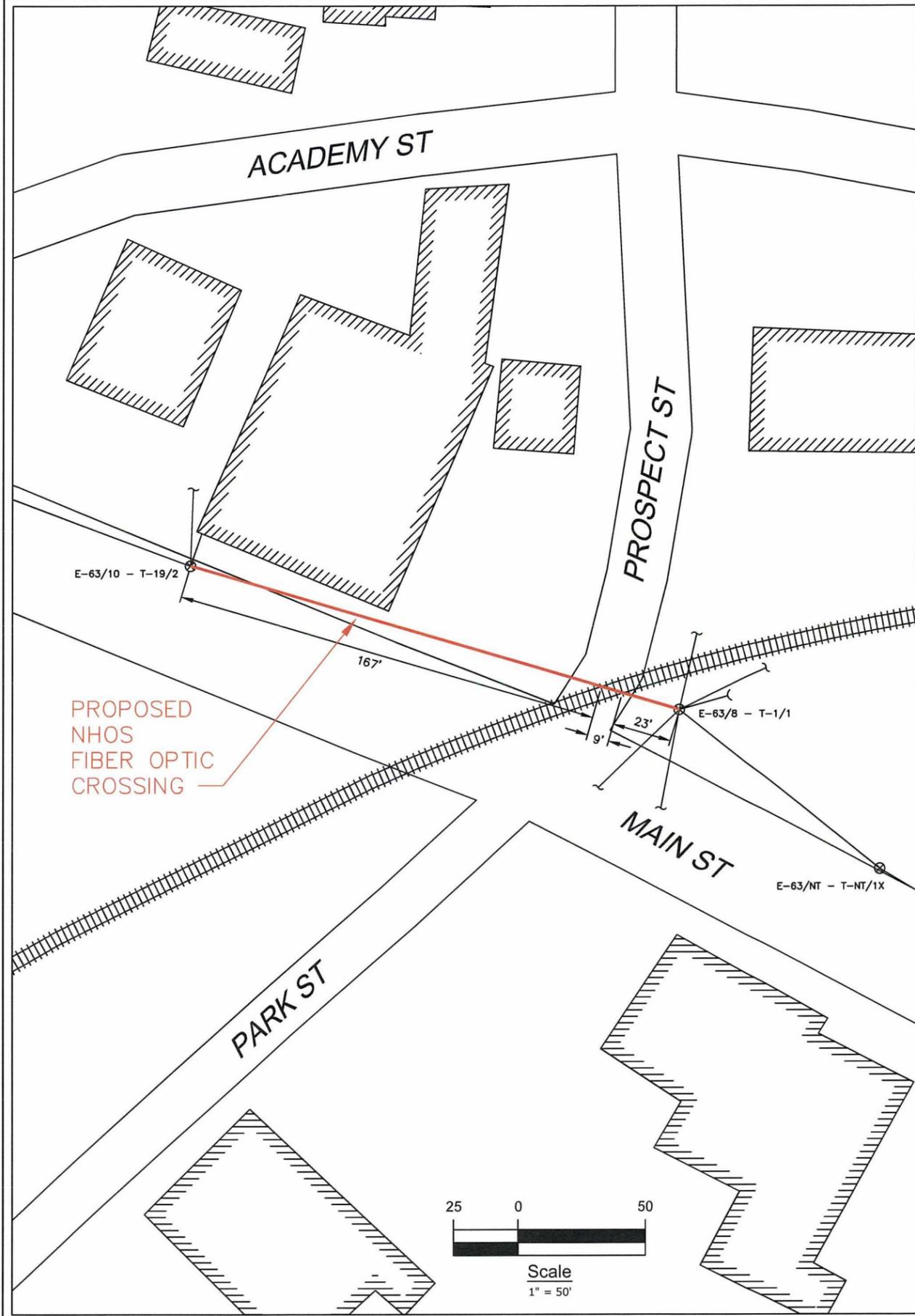
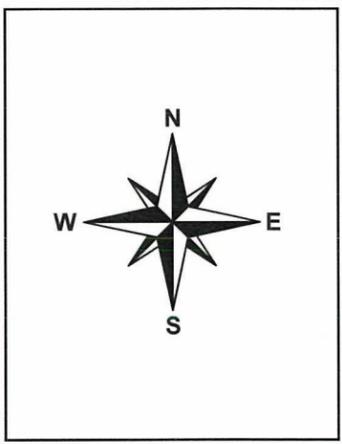




