
Revision #

Proposed Mascoma River Crossing
Lebanon, NH

Location:
Riverside Drive, Lebanon, NH
Nearest Cross street-Bank Street Extension

Sheet 1 of 2

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LOCUS MAP
(Not In Scale)

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

Waveguide
River and Rail Crossings

03/15/11 Waveguide

	X-SECT AREA (sq in)	EFF MODULUS (ksi)	NOMINAL CWM (in)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	67% LOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
Selected Cables							
9476 (Inch)-ES	0.0992	2.60E+07	0.259	3.94E-06	0.1210	814940	5850
DFF-D 144 LS	0.4307	3.00E+06	0.741	1.09E-05	0.1520	180700	840
Bundle			0.941		0.2730		

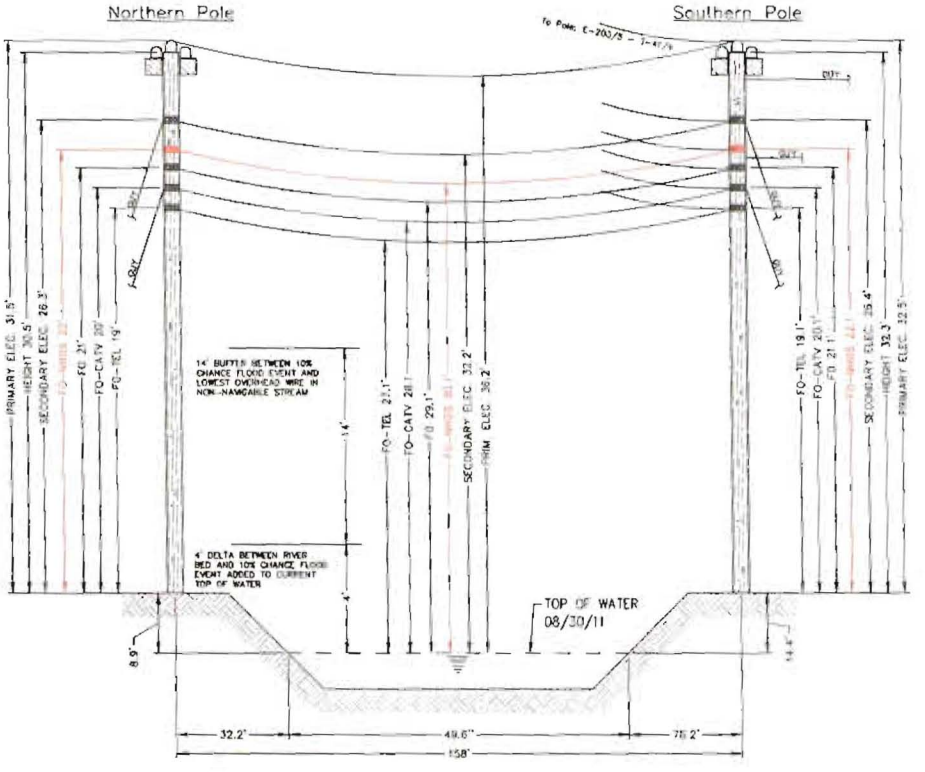
NESC RESULTS

Rule 251 - Heavy	0.0	0.027	50	3	4.3	1.671	3.18	1639	6.06	3.18	1.54	2.78	29.9	
250A1	129.0	0.000	60	0	0.0	0.275	1.96	427	0.02	1.96	11.06	1.96	0.0	

Span Length = 158.00 ft
Span Sag = 1.58 ft (1.0 in)
Span Tension = 330 lb
Max Load = 6,650 lb
Double load (66%) = 3,990 lb
Catenary Length = 158.042 ft
Stress Free Length (ft)
Installed Temperature = 157.940 ft

Unloaded Strand
Sag = 37.5 (11.5 in) 0.62 %
Tension = 285 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	1.41	938	0.02	N/A
-20.0	1.45	895	-0.02	N/A
-20.0	1.09	853	-0.02	N/A
-10.0	1.05	812	-0.01	N/A
0	1.10	772	-0.01	N/A
10.0	1.16	733	0.01	N/A
20.0	1.22	697	0.01	N/A
30.0	1.29	661	0.01	N/A
40.0	1.36	628	0.01	N/A
50.0	1.43	596	0.00	N/A
60.0	1.51	567	0.00	N/A
70.0	1.58	539	0.00	N/A
80.0	1.66	513	0.00	N/A
90.0	1.74	488	0.01	N/A
100.0	1.82	467	0.01	N/A
110.0	1.92	446	0.01	N/A
120.0	2.02	427	0.02	N/A
130.0	2.08	410	0.02	N/A
140.0	2.16	394	0.02	N/A



E-203/2 - T-41/1
(Existing joint owned utility pole (Notional Grid/Fairpoint) in existing Right-of-Way)

E-203/3 - T-41/3
(Existing joint owned utility pole (National Grid/Fairpoint) in existing Right-of-Way)

Notes:

1. The heights of structures shown thereon are based on field measurements taken with a Nikon 152 total station during a site survey on 08/30/11.
2. The horizontal distance between the nearest bridge edge and the existing overhead wires is over 100'.
3. The waterway is classified as not suitable for rail boating and per NESC Table 232-1 a vertical clearance of 19' shall be maintained between the lowest conductor and 10 year floodplain.
4. Based on the CTRM Flood Profile for the Mascoma River (Page 5/8) and the Flood Insurance Rate Map for Grafton County Map Panel 334 of 1125 dated 02/20/08 a conservative 10 year flood elevation was calculated by adding the delta between the river bed and the 10 year flood elevation to the surveyed water level and then the 14' buffer (for non-navigable stream) was added on that.
5. Vertical distances are representative of determined heights after utility pole make ready work are completed.

NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
99 Pine Hill Rd.
Nashua, NH 03063
(603-921-8487)

Project # TID-41
Drawing # NC-428-RIV-1

Date: 10/11/11
Revision 2

Proposed Mascoma River Crossing
Lebanon, NH

Location:
Riverside Drive, Lebanon, NH
Nearest cross street-Bank Street Extension

Sheet 2 of 2

E-203/2 - T-41/1

Construction Notes:

NHOS proposes to install a 5-inch metal outrigging strand between the existing utility pole shown above that will traverse the river. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will lash a one inch diameter fiber optic cable (FO) strand to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with labels that have contact information at each pole. NHOS will employ the proper safety personnel during the crossing installation. The proposed attach will meet all proper clearances from other cables (see above). Additional pole guys will be added per RUS, Bulletin 304 and as directed by pole owners.

E-91/NT - T-110D/10

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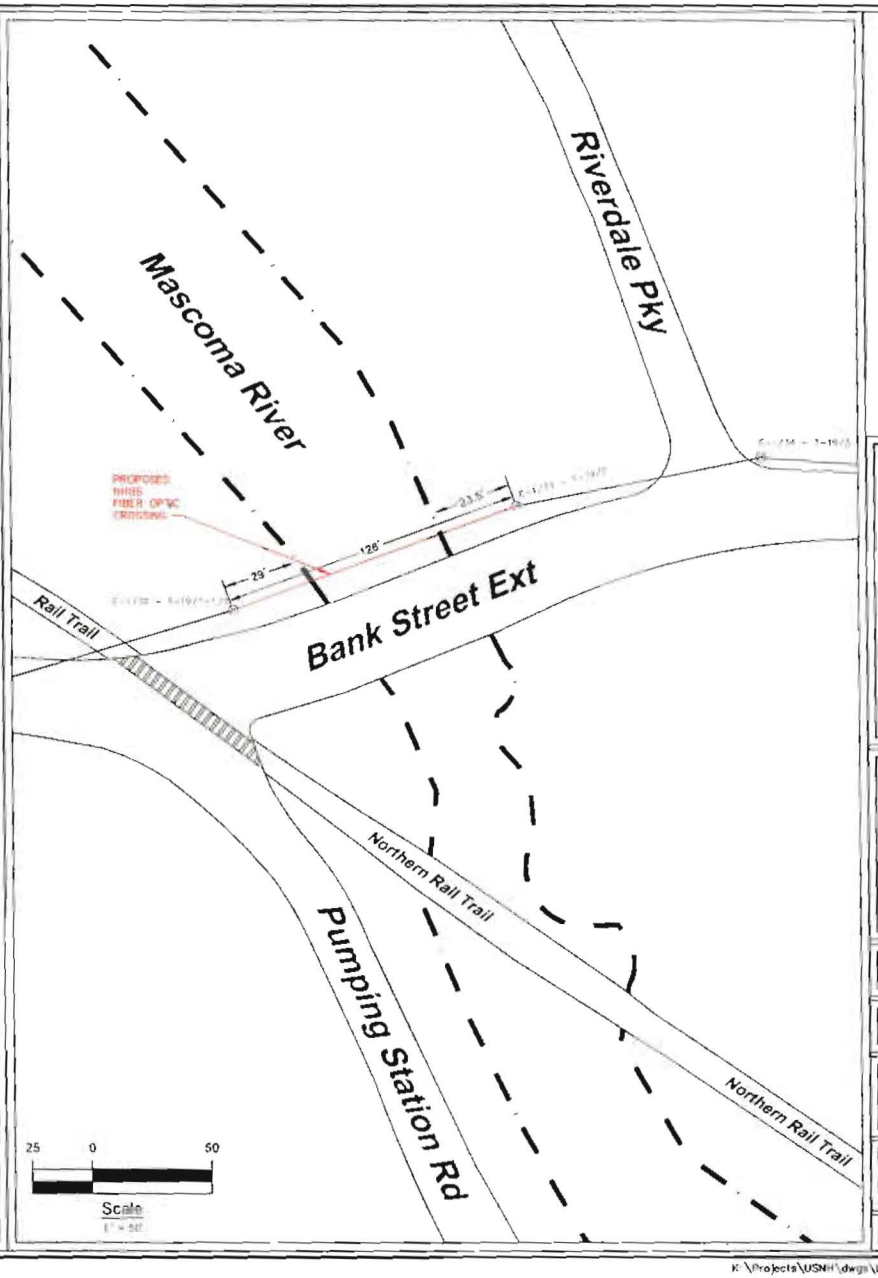

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NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
98 Pine Hill Rd.
Nashua, NH 03063
(603-821-8487)

Project # TID-44
Drawing # NC-LEB-RIV-4

Date: 10/31/18
Revision: 0

Proposed Mascoma River Crossing Lebanon, NH

Location:
Bank Street Extension, Lebanon, NH
Nearest cross street-Pumping Station Road

Sheet 1 of 2

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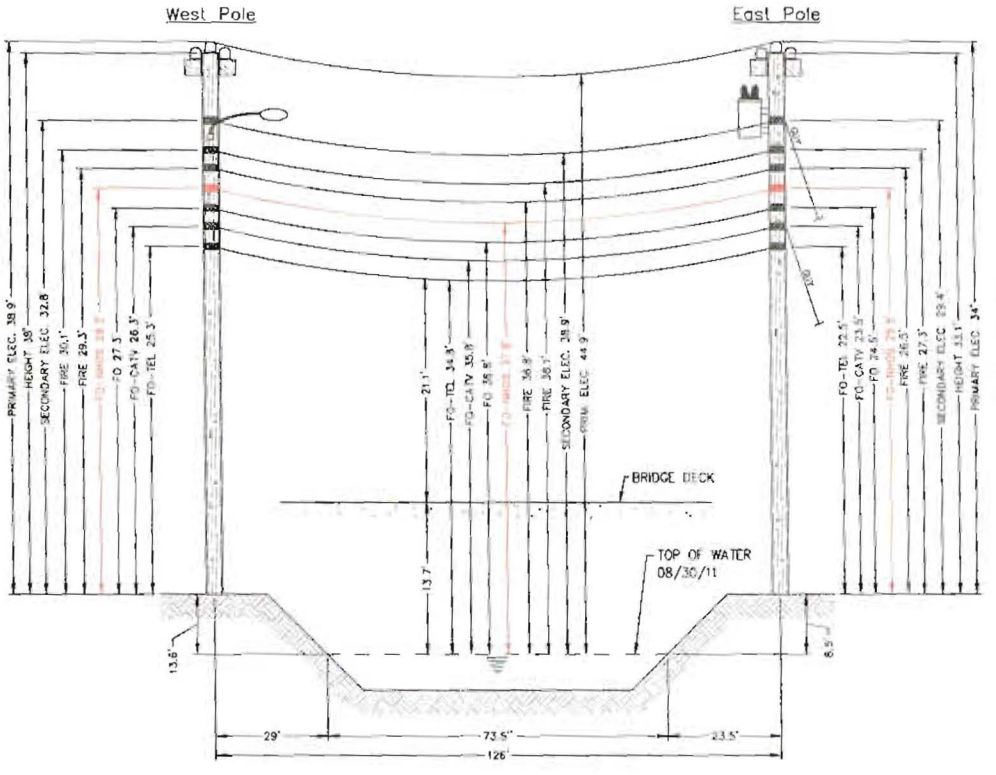
LOCUS MAP
(Not to Scale)



E-1/32 - T-19/1-1/2
(Existing joint owned utility pole (National Grid/Fairpoint) in existing Right-of-Way)

E-1/33 - T-19/2
(Existing joint owned utility pole (National Grid/Fairpoint) in existing Right-of-Way)

Notes:

1. The heights of structures shown herein are based on field measurements taken with a Nikon 302 total station during a site survey on 08/30/11.

2. The horizontal distance between the nearest bridge edge and the existing overhead wires ranges from 6.4' to 7.4'.

3. The smallest vertical distance from the top of existing bridge deck to the lowest existing overhead wires is 21.1'.

4. The vertical distance between the top of water and bridge deck is approximately 13.7'.

5. Because of the close horizontal proximity to the existing bridge structure, the supplied drawing is annotated with vertical distances measured to the structure. This process simplifies the preparation and review of the crossing without expanding (if allowed to proceed) the safe usage of the waterway.

6. Vertical distances are approximation of structures heights after utility make ready moves are completed.

CommScope®

Spanmaster® Release 3.1 Sag / Tension Computations
03/01/11 Waveguide

Waveguide
River and Rail Crossings

Selected Cables	X SECT AREA (sq.in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	FAILOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
FIRE ENERG	0.0352	2.90E+07	0.250	2.00E-06	0.1210	914940	9150
CBR G-144 LN	0.4307	2.90E+06	0.741	1.09E-06	0.1520	150720	940
Bundle			0.991		0.2730		

NESC RESULTS

Rule 251 - Heavy	0.0	0.907	00	0	0.0	1.671	2.36	1.902	0.07	2.37	1.14	2.07	28.9
232A1	120.0	0.000	00	0	0.0	0.270	1.62	336	0.02	1.82	0.00	1.82	0.0

Span Length = 126.00 ft
Span Sag = 1.26 ft (15.1 in)
Span Tension = 432 lb
Max Load = 0.650 lb
Usable load (60%) = 0.988 lb
Catenary Length = 126.034 ft
Stress Free Length @
Installed Temperature = 125.974 ft

Uncoated Strand
Sag = 20.4 ft (9.5 in) 0.66 %
Tension = 291 lb

Temp (F)	Attachment Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	.99	918	0.02	N/A
-30.0	.79	773	-0.02	N/A
-20.0	.74	731	-0.02	N/A
-10.0	.78	689	-0.02	N/A
0	.83	655	-0.02	N/A
10.0	.88	619	-0.01	N/A
20.0	.94	577	-0.01	N/A
30.0	1.00	541	-0.01	N/A
40.0	1.06	512	-0.01	N/A
50.0	1.12	482	-0.01	N/A
60.0	1.19	455	0.00	N/A
70.0	1.26	430	0.00	N/A
80.0	1.33	407	0.00	N/A
90.0	1.40	385	0.01	N/A
100.0	1.48	367	0.01	N/A
110.0	1.55	350	0.01	N/A
120.0	1.62	334	0.02	N/A
130.0	1.69	320	0.02	N/A
140.0	1.77	307	0.03	N/A

E-1/32 - T-19/1-1/2

Construction Notes:

NHOS proposes to install a 1 inch metal supporting strand between the existing utility poles shown above that will traverse the river. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double dead-end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will lash a one inch diameter fiber optic cable (FOC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with bundle line loss contact information at each pole along. NHOS will employ the proper safety personnel during the cabling installation. The proposed strand will meet all power clearances from other utilities, see above. Additional pole guys will be added per NESC Rule 261 and as directed by pole owners.

E-E-1/33 - T-19/2

NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
99 Pine Hill Rd.
Nashua, NH 03063
(603-821-4487)

Project # TID-44
Drawing RAC-LEB-REV-4

Date: 10/11/11
Revision 4

Proposed Mascoma River Crossing
Lebanon, NH

Location:
Bank Street Extension, Lebanon, NH
Nearest cross street-Pumping Station Road

Sheet 2 of 2

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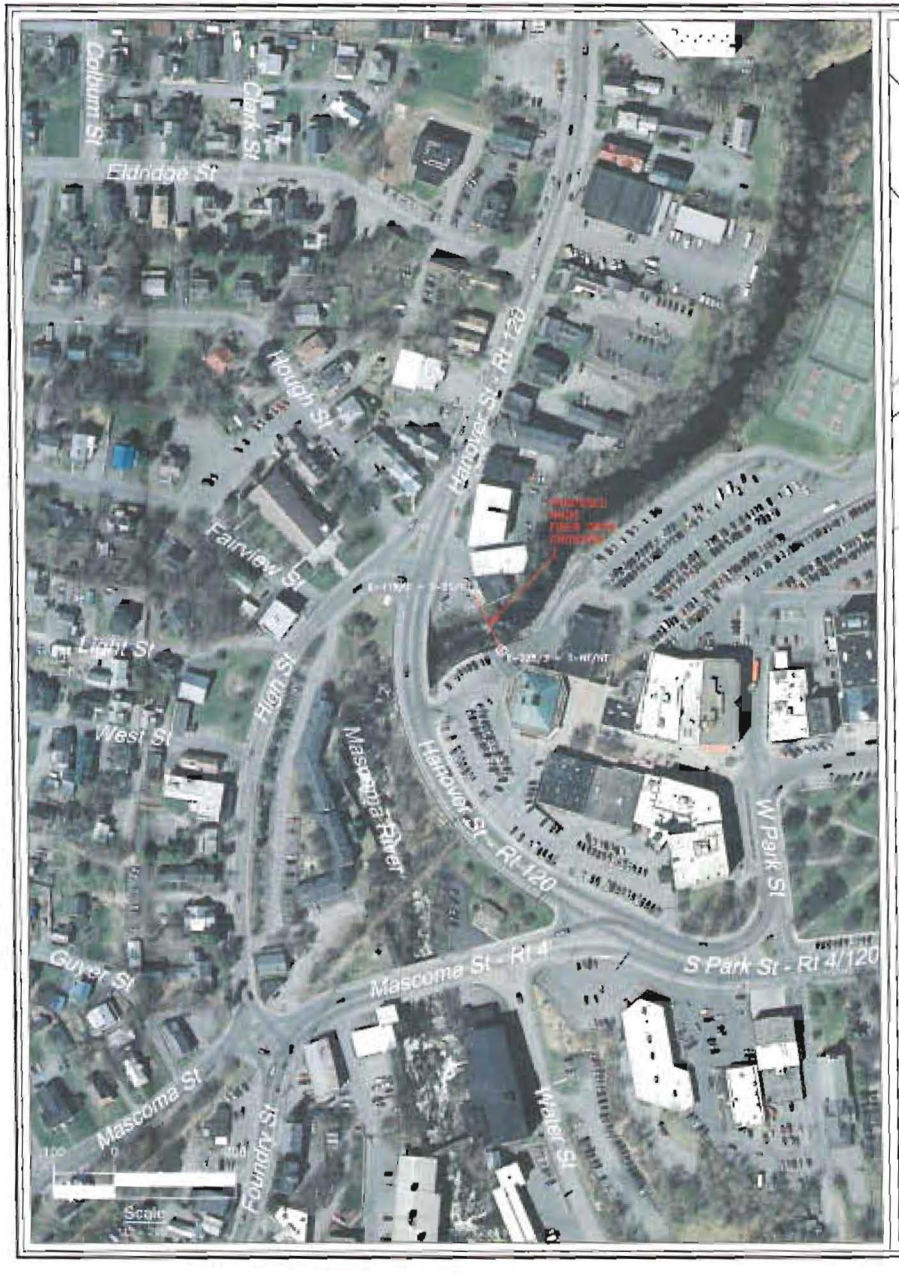

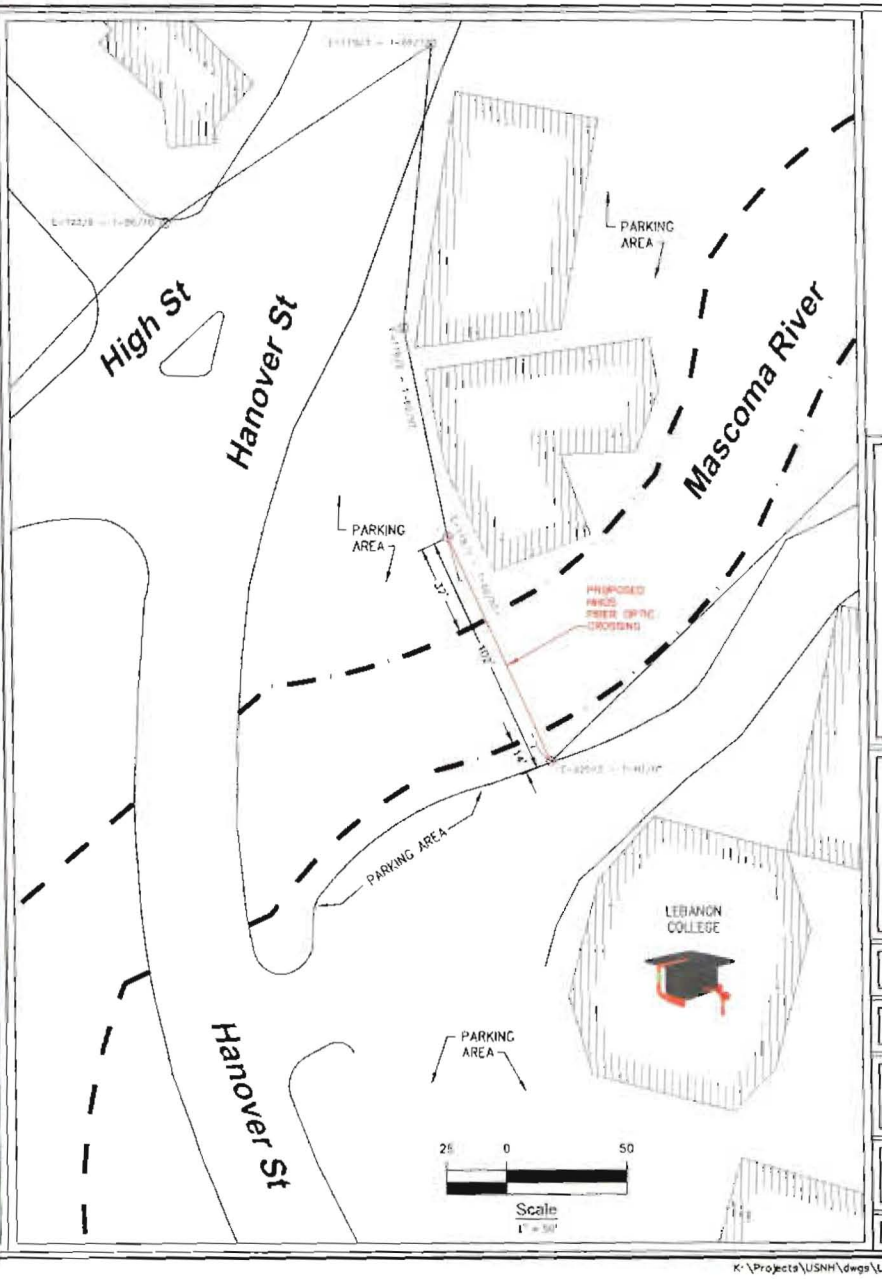

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NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
96 Pine Hill Rd.
Nashua, NH 03063
(603-821-6481)

Project # TID-47-HRI-15
Drawing #RC-LEB-Rlv-2

Date: 10/29/11
Revision: 4

Proposed Mascoma River Crossing Lebanon, NH

Location:
Hanover St - Rt 120, Lebanon, NH
Nearest cross street: High St

Sheet 1 of 2

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LOCUS MAP
(Not to Scale)

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

Wiremaster
River and Rail Crossings

Selected Cables	X-SECT AREA (sq.in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	E*A/LOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
DATE 6x19HS	0.0352	2.66E+07	0.250	5.90E-06	0.1210	934840	6850
CRF-D-130-LN	0.4307	1.88E+05	0.731	1.39E-06	0.1525	160726	840
Bundle			0.993		0.2730		

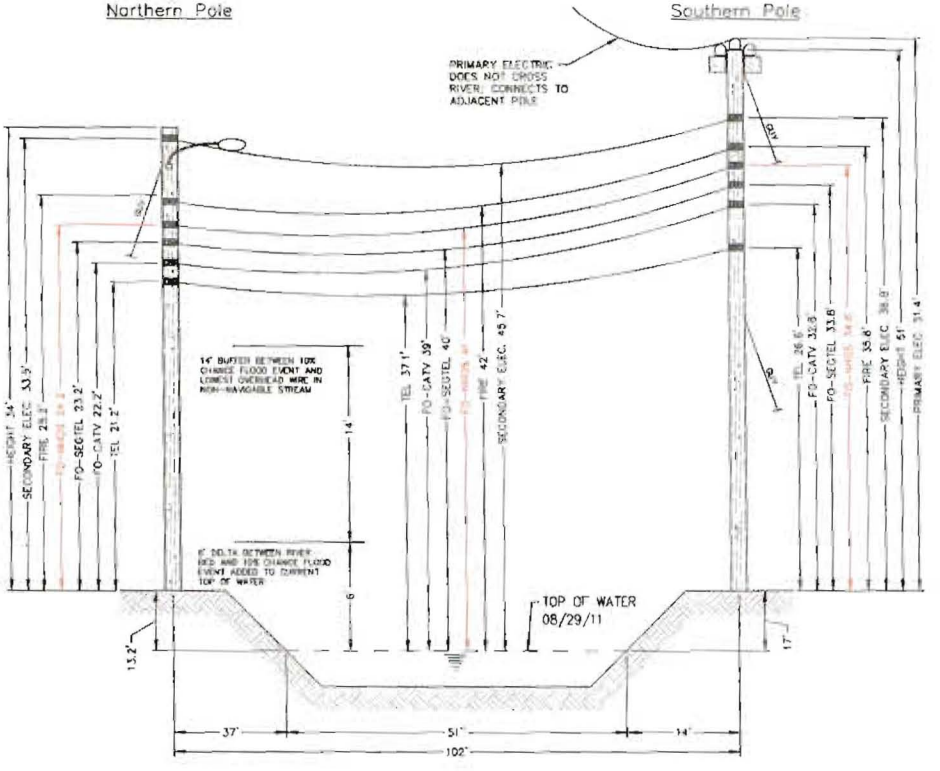
NESC RESULTS

Rule 251 - Heavy	0.9	0.907	36	5	4.0	1.671	1.79	121.1	0.06		1.76		0.87	1.57	28.8
232A1	120.0	0.000	0.0	6	0.0	0.273	1.34	266	0.03		1.39		0.06	1.34	0.0

Span Length = 102.00 ft
Span Sag = 1.42 ft (12.2 in)
Span Tension = 348 lb
Max Load = 5,600 lb
Usable load (60%) = 3,360 lb
Catenary Length = 102.027 ft
Stress Free Length (ft)
Installed temperature = 111.994 ft

Unloaded Strand
Sag = 21.8 (18.5 in) 0.70 %
Tension = 222 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	48	723	-0.02	N/A
-30.0	52	680	-0.02	N/A
-20.0	56	637	-0.02	N/A
-10.0	60	597	-0.02	N/A
0	64	557	-0.02	N/A
10.0	68	520	-0.01	N/A
20.0	72	486	-0.01	N/A
30.0	76	453	-0.01	N/A
40.0	84	423	-0.01	N/A
50.0	90	395	-0.01	N/A
60.0	96	370	0.00	N/A
70.0	1.02	348	0.00	N/A
80.0	1.08	328	0.00	N/A
90.0	1.15	310	0.01	N/A
100.0	1.21	294	0.01	N/A
110.0	1.27	279	0.01	N/A
120.0	1.34	266	0.02	N/A
130.0	1.40	254	0.02	N/A
140.0	1.46	244	0.03	N/A



E-119/1 - T-69/NT
(Existing joint owned utility pole (National Grid/Fairpoint) in existing Right-of-Way)

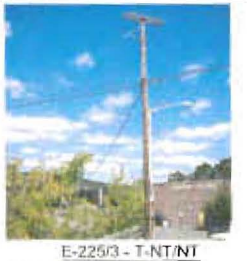
Not to Scale

E-225/3 - T-NT/NT
(Existing joint owned utility pole (National Grid) in existing Right-of-Way)

E-119/1 - T-69/NT

Construction Notes

NHOS proposes to install a 3 mil metal supporting strand between the existing utility poles shown above that will traverse the river. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearance. NHOS will lash a fiber optic cable (FOC) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with twenty four foot overlap information at each pole (based upon) will employ the proper safety procedures during the cabling installation. The proposed install will meet all proper clearances from other utilities (see above). Additional pole guys will be added per NESC Rule 261 and as directed by pole owners.