PROPOSED  
NHOS  
FIBER OPTIC  
CROSSING



PROPOSED  
NHOS  
FIBER OPTIC  
CROSSING



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

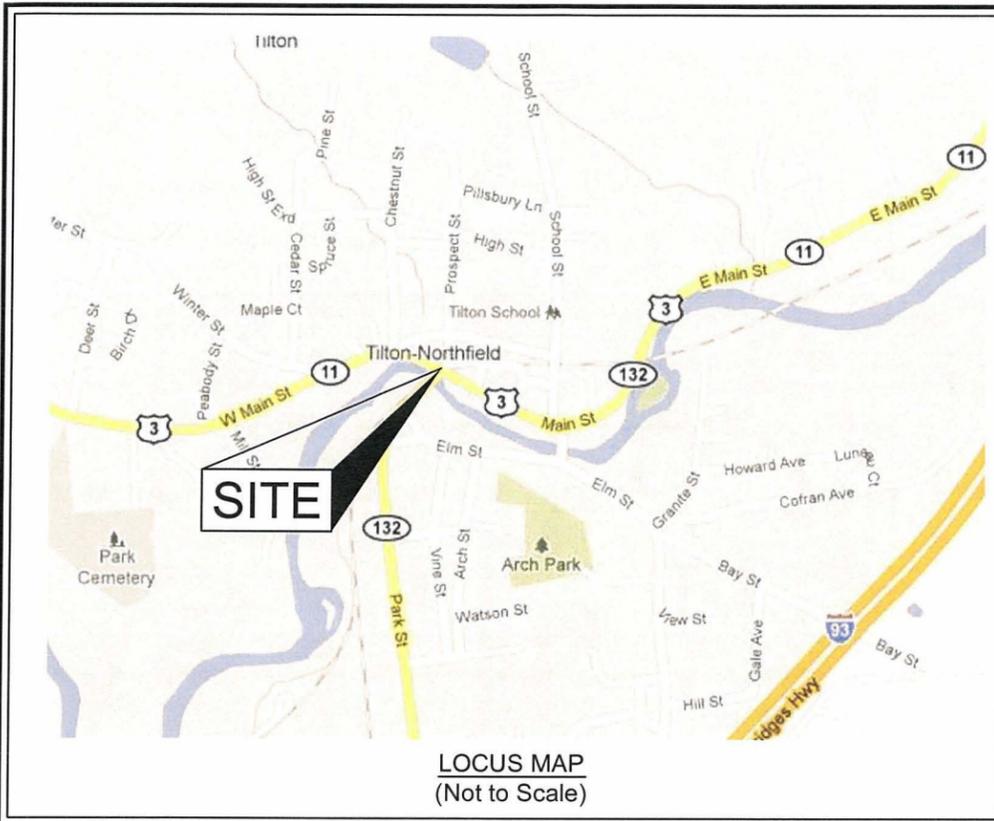
Project # TID-15-PRI-15  
Drawing # AC-NOR-RR-1

Date: 02/08/12  
Revision # 1

Proposed  
Railroad Crossing  
Northfield, NH

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

Sheet 1 of 2



LOCUS MAP  
(Not to Scale)