E-225/3 - T-NT/NT

Notes:

1. The heights of structures shown hereon are based on field measurements taken with a Nikon 302 total station during a site survey on 08/29/11.
2. The horizontal distance between the nearest bridge edge and the nearest overhead wire is over 100'.
3. The waterway is classified as not suitable for rail traffic, and per NESC Table 232-1 a vertical clearance of 14' shall be maintained between the lowest conductor and 10 year flood plain.
4. Based on the USGS Flood Profile for the Mascoma River (Page 89), a conservative 10 year flood elevation was calculated by adding the delta between the river bed and the 10 year flood elevation to the surveyed water level, and then the 14' buffer (for non-navigable streams) was added to that.
5. Vertical distances are representative of attachment heights after utility make ready work (if any) is completed.

NHOS
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New Hampshire Optical Systems, Inc
99 Pine Hill Rd
Nashua, NH 03063
(603-821-6867)

Project # 110-47-PRI-15
Drawing #40-LEB-XIV-2

Date: 10/24/11
Revision 2

Proposed Mascoma River Crossing
Lebanon, NH

Location:
Hanover St - Rt 120, Lebanon, NH
Nearest cross street: High St

Sheet 2 of 2

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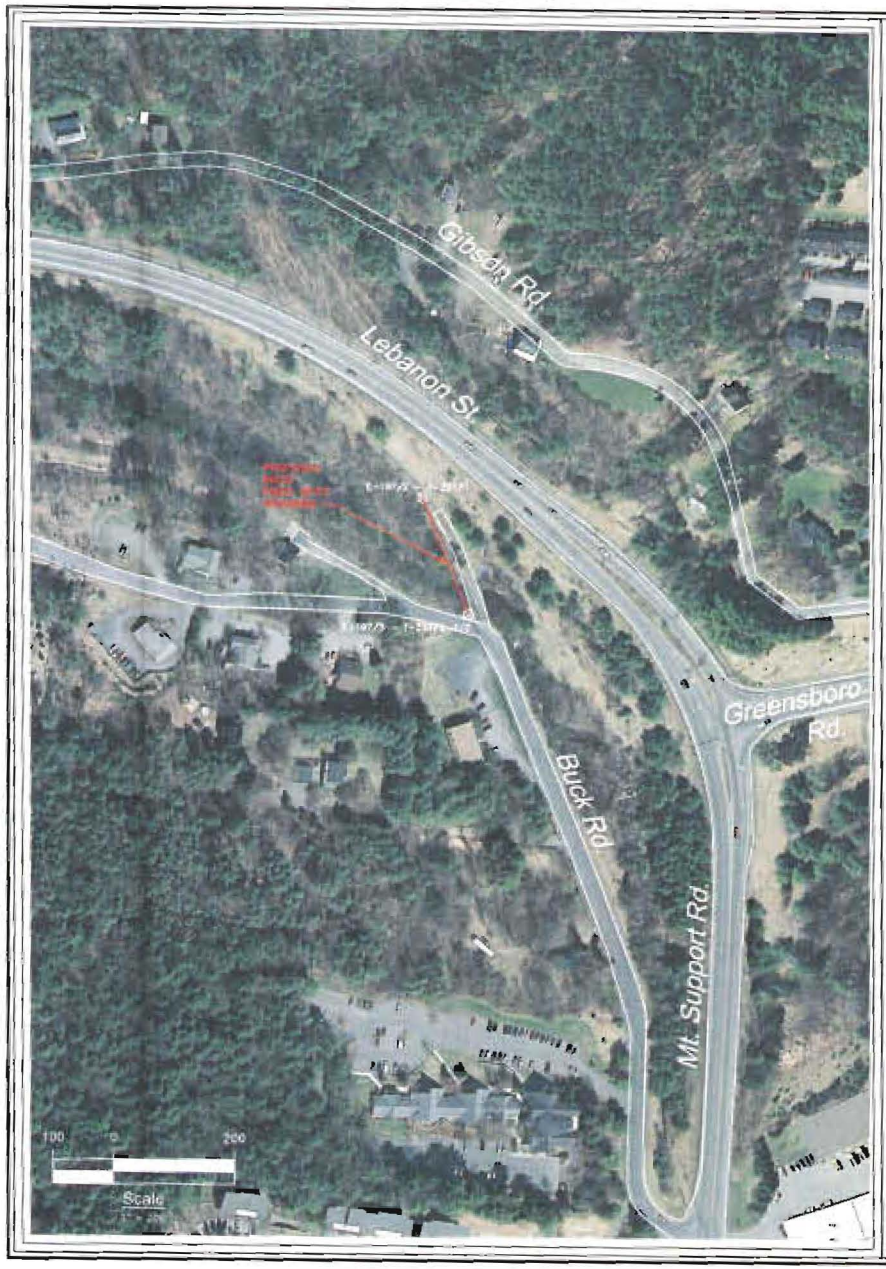

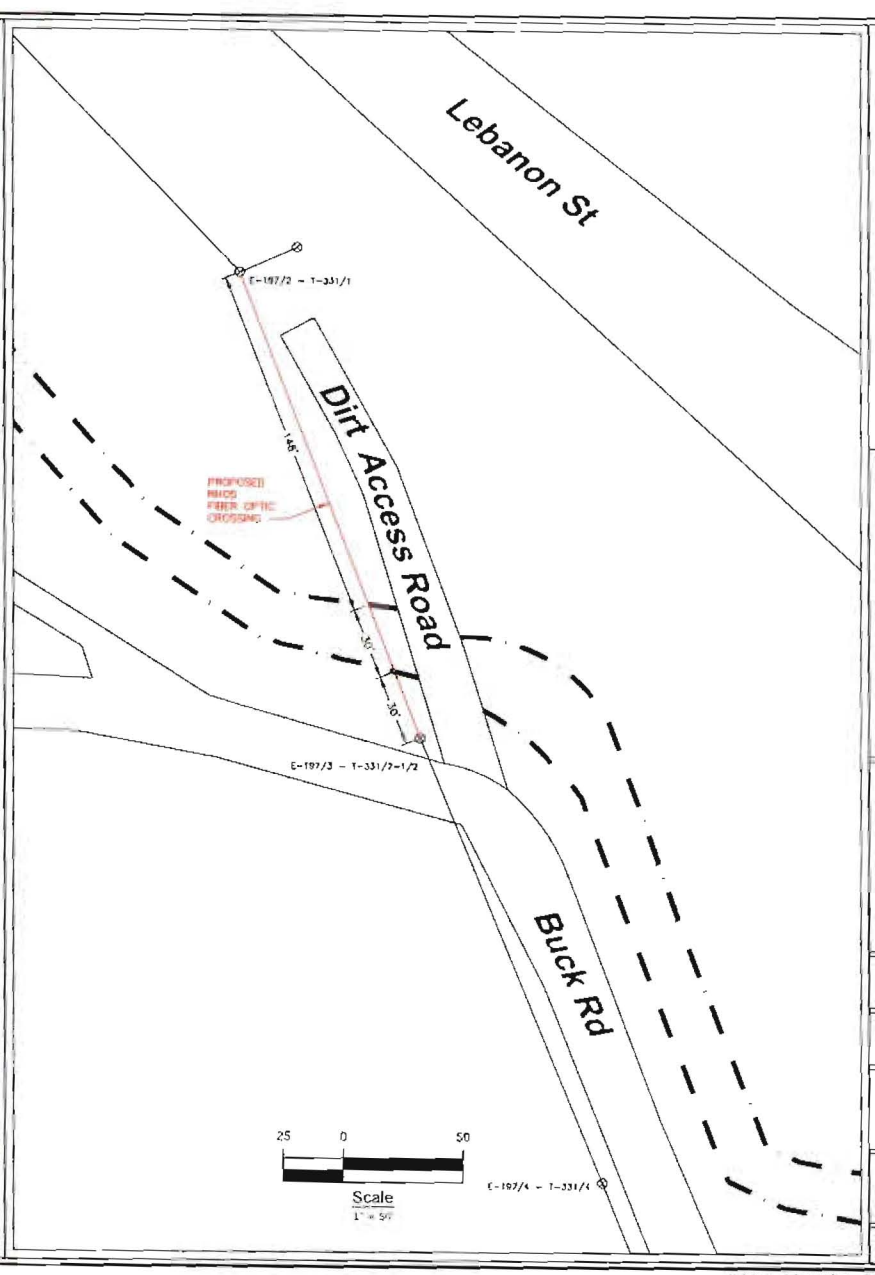

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NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
90 Pine Hill Rd.
Nashua, NH 03060
(603-821-6467)

Project # TID-43 - Primary 15
Drawing #AG-HAN-RIV-1

Date: 10/21/11
Revision #

Proposed
Stream Crossing
Hanover, NH

Location:
Buck Rd., Hanover, NH
Nearest cross street- Mt. Support Rd.

Sheet 1 of 2

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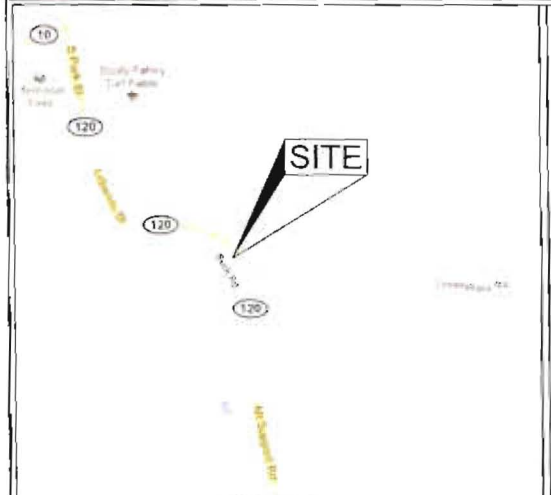


LOCUS MAP
(Not to Scale)

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

Wavegate
River and Rail Crossings

Natural Wavegate

	A SECT AREA (sq in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	FULLOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
General Cables							
1/4"E BARE-HS	0.0352	2.90E+07	0.250	5.90E-06	0.1210	154040	6600
OFF-O 288-LN	0.0587	2.70E+05	0.300	1.13E-05	0.1800	15962	651
Bundle			1.109		0.3110		

NESC RESULTS

Rule 251 - Heavy	0.0	1.000	60	0	0.0	1.000	0.34	2715	9.30		4.58		9.15	4.02	28.1	
232A1	100.0	0.600	60	0	0.0	0.317	2.32	667	9.07		2.52		9.86	2.92	0.0	

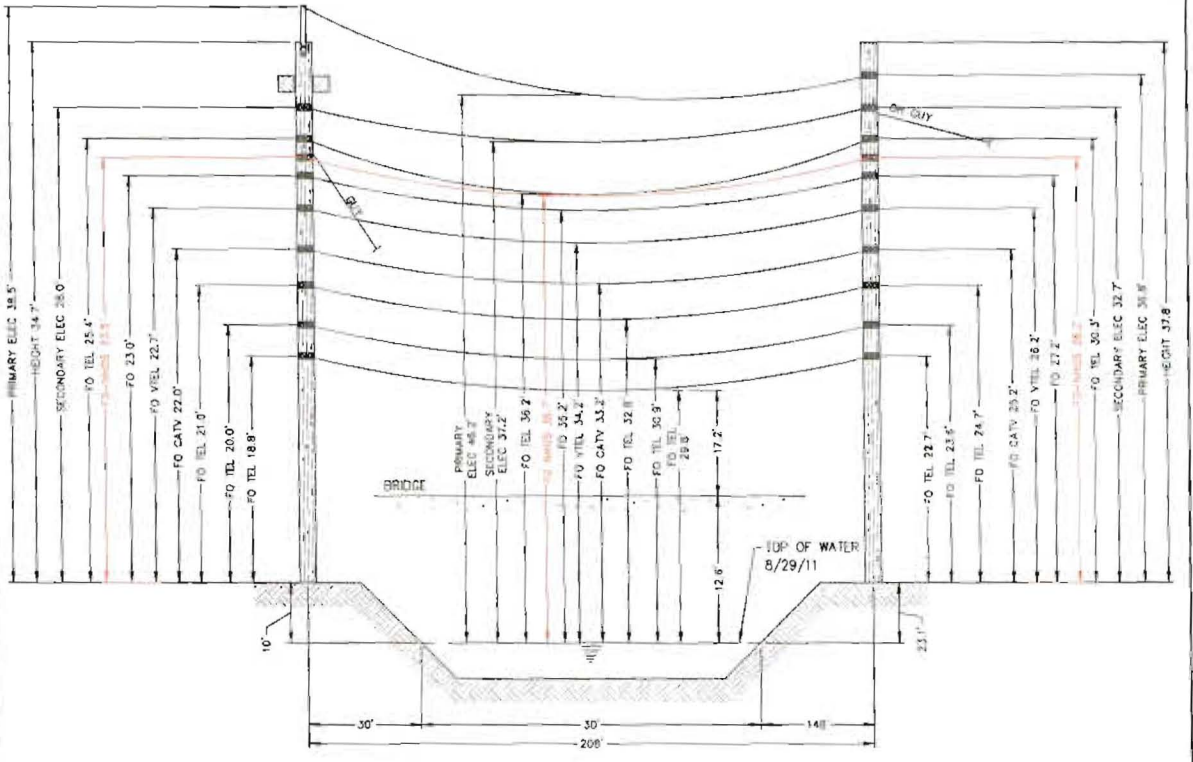
Span Length = 208.00 ft
Span Sag = 2.08 ft, 225.0 in
Span Tension = 924 lb
Max Load = 6.990%
Usable load (MBs) = 3.960 lb
Catenary Length = 208.002 ft
Stress Free Length @
Installed Temperature = 287.888 F

Unloaded Strand
Sag = 1.02 ft (12.3 in) - 0.49 %
Tension = 636 lb

Range (ft)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
0.0	1.97	1,343	0.02	N/A
5.0	1.42	1,304	0.01	N/A
25.0	1.87	1,362	-0.01	N/A
15.0	1.59	1,120	-0.01	N/A
0	1.08	1,071	0.00	N/A
10.0	1.89	1,036	-0.01	N/A
20.0	1.71	1,030	-0.01	N/A
30.0	1.76	962	-0.01	N/A
40.0	1.88	925	-0.01	N/A
50.0	1.97	890	0.00	N/A
60.0	2.06	858	0.00	N/A
70.0	2.08	823	0.00	N/A
80.0	2.18	792	0.00	N/A
90.0	2.29	762	0.00	N/A
100.0	2.34	733	0.01	N/A
110.0	2.63	706	0.01	N/A
120.0	2.52	681	0.01	N/A
130.0	2.61	658	0.02	N/A
140.0	2.70	634	0.02	N/A

Southern Pole

Northern Pole



E-197/3 - T-331/2-1/2
(Existing joint owned utility pole (Fairpoint/National Grid) in existing Right-of-Way)

E-197/2 - T-331/1
(Existing joint owned utility pole (Fairpoint/National Grid) in existing Right-of-Way)

E-197/3 - T-331/2-1/2

Construction Notes:

NHOS proposes to install a 1/4 inch aerial supporting strand between the existing utility poles, therein above that will traverse the river. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will lash a non-metallic fiber optic cable (FOC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with manufacturer information at each pole change. NHOS will employ the proper safety personnel during the crossing installation. The proposed install will meet all proper clearances from other utilities (see above). Additional pole guys will be added per NESC Rule 264 and as directed by pole owners.

E-197/2 - T-331/1

Notes:

1. The heights of structures shown hereon are based on field measurements taken with a Nikon 310 total station during a site survey on 08/29/11.
2. The horizontal distance between the nearest bridge edge and the crossing overhead wires ranges from 19' to 41'.
3. Because of the close horizontal proximity to the existing bridge structure, the supplied drawing is identified with vertical distances measured to the structure. This process supplies the penetration and levels of the crossing without jeopardizing its intent to protect the safe usage of the waterway.
4. The smallest vertical distance from the top of existing bridge deck to the lowest existing overhead wires is 12.2'.
5. The vertical distance between the top of water and bridge deck is approximately 12.5'.
6. Vertical distances are approximate of attachment heights after utility water levels return to normal.

NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems Inc.
99 Pine Hill Rd.
Nashua, NH 03063
(603-821-6487)

Project # T20-43 - Primary 15
Drawing #NC-HAN-REV-1

Date: 10/23/11
Revision #

Proposed
Stream Crossing
Hanover, NH

Location:
Bank Rd., Hanover, NH
Nearest cross street- Mt. Support Rd.

Sheet 1 of 2

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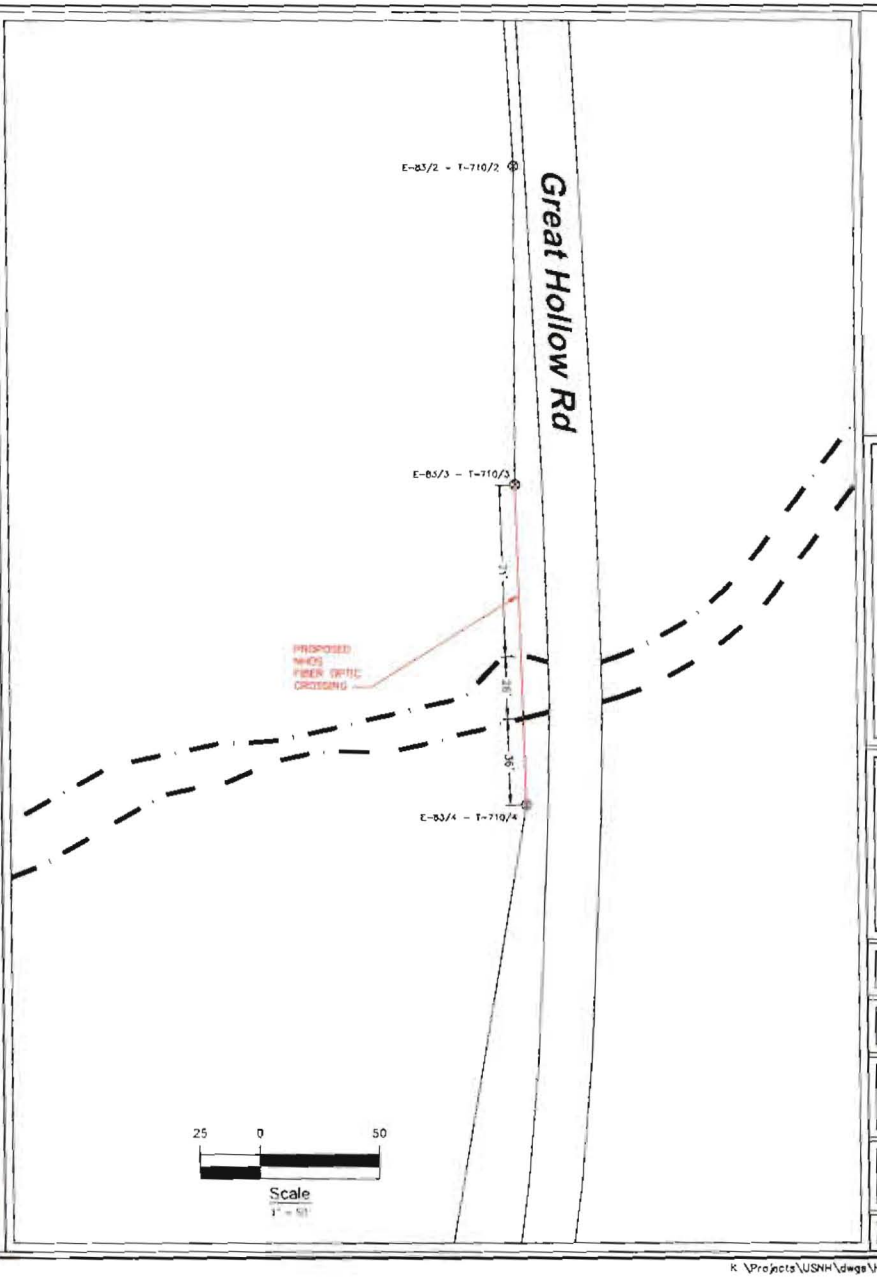

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NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
89 Pine Hill Rd.
Nashua, NH 03063
(603-821-6457)

Project # T10-50 - Lateral 28
Drawing: ABC-HWR-RDW-2

Date: 10/26/11
Revision: 4

Proposed Crossing
Mink Brook
Hanover, NH

Location:
Great Hollow Rd, Hanover, NH
Nearest cross street: Greensboro Rd.

Sheet 1 of 2

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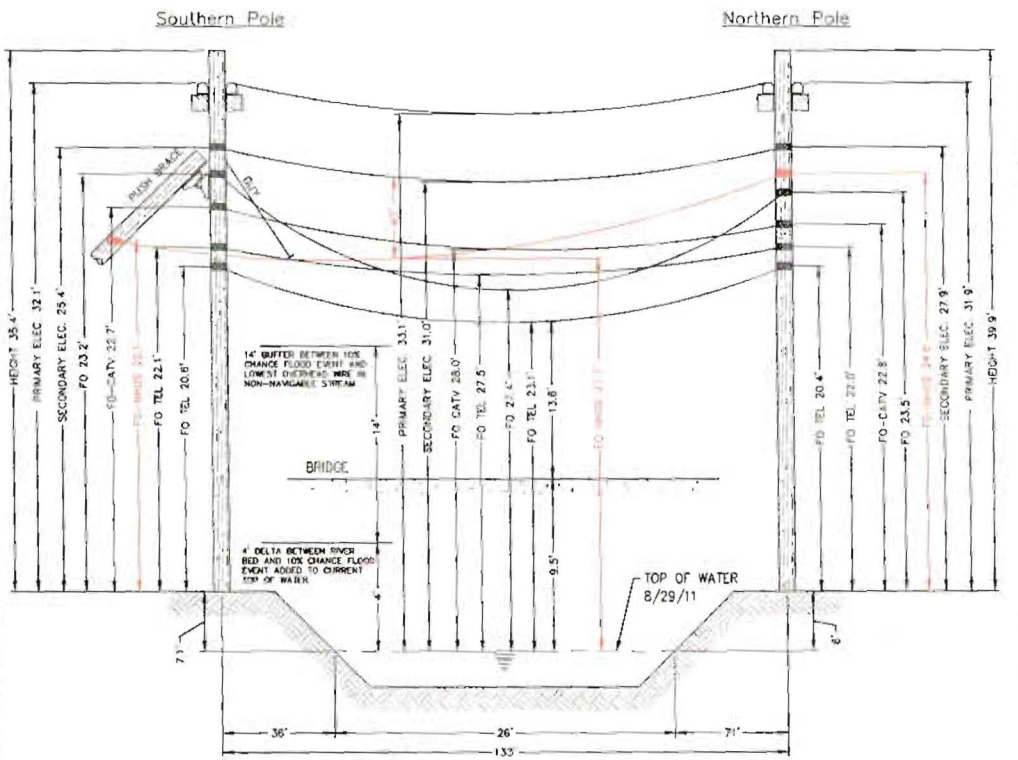
LOCUS MAP
(Not to Scale)



E-83/4 - T-710/4
(Existing joint owned utility pole (National Grid/Fairpoint) in existing Right-of-Way)

E-83/3 - T-710/3
(Existing joint owned utility pole (National Grid/Fairpoint) in existing Right-of-Way)

Notes:

1. The heights of structures shown herein are based on field measurements taken with a Nikon Nut total station during a site survey on 8/29/11
2. The horizontal distance between the nearest bridge edge and the existing overhead wires ranges from 38' to 15'
3. The smallest vertical distance from the top of existing bridge deck to the lowest existing overhead wire = 11.6'
4. The vertical distance between the top of water and bridge deck is approximately 13.1'
5. The waterway is classified as not suitable for navigation under NESC Table 232-1. A vertical clearance of 14' must be maintained between the lowest conductor and Ordinary Relighted
6. Based on the FEMA Good Pride by Mink Brook (Page 10001) a conservative 10 year flood frequency was calculated by adding the delta between the river bed and the Ordinary Relief elevation to the current water level and then the 14' buffer (for non navigable streams) was added to that
7. Vertical distances are represented upon attachment heights after utility make ready moves are completed

NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
93 Pine Hill Rd.
Nashua, NH 03063
(603-821-6161)

Project # TID-50 – Lateral 29
Drawing: NHC-HAN-RTV-2

Date: 10/26/11
Revision 4

Proposed Crossing
Mink Brook
Hanover, NH

Location:
Great Hollow Rd, Hanover, NH
Nearest cross street: Greensboro Rd.

Sheet 2 of 2

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations
03/29/11 Waveguide

Waveguide
River and Rail Crossings

Selected Cables	X-SECT AREA (sq in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	E*A LOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
1/4" BELDEN	0.0352	2.86E+07	0.250	5.50E-06	0.0210	910880	860
ORF-D-25R-LA	0.5782	3.70E+06	0.856	1.13E-05	0.5800	165862	651
Bundle			1.106		0.3170		

NESC RESULTS

Rule 261 - Heavy	0.0	1.000	50	3	4.0	1.793	2.50	1545	0.87	2.56	1.23	2.26	28.7
232A1	120.0	0.000	00	0	0.0	3.217	1.68	457	0.02	1.68	0.00	1.68	0.0

	Temp (F)	Midspan Sag (ft)	Tension (lbs)	% Length Change	Clearance
Span Length = 133.00 ft					
Span Sag = 1.33 ft (16.0 in)					
Span Tension = 527 lb					
Max Load = 6,030 lb					
Usable Rail (60%) = 3,618 lb					
Catenary Length = 133.035 ft					
Stress Free Length (ft)					
Installed Temperature = 32/-59 F					
	10.0	1.97	720	0.01	N/A
	20.0	1.82	663	0.01	N/A
	30.0	1.68	648	0.01	N/A
	40.0	1.14	615	0.01	N/A
	50.0	1.20	584	0.00	N/A
	60.0	1.26	554	0.00	N/A
	70.0	1.33	527	0.00	N/A
	80.0	1.40	501	0.00	N/A
	90.0	1.47	477	0.01	N/A
	100.0	1.54	456	0.01	N/A
	110.0	1.61	435	0.01	N/A
	120.0	1.68	417	0.02	N/A
	130.0	1.75	400	0.02	N/A
	140.0	1.83	384	0.02	N/A

Unloaded Strand
Sag = 74.8 (6.2 in) 0.56 %
Tension = 309 lb

E-83/4- T-710/4

Construction Notes

NHOS proposes to install a bi-directional supporting strand between the existing utility poles shown above that will span the river. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double dead-end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will lash a new bi-directional fiber optic cable (FOC) lashed to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with twenty four hour contact information at each pole along. NHOS will employ the proper utility personnel during the crossing installation. The proposed install will meet all pages clearances from other utilities (see above). Additional pole guys will be added per NESC Rule 264 and as deemed by pole owners.

E-83/3 - T-710/3

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The State of New Hampshire
Before the
Public Utilities Commission
Docket No.

PETITION OF THE NEW HAMPSHIRE OPTICAL SYSTEMS INC. FOR LICENSE TO CONSTRUCT AND MAINTIAN FIBER OPTIC CABLES OVER AND ACROSS THE FOLLOWING NEW HAMPSHIRE RAILROADS:

- MAIN STREET NORTHFIELD NH BETWEEN UTILITY POLE 63/10 AND POLE 63/8 (Ref. TID 15)
- NEW SALEM STREET LACONIA NH BETWEEN UTILTIY POLE 180/14 AND POLE 180/15 (Ref. TID 20)
- WINONA ROAD NEW HAMPTON NH BETWEEN UTILTIY POLE 380/331 AND POLE 380/300 (Ref. TID 22.1)
- JOHN JENESS ROAD BRIDGEWATER NH BETWEEN UTILITY POLE 380/458 AND POLE 380/457 (Ref. TID 28)
- MAIN STREET TILTON NH BETWEEN UTILITY POLE 64/8 AND POLE 64/7 (Ref. TID 213)

TO THE PUBLIC UTILITIES COMMISSION:

New Hampshire Optical Systems Inc., a Competitive Local Exchange Carrier ("CLEC") in the State of New Hampshire, hereby petitions the Public Utilities Commission ("Commission"), pursuant to the RSA 371:17, for a license to construct and maintain fiber optic cables over and across the aforementioned railroads at five locations in the towns or cities of Northfield, Laconia, New Hampton, Bridgewater, and Tilton.

New Hampshire Optical Systems, Inc. submits this petition in the interest of the public good as the fiber being placed over the railroad crossings is part of the Network New Hampshire Now (NNHN) Middle Mile Fiber network. The project will extend the availability of Internet access and broadband communications to areas of New Hampshire that heretofore had limited or no service. In adherence with the Federal Broadband Technology Opportunities Program (BTOP) grant, NHOS will build and maintain an open access, non-discriminatory network offering broadband providers the ability to economically expand their services areas, companies the opportunity to build private networks they own and control, and users more choice and affordability in their Internet access and communications products.