Spanmaster® Release 3.1 Sag / Tension Computations  
09/01/11 Waveguide

Waveguide  
River and Rail Crossings

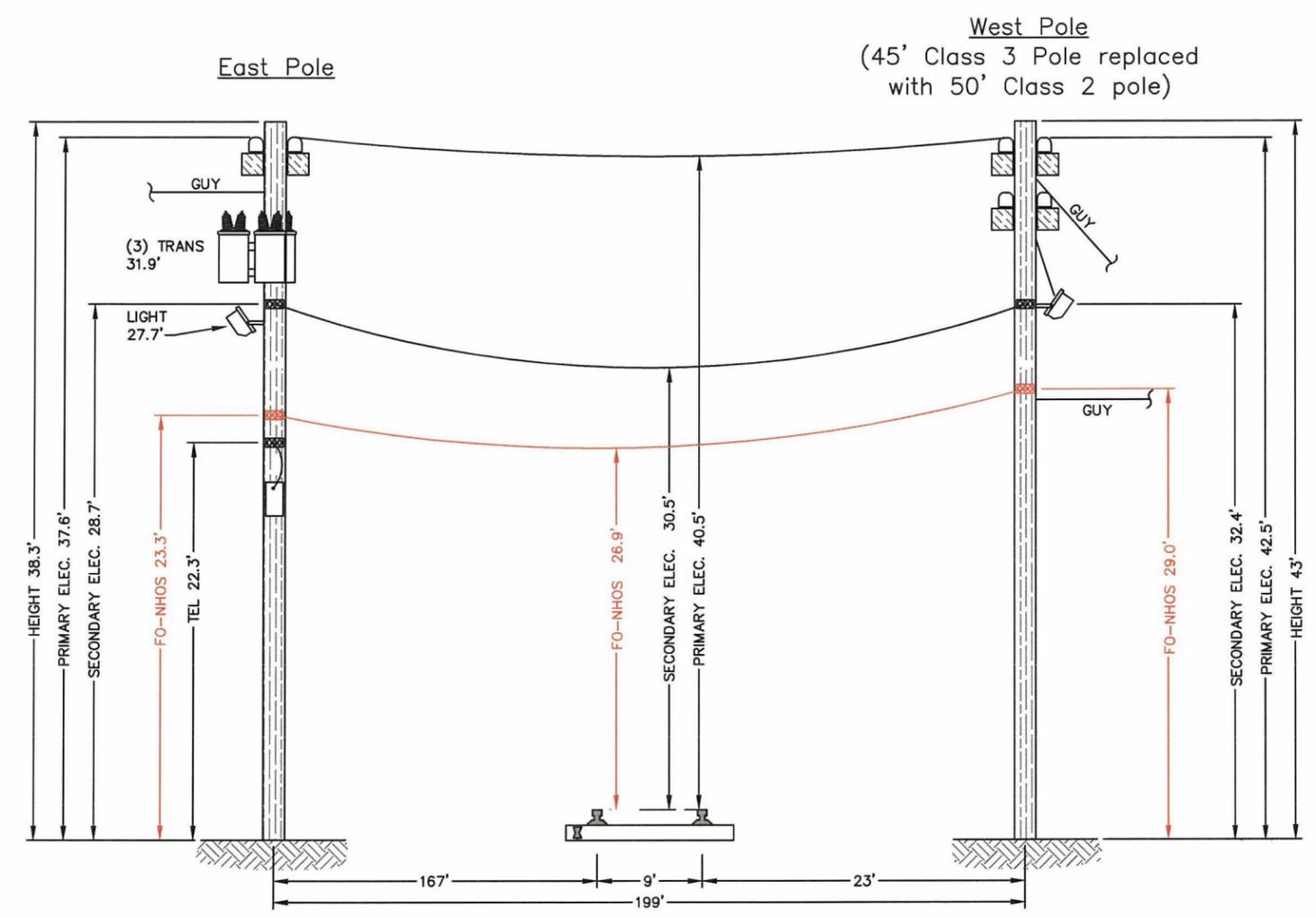
Selected Cables	X-SECT AREA (sq.in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF.EXP. COEFF. (1/F)	CABLE WEIGHT (lb/ft)	E*A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-288-LN Bundle	0.5782	2.70E+05	0.858	1.13E-05	0.1960	155982	651
			1.108		0.3170		

**NESC RESULTS**

Loading Condition	Temp (F)	Ice Load (lb/ft)	Ice Thick (in)	Wind Const (lb/ft)	Horz Wind Load (lb/ft)	Result Load Const (lb/ft)	Sag (ft)	Tension (lb)	% Len Chg From Input Conditions	Sag @ 99.5 ft	Horz Sag Comp (ft)	Vert Sag (ft)	Vector Angle Deg
Rule 251 - Heavy	0.0	1.000	.50	.3	4.0	1.793	4.32	2050	0.10	4.33	2.03	3.81	28.1
232A1	120.0	0.000	.00	.0	0.0	0.317	2.42	648	0.01	2.42	0.00	2.42	0.0