In support of its petition New Hampshire Optical Systems Inc. states as follows:

1. In order to meet reasonable requirements of service to the public, New Hampshire Optical Systems Inc. is proposing to construct a new fiber optic cable, to expand its fiber network, which is used for the purpose of providing telecommunications services to customer in New Hampshire.

2. A separate engineering package is provided for each of the five crossings, which includes the design and proposed construction, with location maps detailing where and how the new line will cross each railroad.

3. Each proposed crossing will be placed between two existing utility poles in the existing public right-of-way. The attached diagrams provide exact distances between poles and the height of each pole. Vertical distances are representative of attachment heights after the completion of all moves deemed necessary by the pole owner's during their make-ready assessments.

4. The New Hampshire Optical Systems Inc. attachment will be made up of two materials; strand (nominal diameter ¼ in. 7-strand steel EHS) and one 288 count non-selfsupporting Pureband (ZWP) single-mode fiber optic cable. Sag and tension calculations were done per NESC articles 232.A1 and 251 and the results are included in the attachments. In all cases the calculations for Article 251 using the heavy load conditions (0° F, pounds 4.0 psf wind loading and ½" radial ice) were found to be the governing condition for both sag and tension. The maximum tension under heavy load conditions was shown not to exceed the 60% usable strand load of 3990 lbs.

5. One railroad crossing (TID 22.1 Winona Road, New Hampton, NH) requires a NHDOT permit necessary for the construction of the crossing. New Hampshire Optical Systems is in the process of obtaining approval from the NHDOT to construct across the railroad.

6. The proposed crossings have been designed and will be constructed, maintained and operated by New Hampshire Optical Systems, its affiliates and contractors, in accordance with the NESC.

7. New Hampshire Optical Systems submits that the license petition for herein may be exercised without affecting the rights of the public in the public right of way. Minimum safe line clearances will be maintained at all times as required by the National Electrical Safety Code (NESC) and the New Hampshire Division of Transportation (NHDOT).

WHEREFORE, NEW HAMPSHIRE OPTICAL SYSTEMS respectfully requests that the Commission:

A. Find that the license petitioned for herein may be exercised without affecting the railroads which are the subject of this petition.

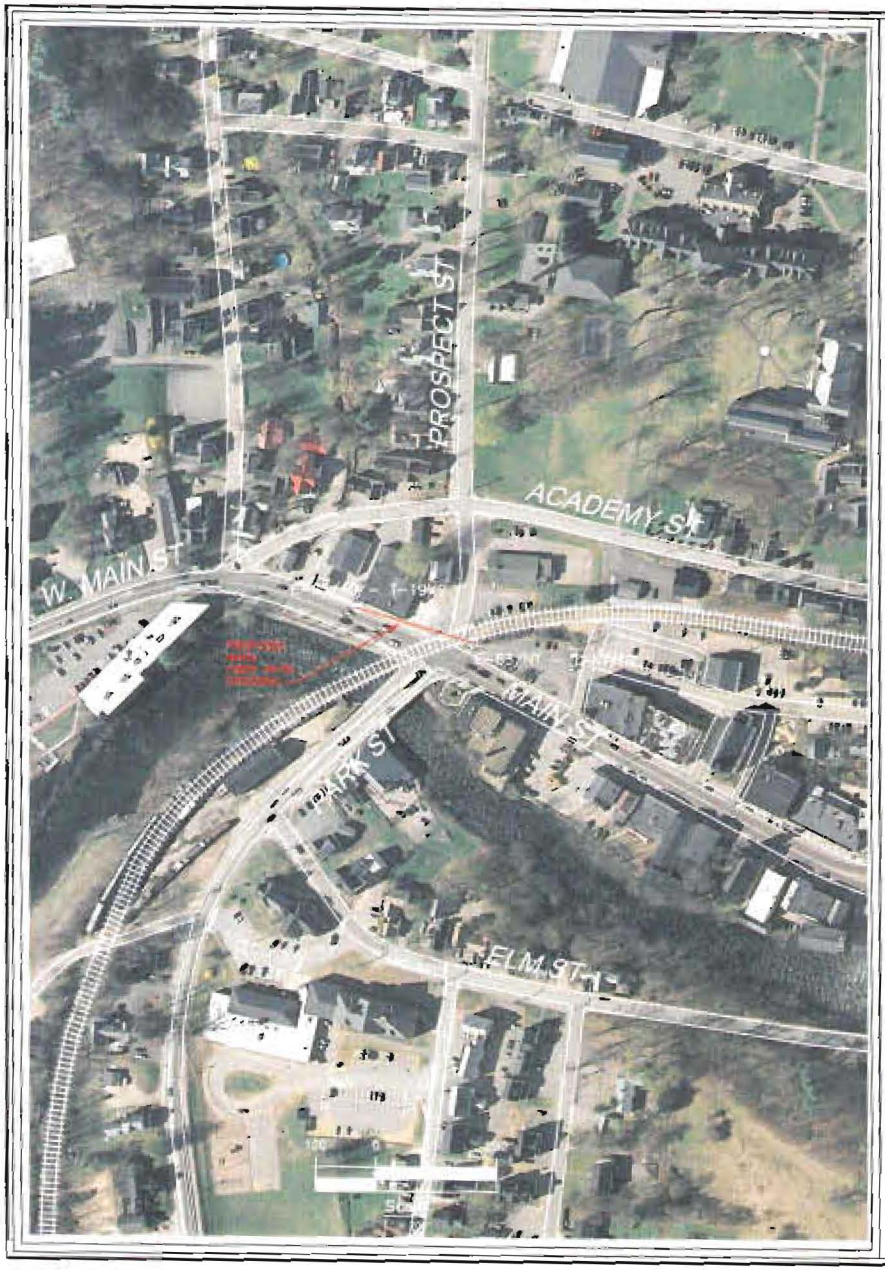
B. Grant New Hampshire Optical Systems, Inc. a license to construct and maintain fiber optic cables over and across the railroads as specified in this petition; and

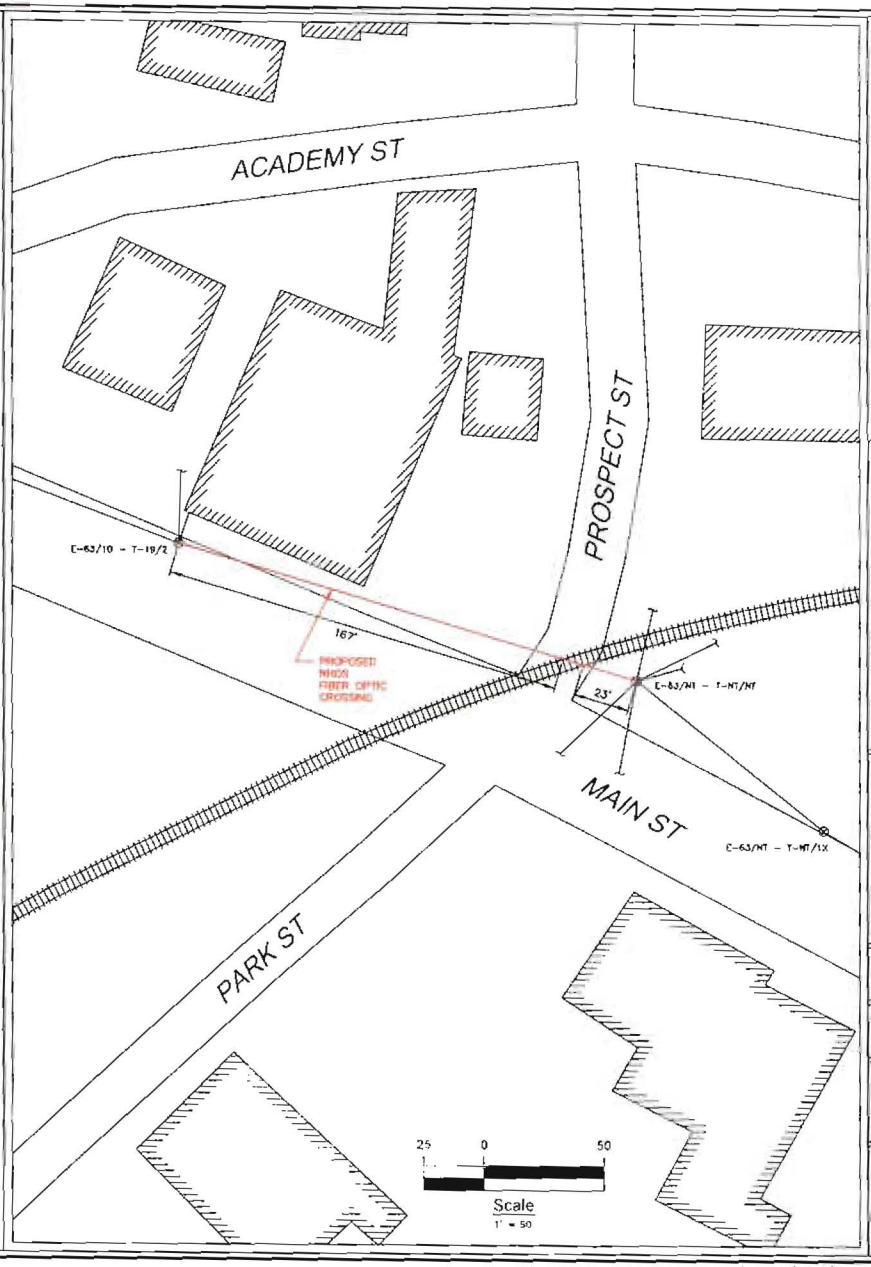
C. Issue an Order Nisi and orders for its publication.

Dated at Nashua the 19th day of December, 2011.

Respectfully submitted
New Hampshire Optical Systems Inc.
By Its President

Rob Carmichael
New Hampshire Optical Systems, Inc.
99 Pine Hill Rd.
Nashua, NH 03063
(603)821-6467





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NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
[illegible]
Nashua, NH [illegible]
(603-[illegible])

Project # TID-15-PRJ-13
Drawing #AC-NOR-PR-1

Date: [illegible]
Revision #

Proposed
Railroad Crossing
Northfield, NH

Location:
Main St., Northfield, NH
Nearest cross street- Prospect St.

Sheet 1 of 1

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LOCUS MAP
(Not to Scale)

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

Waveguide
River and Rail Crossings

	X-SECT AREA (sq in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	1*LOAD BOARDING CAPACITY (lbs)	MAX RATED LOAD (lbs)
Selected Cables							
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bundle					[illegible]		

NESC RESULTS

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Rule 250 - Heavy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

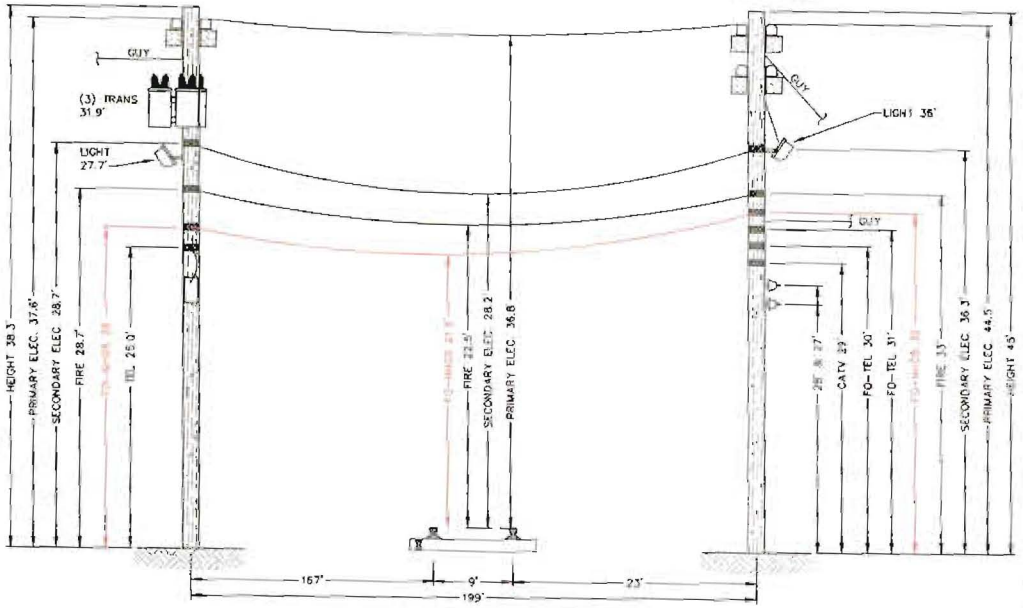
Span Length = 199.00 ft
Span Sag = 1.167 ft (23.0 in)
Span Tension = 599 lb
Max Load = 6,000 lb
Usable load (60%) = 3,600 lb
Catenary Length = 199.050 ft
Stress Free Length @
Installed Temperature = 199.002 ft

Waveguide Strand
Sag = 39.8 (11.9 in) 0.98 ft
Tension = 896 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
40.0	1.29	1,209	0.02	N/A
30.0	1.34	1,106	0.01	N/A
20.0	1.38	1,125	0.01	N/A
10.0	1.45	1,002	0.01	N/A
0	1.50	1,047	0.01	N/A
-10.0	1.56	1,001	-0.01	N/A
-20.0	1.63	962	-0.01	N/A
-30.0	1.69	925	-0.00	N/A
-40.0	1.76	888	-0.01	N/A
-50.0	1.84	854	0.00	N/A
-60.0	1.91	820	0.00	N/A
-70.0	1.99	788	0.00	N/A
-80.0	2.07	757	0.00	N/A
-90.0	2.16	727	0.00	N/A
-100.0	2.24	700	0.01	N/A
-110.0	2.33	673	0.01	N/A
-120.0	2.42	648	0.01	N/A
-130.0	2.51	625	0.00	N/A
-140.0	2.60	604	0.02	N/A

East Pole

West Pole
45' Pole to be Replaced
with 50' pole



E-63/10 - T-19/2
(Existing joint owned utility pole (PSNH/Fairpoint) in existing Right-of-Way)

E-63/NT - T-NT/NT
(Existing joint owned utility pole (PSNH/Fairpoint) in existing Right-of-Way)

Notes.

1. The heights of attachments shown herein are based on field measurements taken with a Nikon 1612 total station during a site inspection 07/08/11.
2. Vertical distances are representative of attachment heights after utility make ready work are completed.

E-63/10 - T-19/2

Construction Notes.

NHOS proposes to install a 5 lock partal supporting strand between the existing utility poles shown above that will traverse the railroad. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double-dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will lash a one inch diameter fiber optic cable (FOC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with twenty foot loop consist information at each pole stop. NHOS will employ the proper safety personnel during the crossing installation. The proposed install will meet all proper clearances from other utilities (see above). Additional pole guys will be added per NESC Rule 264 and as directed by pole owners.

E-63/NT - T-NT/NT

NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
99 Pine Hill Rd.
Nashua, NH 03063
(603-821-6967)

Project # TID-15-NR1-15
Drawing #AC-[illegible]-1

Date: 10/20/11
Revision 0

Proposed
Railroad Crossing
Northfield, NH

Location:
Main St., Northfield, NH
Nearest cross street- Prospect St.

Sheet 2 of 2

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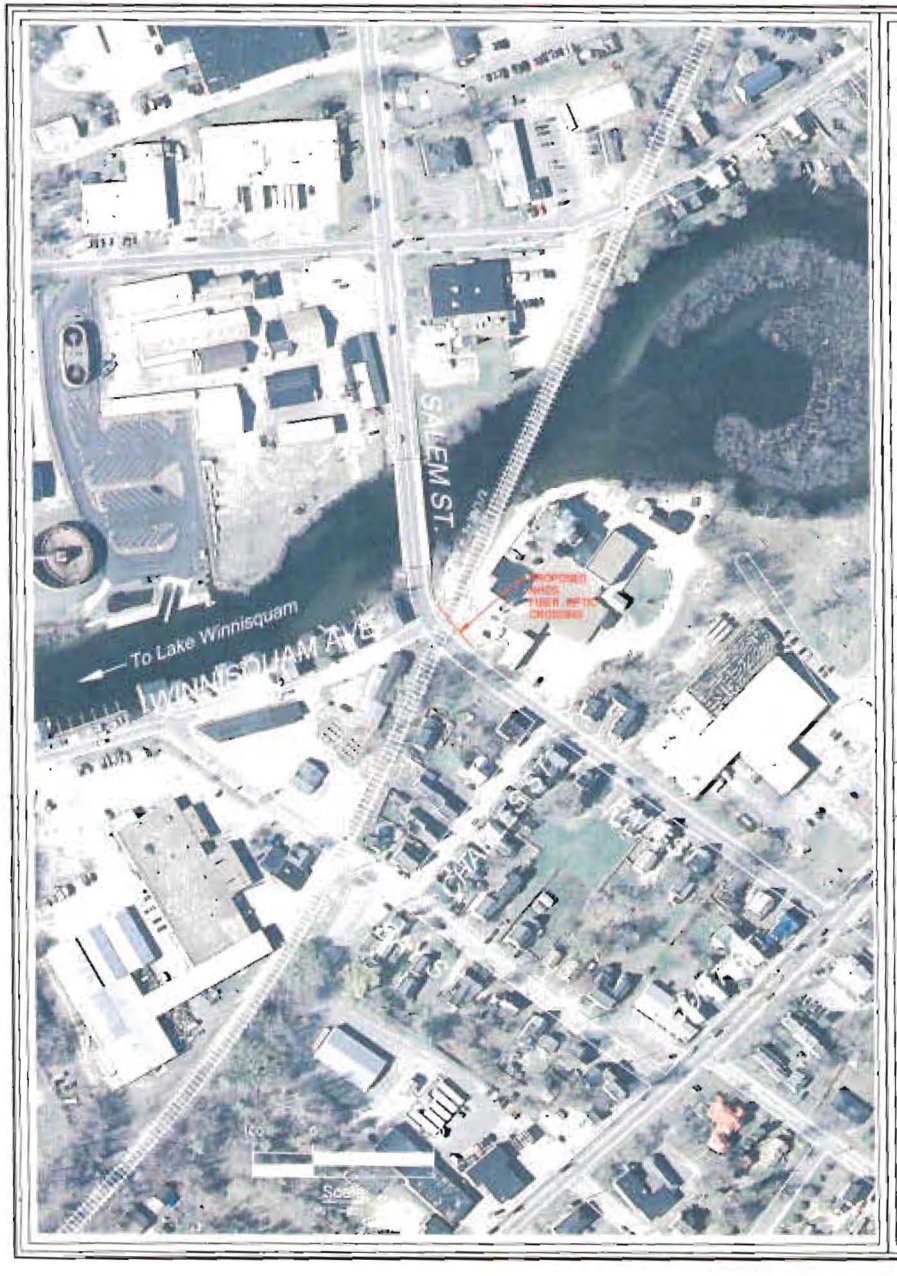

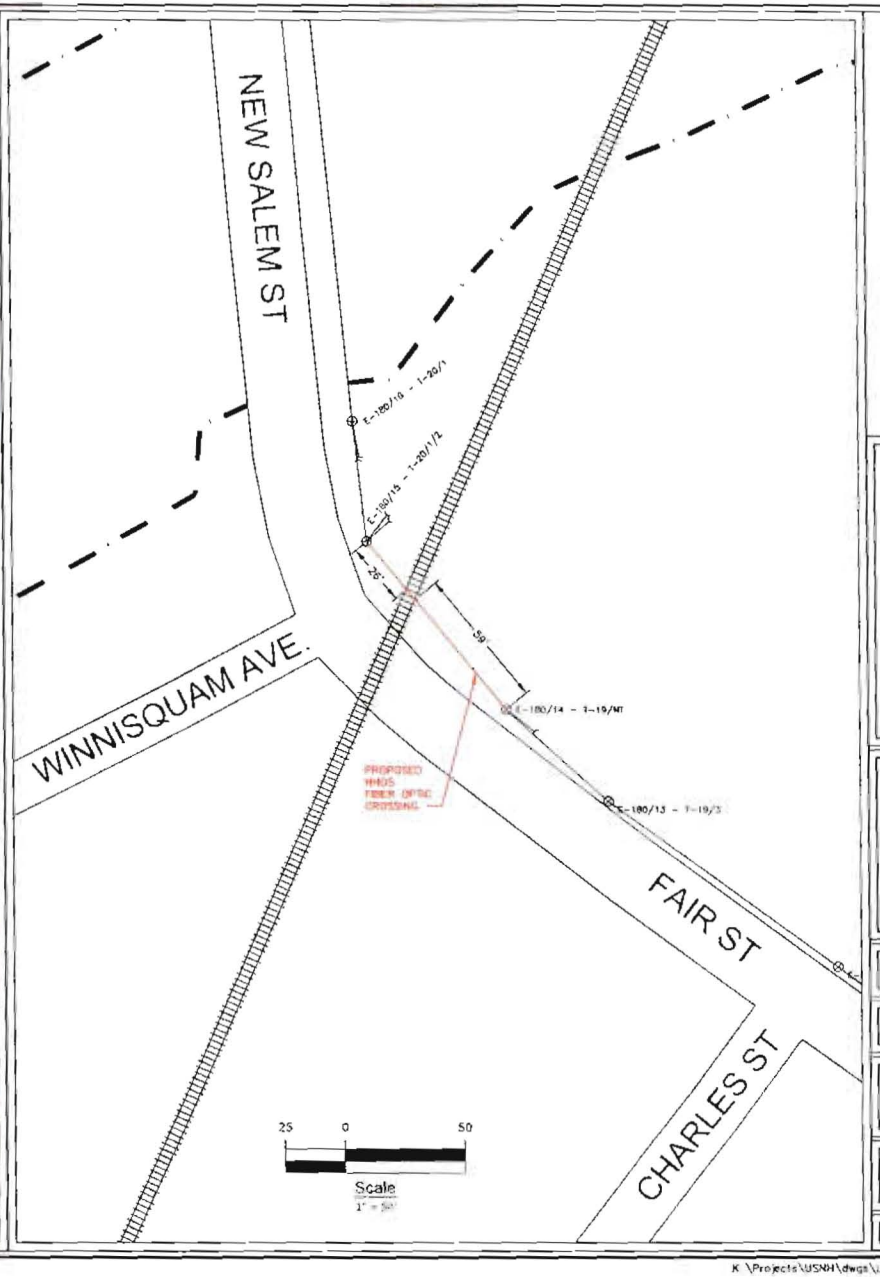

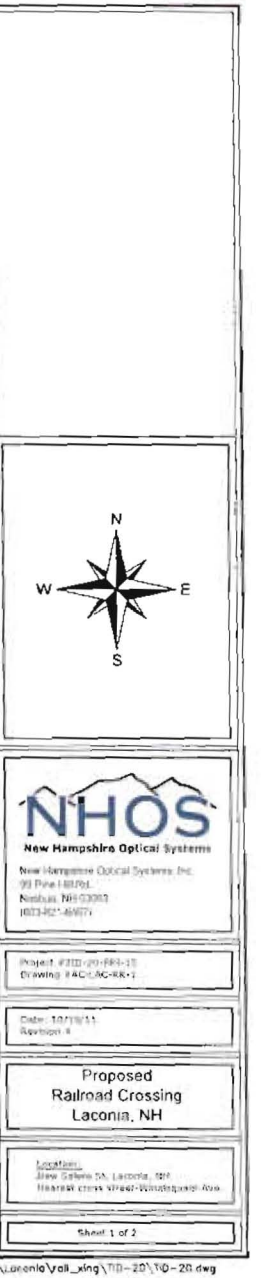

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LOCUS MAP
(Not to Scale)

CommScope®

Spanmaster ® Release 3.1 Sag / Tension Computations

Wesquale
River and Rail Crossings

Selected Cables	FIBER AREA (sq in)	EFF. MODULUS (psi)	NOMINAL DIAM (in)	EFFEKT COEFF (1/F)	CABLE WEIGHT (lb/ft)	EFFLOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
NHOS-NHRR	0.0352	2.80E+07	0.250	5.00E-06	0.1210	914840	8650
OPF-D-288-UT	0.0352	2.70E+05	0.859	1.30E-05	0.1980	155882	651
Bundle			1.508		0.3170		

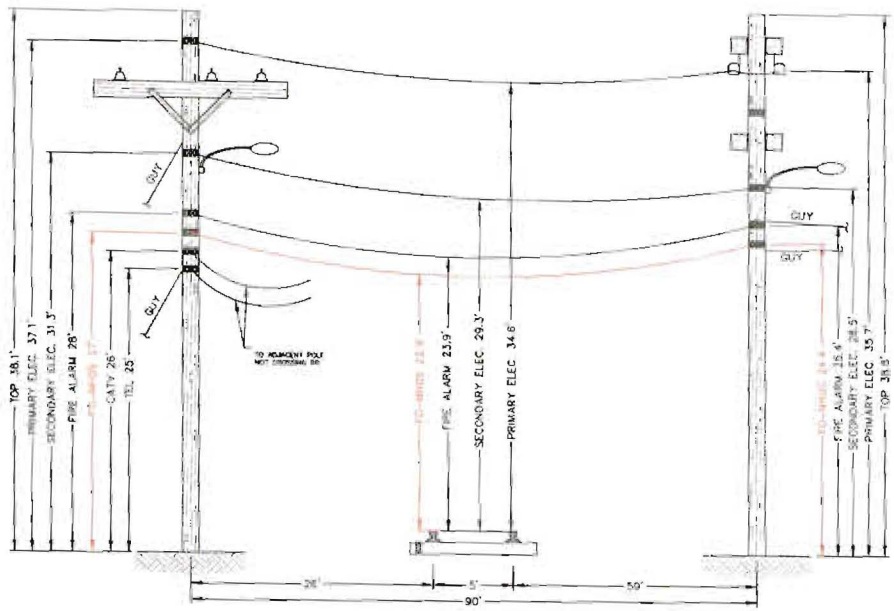
NESC RESULTS

Span 292 - Heavy	0.9	1.000	50	3	4.0	1.293	1.54	2161	0.02	1.64	8.72	1.38	20.1
292/41	120.0	0.980	00	3	0.0	8.017	1.18	273	0.02	1.16	0.00	1.19	0.0

Span Length = 90.00 ft
Span Sag = 00.# (10.0 in)
Span Tension = 101 lb
Max Load = 6.07#/ft
Usable load (80%) = 2 980 lb
Catenary Length = 90.1074 ft
Stress Free Length (ft)
Installed Temperature = 60 deg F

Unloaded Stress
Sag = 00.# (10.0 in) 0.01 %
Tension = 2 [illegible]

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
40.0	44	133	-0.02	N/A
-20.0	48	660	-0.02	N/A
20.0	76	664	-0.02	N/A
-10.0	51	606	-0.02	N/A
0	57	567	-0.02	N/A
10.0	61	530	-0.01	N/A
20.0	65	496	-0.01	N/A
30.0	69	462	-0.01	N/A
40.0	74	432	-0.01	N/A
50.0	79	404	-0.01	N/A
60.0	84	379	0.00	N/A
70.0	90	357	0.00	N/A
80.0	96	336	0.00	N/A
90.0	101	318	0.01	N/A
100.0	1.02	301	0.01	N/A
110.0	1.12	286	0.01	N/A
120.0	1.18	273	0.02	N/A
130.0	1.23	261	0.02	N/A
140.0	1.28	250	0.03	N/A



E-180/15 - T-20/1/2
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)

E-180/14 - T-19/NT
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)

Notes.

1. The heights of the bare-cable tension are based on field measurements taken with a Nikon DL2 total station during a site survey on 08/21/11
2. Vertical distances are representative of attachment heights after utility make-ready moves are complete.

E-180/15 - T-20/1/2

Construction Notes:

NHOS proposes to install a ¼ inch metal messenger strand between the existing utility poles shown above that will traverse the railroad. The strand will be installed at the proposed height (see above). The messenger strand will be secured to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will lash a one inch diameter fiber optic cable (FOC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with twenty four fiber capital information at each pole/lamp. NHOS will employ the proper safety personnel during the crossing installation. The proposed install will meet all proper clearances from other utilities (see above). Additional pole guys will be added per NESC Rule 264 and as directed by pole owners.

E-180/14 - T-19/NT

NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
[illegible]
Nashua, NH 03063
(603-821-6987)

Project #TID-20-RR1-1T
Drawing #AC-LAD-RR-1

Date: 10/19/11
Revision: 0

Proposed
Railroad Crossing
Laconia, NH

Location:
New Salem St. Laconia, NH
Nearest cross street-Winnisquam Ave.