Span Length = 199.00 ft  
Span Sag = 1.99 ft (23.9 in)  
Span Tension = 789 lb  
Max Load = 6,650 lb  
Usable load (60%) = 3,990 lb  
Catenary Length = 199.053 ft  
Stress Free Length @ Installed Temperature = 198.882 ft  
Unloaded Strand Sag = .99 ft (11.9 in) 0.50 % Tension = 605 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	1,166	-0.01	N/A
-20.0	1.39	1,123	-0.01	N/A
-10.0	1.45	1,082	-0.01	N/A
.0	1.50	1,041	-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	-0.01	N/A
40.0	1.76	889	-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	0.02	N/A
140.0	2.60	603	0.02	N/A



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

E-63/8 - T-1/1  
(Existing joint owned utility pole (PSNH/Fairpoint) in existing Right-of-Way)

Not to Scale



E-63/10 - T-19/2

**Construction Notes:**

NHOS proposes to install a 1/4 inch 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 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 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 264 and as directed by pole owners.



E-63/NT - T-NT/NT

**Notes:**

- The heights of structures shown hereon are based on field measurements taken with a Nikon 362 total station during a site survey on 07/20/11.
- Vertical distances are representative of attachment heights after utility make ready moves are completed.



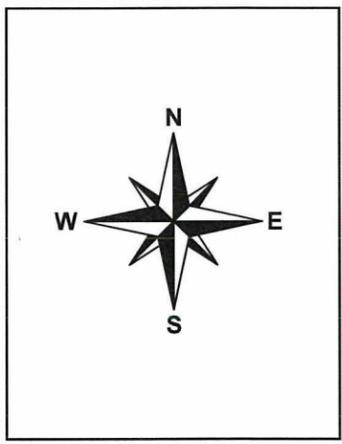
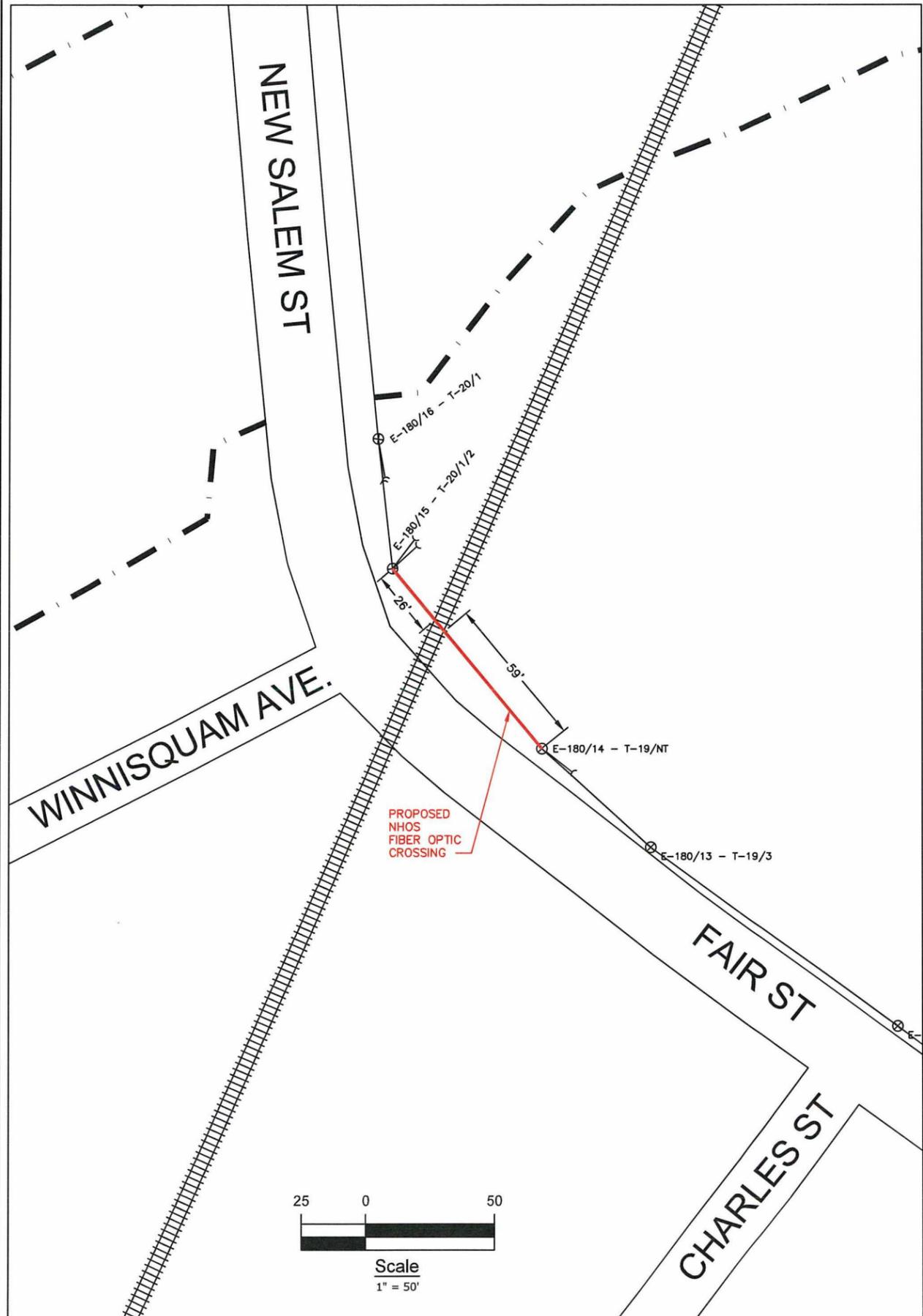
New Hampshire Optical Systems, Inc.  
99 Pine Hill Rd.  
Nashua, NH 03063  
(603-821-6467)

Project #TID-15-PRI-15  
Drawing #AC-NOR-RR-1

Date: 02/08/12  
Revision # 1

**Proposed  
Railroad Crossing  
Northfield, NH**

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



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

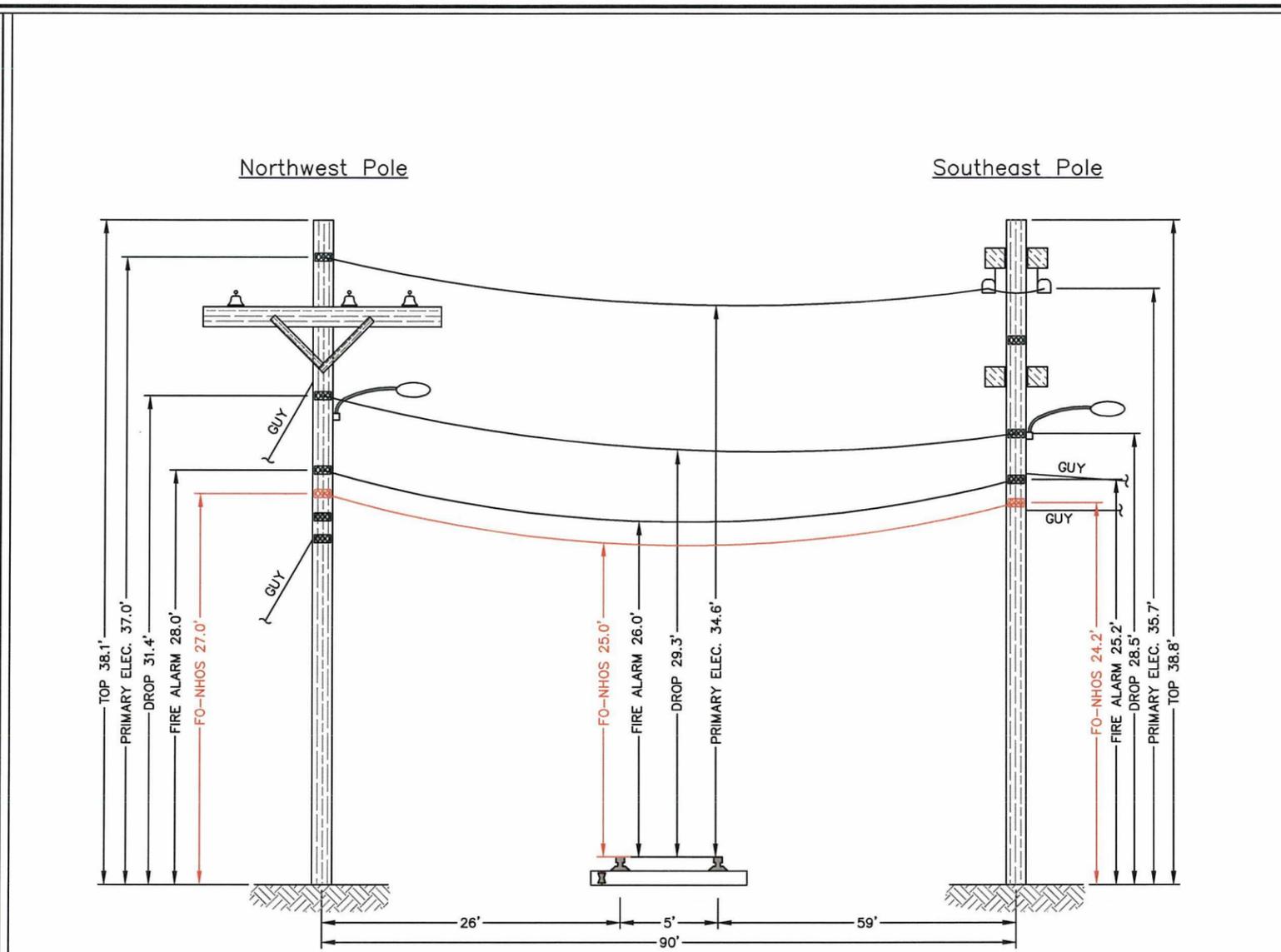
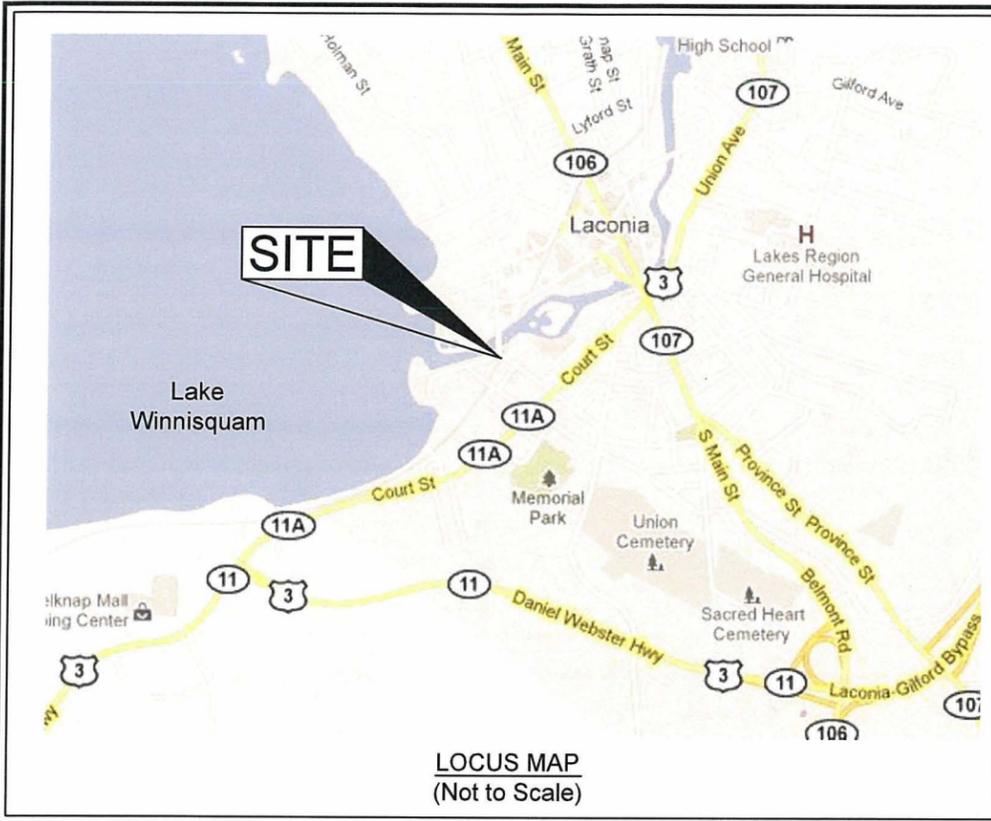
Project #TID-20-PRI-15  
 Drawing #AC-LAC-RR-1