Sheet 2 of 2

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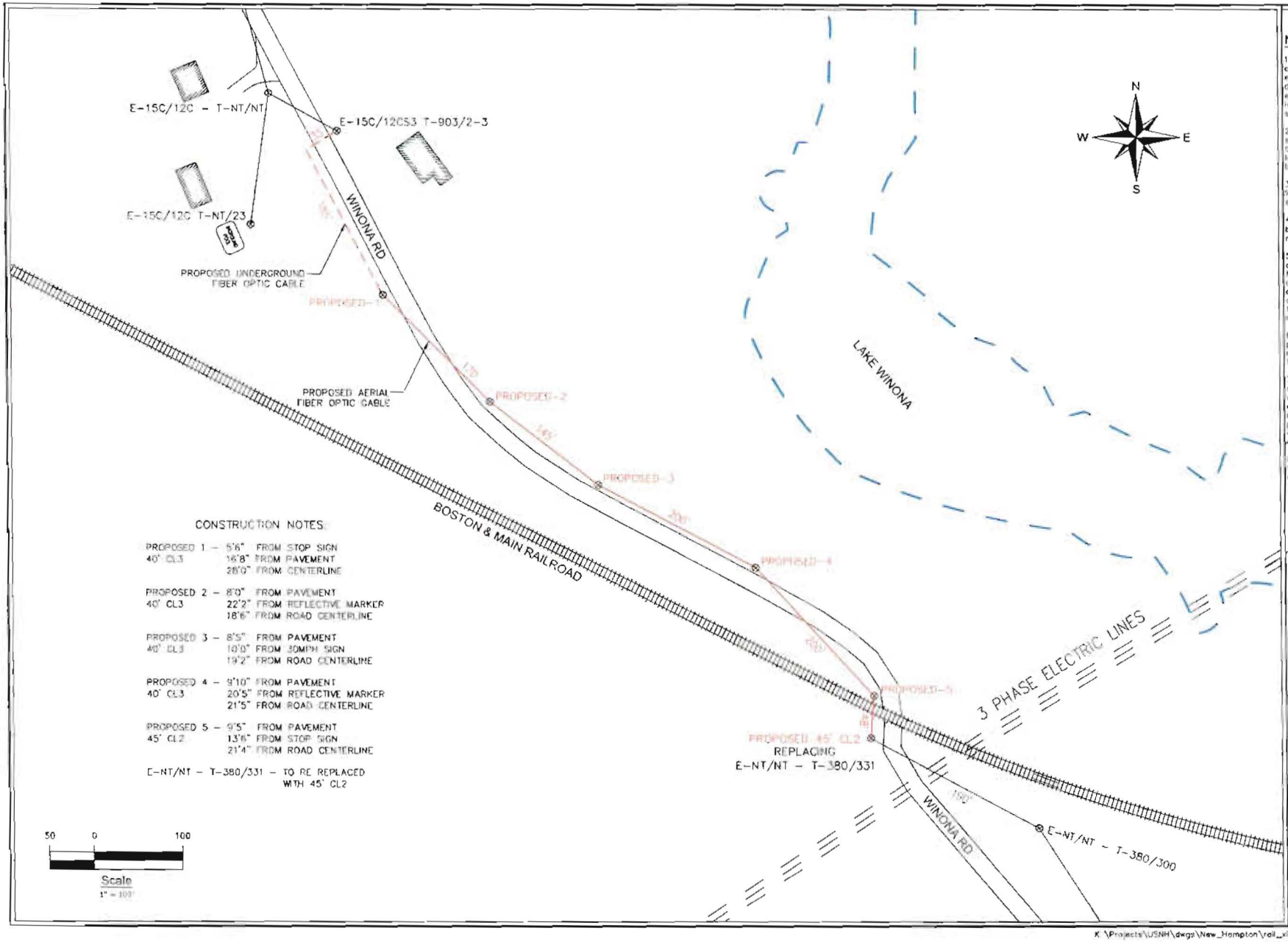

Notes:

1. All utility locations are approximate and may not match field conditions. existing utility information shown on this drawing has been compiled from existing city drawings and/or field inspection. verification by the subcontractor shall be required.

2. The exact location of all underground structures must be verified. It shall be the responsibility of the contractor to locate and avoid existing substructures. before excavating, call 1-888 digsafe.

3. Maintain a minimum clearance of 12 inches when crossing foreign substructures.

4. All conduit, manholes and pole shall be located in public property and/or right of way unless otherwise specified.

5. New poles will be labeled with the owner naming and numbering scheme. the poles will be guyed appropriately and reflectors will be installed in the direction of vehicular traffic. all construction will be in compliance with the national electric safety code requirements.

6. The wires and cables that attach to poles crossing Winona Rd will meet the minimum highway crossing footage of 18 feet.

7. All work performed according to this drawing shall be done so to comply with all the conditions, restrictions, construction methods, and safety requirements imposed by the excavation permit issued and those requirements imposed by osha. Before excavating, call 1-888 digsafe.

8. The subcontractor will be responsible for restoring the construction to original or better than original condition.

NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
98 Pine Hill Rd.
Nashua, NH 03063
(603-821-6487)

Project #TID-22.1-PRI-LT
Drawing #ACAHHNH-86-1

Date: 12/12/13
Revision #

Proposed New Span & Railroad Crossing New Hampton, NH

Location:
Winona Rd., New Hampton, NH
Nearest cross street: Archelaus Rd.

Sheet 1 of 2

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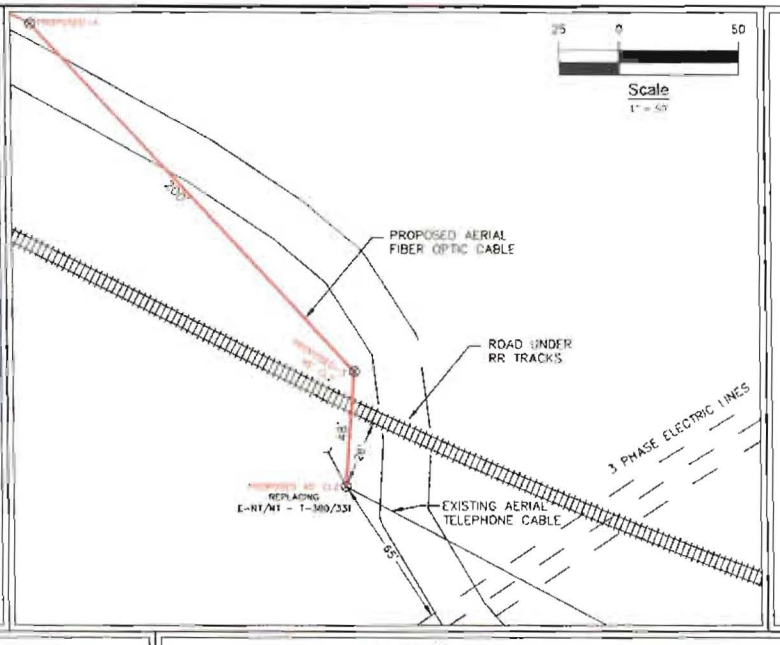
LOCUS MAP
(Not to Scale)



CommScope®

Spanmaster® Release 3.1 Sag / Tension Computations

NESC RESULTS

Construction Notes:

NHOS proposes to install a 6 inch metal supporting strand between two new 45' CL2 utility poles that will traverse the existing railroad right of way. The strand will be installed at the proposed height (see below) that will allow a 20.1' clearance over top of rail, exceeding the 22' height requirement. The supporting strand will be secured to each pole using double dead end attachments to prevent any sag in the span and maintain proper clearances. NHOS will lash a one inch diameter fiber optic cable (FOC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with labels that have contact information at each pole radius. NHOS will employ the proper railroad safety personnel during the crossing installation. The proposed install will meet all proper clearances (see other notes / see above).

Heights shown herein were obtained from a site survey by PL NH.

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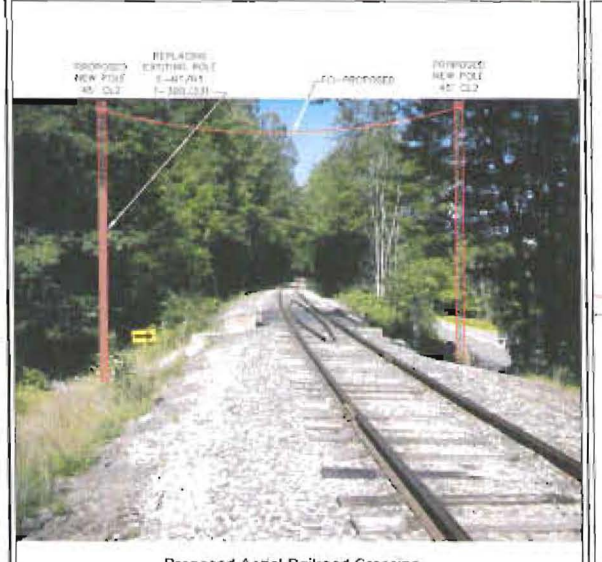
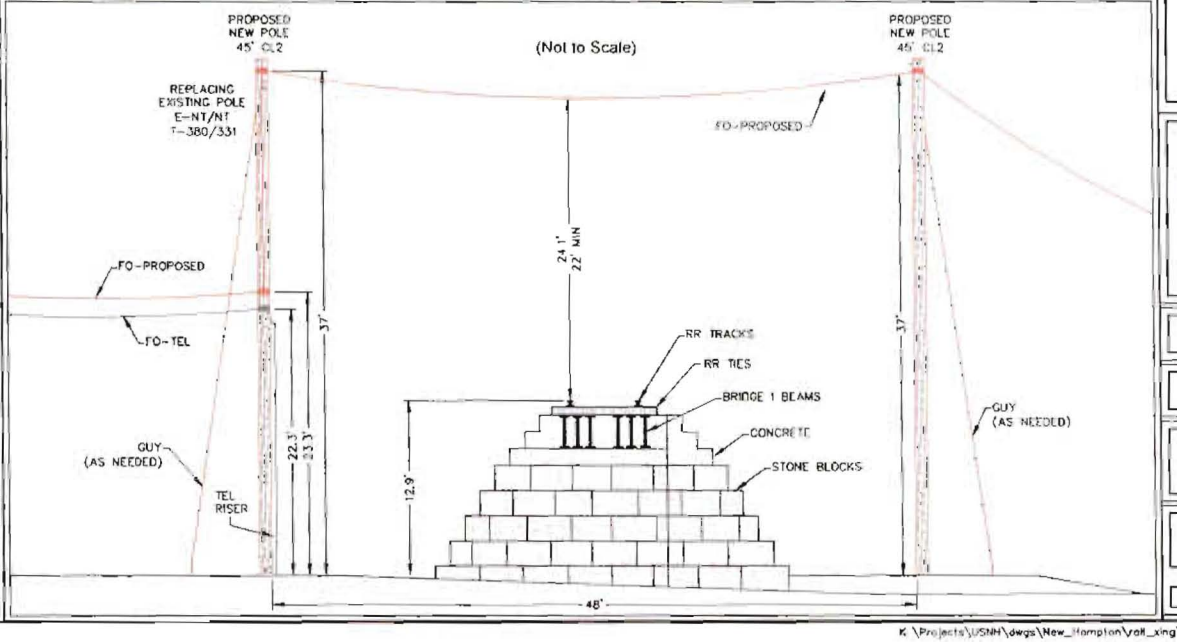


Proposed Aerial Railroad Crossing

(Not to Scale)



NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
99 Pine Hill Rd.
Nashua, NH 03063
(603-821-8487)

Project: #TID-22.1-PR1-11
Drawing: KAZ-NHSM-RR-1

Date: 12/12/11
Revision: 0

Proposed New Span &
Railroad Crossing
New Hampton, NH

Location:
Wilcox Rd., New Hampton, NH
Nearest cross street: Anchorage Rd.

Sheet 2 of 2

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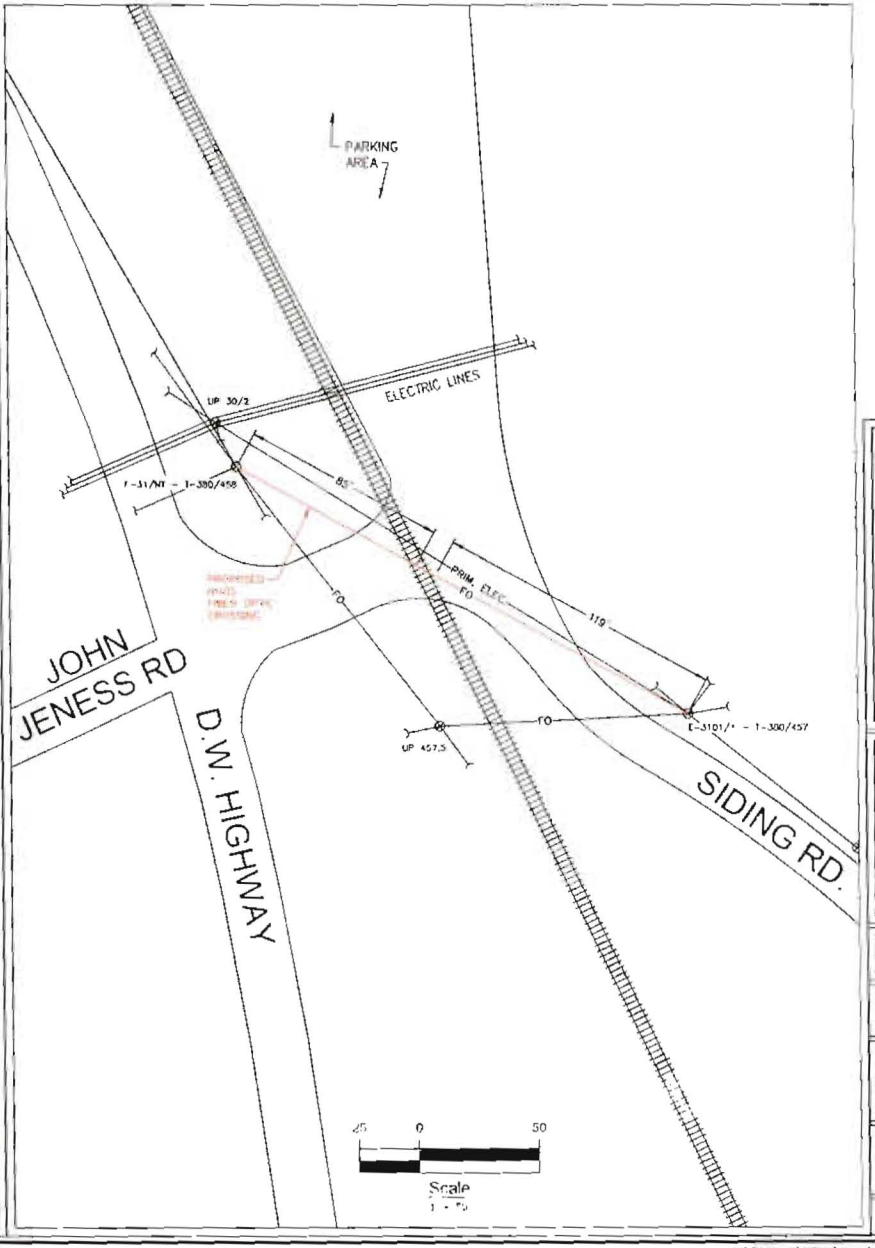