Date: 01/25/12  
 Revision # 1

Proposed  
 Railroad Crossing  
 Laconia, NH

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

Sheet 1 of 2



**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:**
- The heights of structures shown hereon are based on field measurements taken with a Nikon 362 total station during a site survey on 08/21/11.
  - Vertical distances are representative of attachment heights after utility make ready moves are completed.



Spanmaster® Release 3.1 Sag / Tension Computations

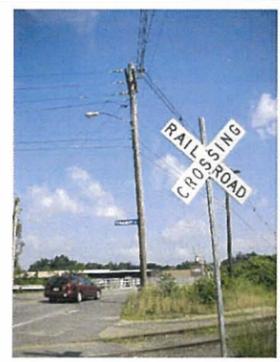
Waveguide  
River and Rail Crossings

Selected Cables	X-SECT AREA (sq.in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF.EXP COEFF (1/F)	CABLE WEIGHT (lb/ft)	E'A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-288-LN Bundle	0.5782	2.70E+05	0.858	1.13E-05	0.1960	155982	651
			1.108		0.3170		

**NESC RESULTS**

Loading Condition	Temp. (F)	Ice Load (lb/ft)	Ice Thick (in)	Wind Const (lb/ft)	Horz Wind Load (lb/ft)	Result Load (lb/ft)	Sag (ft)	Tension (lb)	% Len Chg From Input Conditions	Sag @ Point 45 (ft)	Horz Sag Comp (ft)	Vert Sag Comp (ft)	Vector Angle Deg
Rule 251 - Heavy	0.0	1.000	.50	.3	4.0	1.793	1.54	1181	0.05	1.54	0.72	1.35	28.1
232A1	120.0	0.000	.00	.0	0.0	0.317	1.18	273	0.02	1.18	0.00	1.18	0.0

Span Length = 90.00 ft	Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
Span Sag = .90 ft (10.8 in)	-40.0	.44	733	-0.02	N/A
Span Tension = 357 lb	-30.0	.46	689	-0.02	N/A
Max Load = 6,650 lb	-20.0	.50	647	-0.02	N/A
Usable load (60%) = 3,990 lb	-10.0	.53	606	-0.02	N/A
Catenary Length = 90.024 ft	.0	.57	567	-0.02	N/A
Stress Free Length @ Installed Temperature = 89.989 ft	10.0	.61	530	-0.01	N/A
	20.0	.65	495	-0.01	N/A
Unloaded Strand	30.0	.69	462	-0.01	N/A
Sag = .58 ft (6.9 in) 0.64 %	40.0	.74	432	-0.01	N/A
Tension = 213 lb	50.0	.79	404	-0.01	N/A
	60.0	.85	379	0.00	N/A
	70.0	.90	357	0.00	N/A
	80.0	.96	336	0.00	N/A
	90.0	1.01	318	0.01	N/A
	100.0	1.07	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

**Construction Notes:**

NHOS proposes to install a 1/4 inch 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 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 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 264 and as directed by pole owners.