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NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
90 Pond Hill Rd.
Nashua, NH 03063
(603-821-6787)

Project # TID-28
Drawing: FAC-RRID-RR-1

Date: 10/12/11
Revision: 1

Proposed
Railroad Crossing
Bridgewater, NH

Location:
Siding 2.0, Bridgewater NH
Railroad cross street-D.W. Highway

Sheet 1 of 2

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LOCUS MAP
(Not to Scale)

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Spanmaster ® Release 3.1 Sag / Tension Computations

	Effect Area (sq in)	Eff Modulus (ksi)	Nominal Diam (in)	Eff Exp Coeff (1/F)	Cable Weight (lb/ft)	Cn Load Bearing Capacity (lbs)	Max Rated Load (lbs)
Telecom Cable							
1/4" Steel EHS	0.0262	29,000,000	0.250	6.9E-06	0.1213	919940	0000
1/4" Steel EHS	0.0262	29,000,000	0.250	6.9E-06	0.1213	919940	0000
Danite			1.188		0.3170		

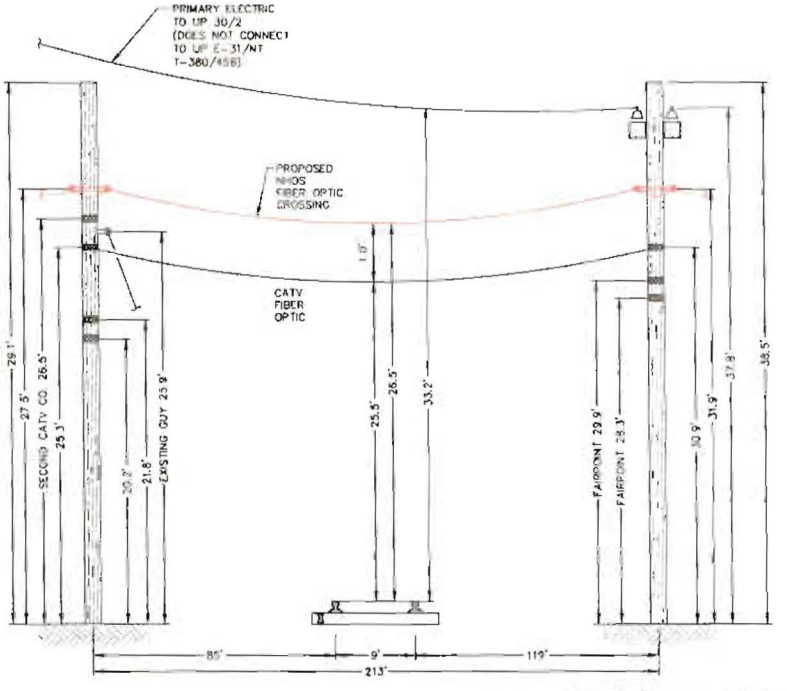
NESC RESULTS

Rule 251 - Heavy	0.0	0.000	50	0	4.0	4.783	4.72	2101	8.96		4.23		2.22	4.10	38.1
250.61	0.0	0.000	60	0	0.0	5.517	2.57	698	0.01		2.57		0.00	2.57	N/A

Span Length = 212.00 ft
Span Sag = 2.15 ft (25.8 in)
Span Tension = 844 lb
Max Load = 5,650 lb
Usable load (80%) = 3,080 lb
Guideway Length = 212.057 ft
Stress Free Length (ft)
Initial Temperature = 212.057 ft

Unloaded Sleeve
Sag = 1.04 ft (12.5 in) 0.49 %
Tension = 406 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
40.0	1.41	1,209	0.01	N/A
-30.0	1.46	1,175	-0.01	N/A
20.0	1.52	1,143	-0.01	N/A
10.0	1.57	1,111	-0.01	N/A
0	1.63	1,080	-0.01	N/A
10.0	1.69	1,049	0.01	N/A
20.0	1.76	1,021	0.01	N/A
30.0	1.83	993	0.01	N/A
40.0	1.90	966	0.01	N/A
50.0	1.97	940	0.00	N/A
60.0	2.05	915	0.00	N/A
70.0	2.13	890	0.00	N/A
80.0	2.21	867	0.00	N/A
90.0	2.30	843	0.00	N/A
100.0	2.38	821	0.01	N/A
110.0	2.48	798	0.01	N/A
120.0	2.57	776	0.01	N/A
130.0	2.67	754	0.02	N/A
140.0	2.78	731	0.02	N/A



E-31/NT - T-380/458
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)

E-3101/1 - T-380/457
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)

Notes:

1. Heights and distances shown/tensions were obtained from a site survey on July 25, 2011 using a Nikon DTM 352 total station.

E-31/NT - T-380/458

Construction Notes:

NHOS proposes to install a 3-bolt metal supporting strand between the existing utility poles shown above that will traverse the railroad. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using double dead end attachments to prevent any sag in the wire and maintain proper clearances. NHOS will lash a two inch diameter fiber optic cable (FOC jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with twenty foot long contact information at each pole (tag). NHOS will employ the proper safety precautions during the crossing installation. The proposed install will meet all proper clearances from other utilities (see above). Additional pole guys will be added per NESC Rule 244 and as directed by pole owners.

E-3101/1 - T-380/457

NHOS
New Hampshire Optical Systems
New Hampshire Optical Systems, Inc.
99 Pease Blvd.
Portsmouth, NH 03801
(603) 821-0467

Project # TID-28
Drawing #AC-0802D-RR-1

Date: 06/12/11
Revision: 0

Proposed
Railroad Crossing
Bridgewater, NH

Location:
Siding Rd, Bridgewater NH
Nearest cross street-D.W. Highway

Sheet 2 of 2

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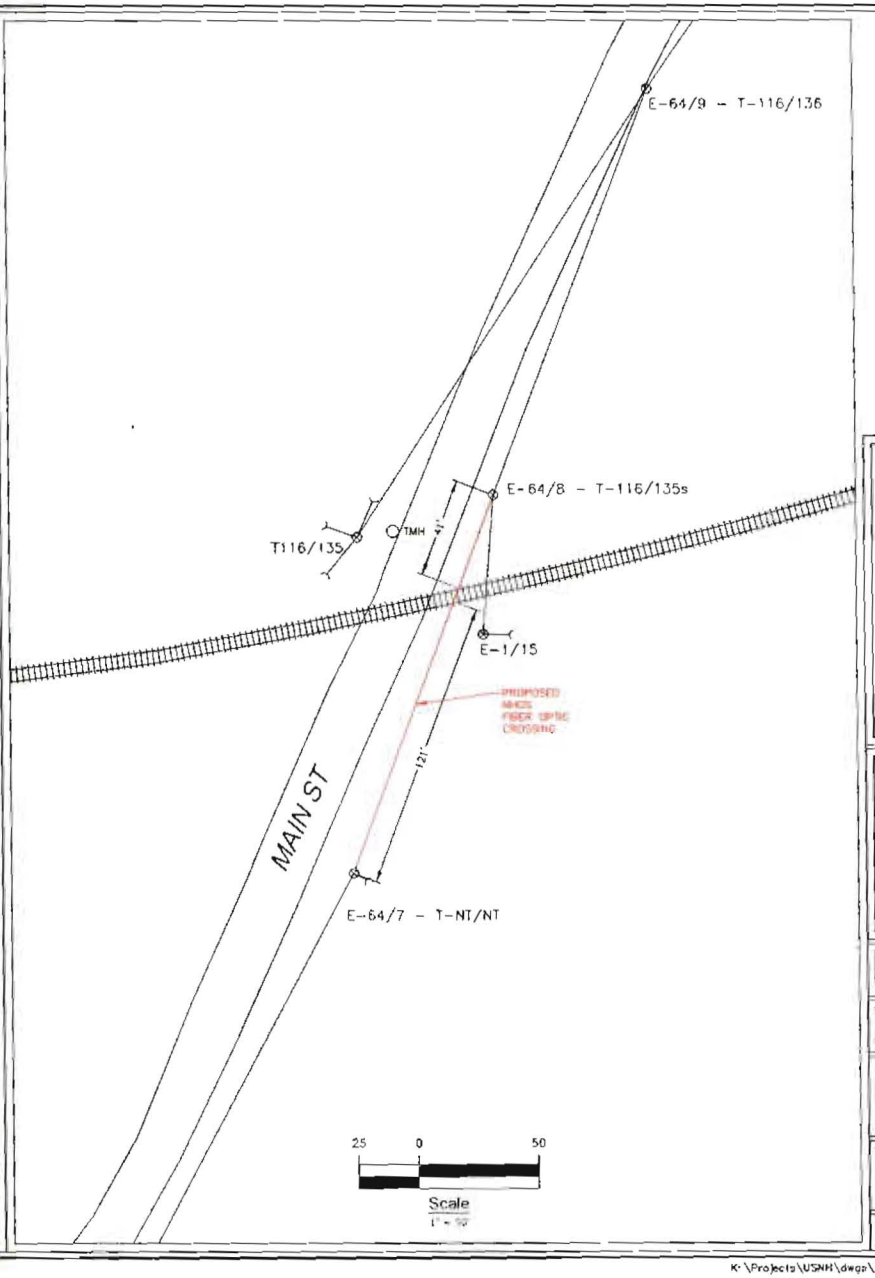

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NHOS
New Hampshire Optical Systems

New Hampshire Optical Systems, Inc.
90 Pine Hill Rd.
Nashua, NH 03063
(603-821-4487)

Project # TID-213-PRI-15
Drawing # NC-TILRX-1

Date: 10/08/11
Revision: 0

Proposed
Railroad Crossing
Tilton, NH

Location:
Main St., Tilton, NH
Nearest cross street-Mechanic St.

Sheet 1 of 2

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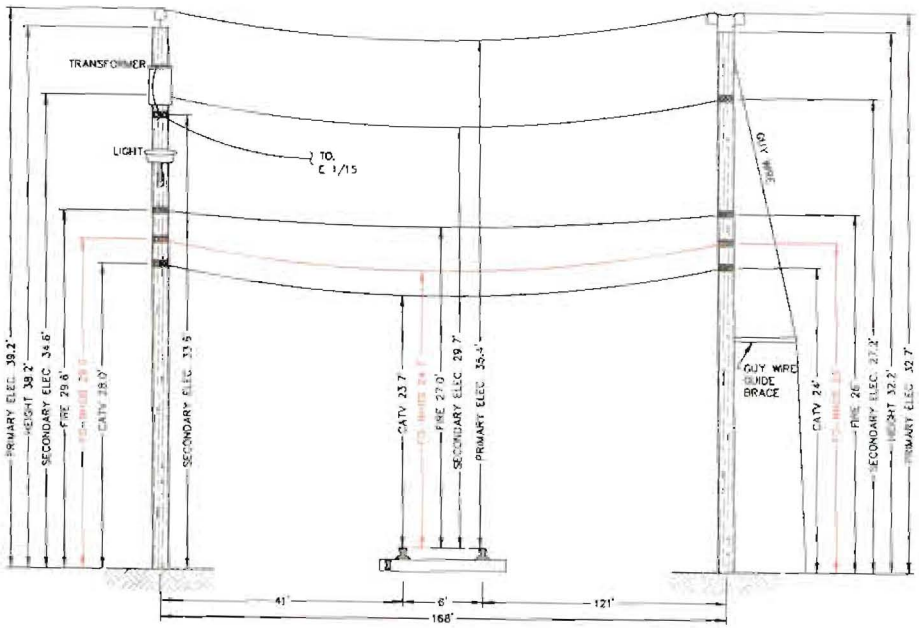
LOCUS MAP
(Not to Scale)



E-64/8 - T-116/135S
(Existing joint owned utility pole (PSNH/Fairpoint) in existing Right-of-Way)

Not to Scale

E-64/7 - T-NT/NT
(Existing joint owned utility pole (PSNH/Fairpoint) in existing Right-of-Way)

CommScope®

Spanmaster® Release 3.1 Sag / Tension Computations

Wamesit
Road and Rail Crossings

	X-SECT AREA (sq in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF EXT COEFF (1/F)	CABLE WEIGHT (lb/ft)	DESIGN LOAD BEARING CAPACITY (lbs)	MAX RATED LOAD (lbs)
Selected Cables							
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bundle			1.105		0.3149		

NESC RESULTS

[illegible]

Span Length = 168.0 ft
Span Sag = [illegible] (201.2 in)
Span Tension = 666 lb
Max Load = [illegible]
Usable Load (66%) = 2,994 lb
Catenary Length = 168.0 ft
Stress Free Length @
Installed Temperature = 167.823 ft

Unloaded Strand
Sag = [illegible] (10.5 in) 0.52 %
Tension = 488 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change
-40.0	1.04	1,370	0.02
-10.0	1.16	1,203	0.02
20.0	1.15	993	-0.01
30.0	1.16	959	-0.01
0	1.23	909	0.01
10.0	1.28	870	0.01
20.0	1.34	832	0.01
30.0	1.40	796	0.01
40.0	1.47	761	0.01
50.0	1.54	727	0.00
60.0	1.61	695	0.00
70.0	1.68	665	0.00
80.0	1.76	636	0.00
90.0	1.83	609	0.00
100.0	1.91	584	0.01
110.0	1.98	560	0.01
120.0	2.06	536	0.01
130.0	2.14	516	0.01
140.0	2.22	496	0.01

E-64/8 - T-116/135s

Construction Notes

NHOS proposes to install a 3 pole metal supporting strand between the existing utility poles shown above that will traverse the railroad. The strand will be installed at the proposed height (see above). The supporting strand will be secured to each pole using flexible dead end attachments to prevent any sags between and maintain proper clearance. NHOS will lash a one inch diameter fiber optic cable (FRZ jacket) to the strand using a dual lash method to provide security of the fiber over the right of way. The fiber will be tagged with twenty foot hour contact information at each pole. Using NHOS will employ the proper safety personnel during the crossing installation. The proposed strand will meet all project clearances from other Utilities (see above). Additional pole guys will be added per NESC Rule 264 and as directed by pole owners.

E-64/7 - T-NT/NT

Notes.

1. The heights of attachment shown hereon are based on field measurements taken with a Nikon 302 total station during a site survey on 02/28/11.
2. Vertical distances are representative of attachment heights after utility make-ready work are completed.

NHOS
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Project #TID-213-FRT-15
Drawing #AC-TS-RR-1

Date: 03/28/11
Revision: 0

Proposed
Railroad Crossing
Tilton, NH

Location:
Map 12, Tilton, NH
Nearest cross street-Mechanic St.

Sheet 2 of 2

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