E-180/14 - T-19/NT

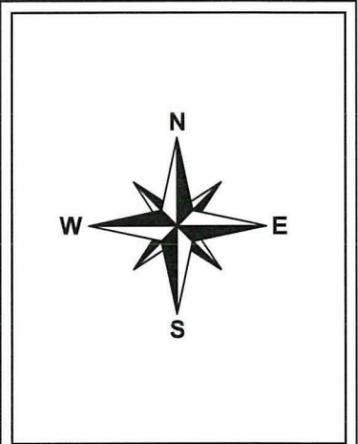
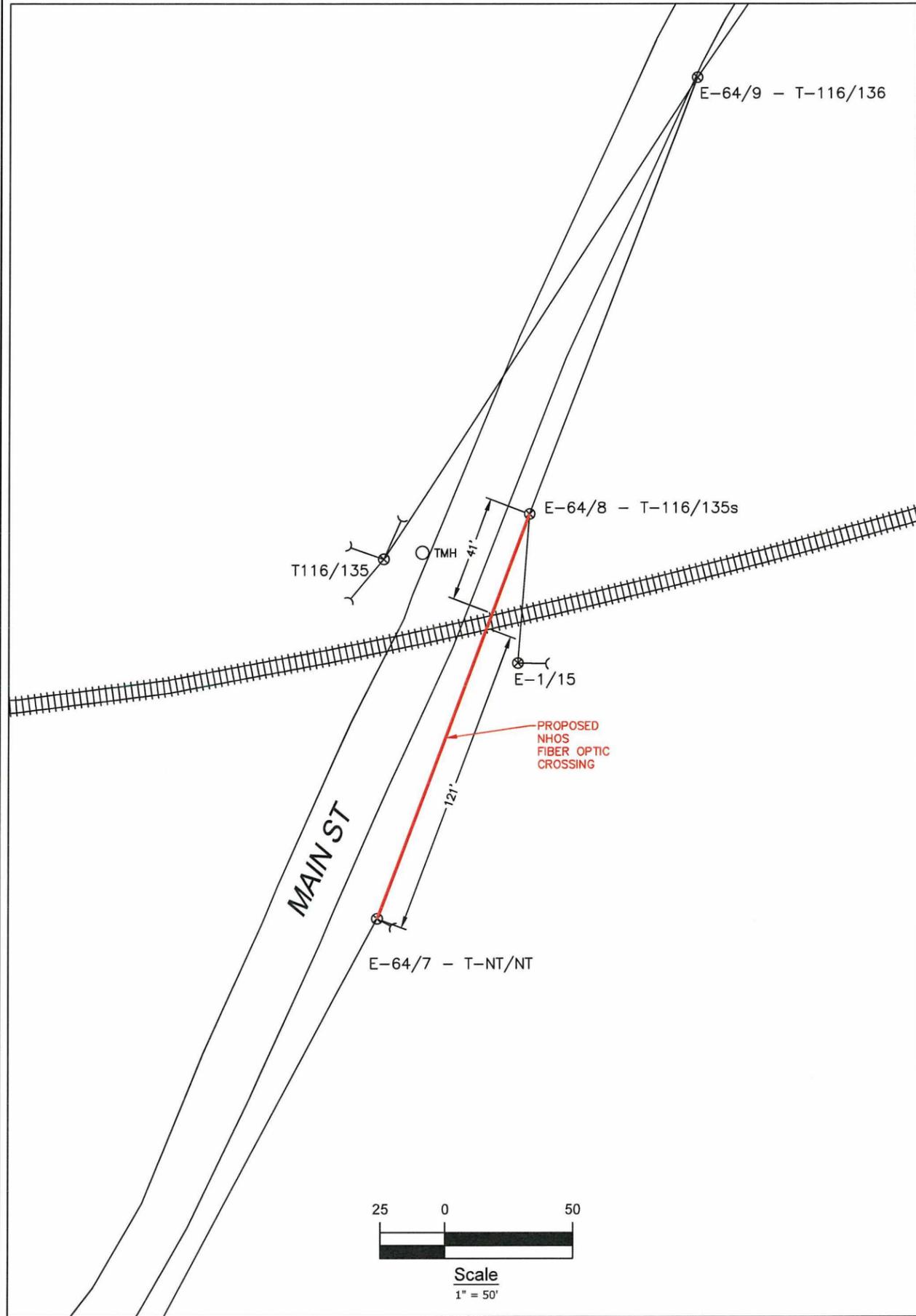
New Hampshire Optical Systems, Inc.  
99 Pine Hill Rd.  
Nashua, NH 03063  
(603-821-6467)

Project #TID-20-PRI-15  
Drawing #AC-LAC-RR-1

Date: 01/25/12  
Revision # 1

**Proposed  
Railroad Crossing  
Laconia, NH**

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



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

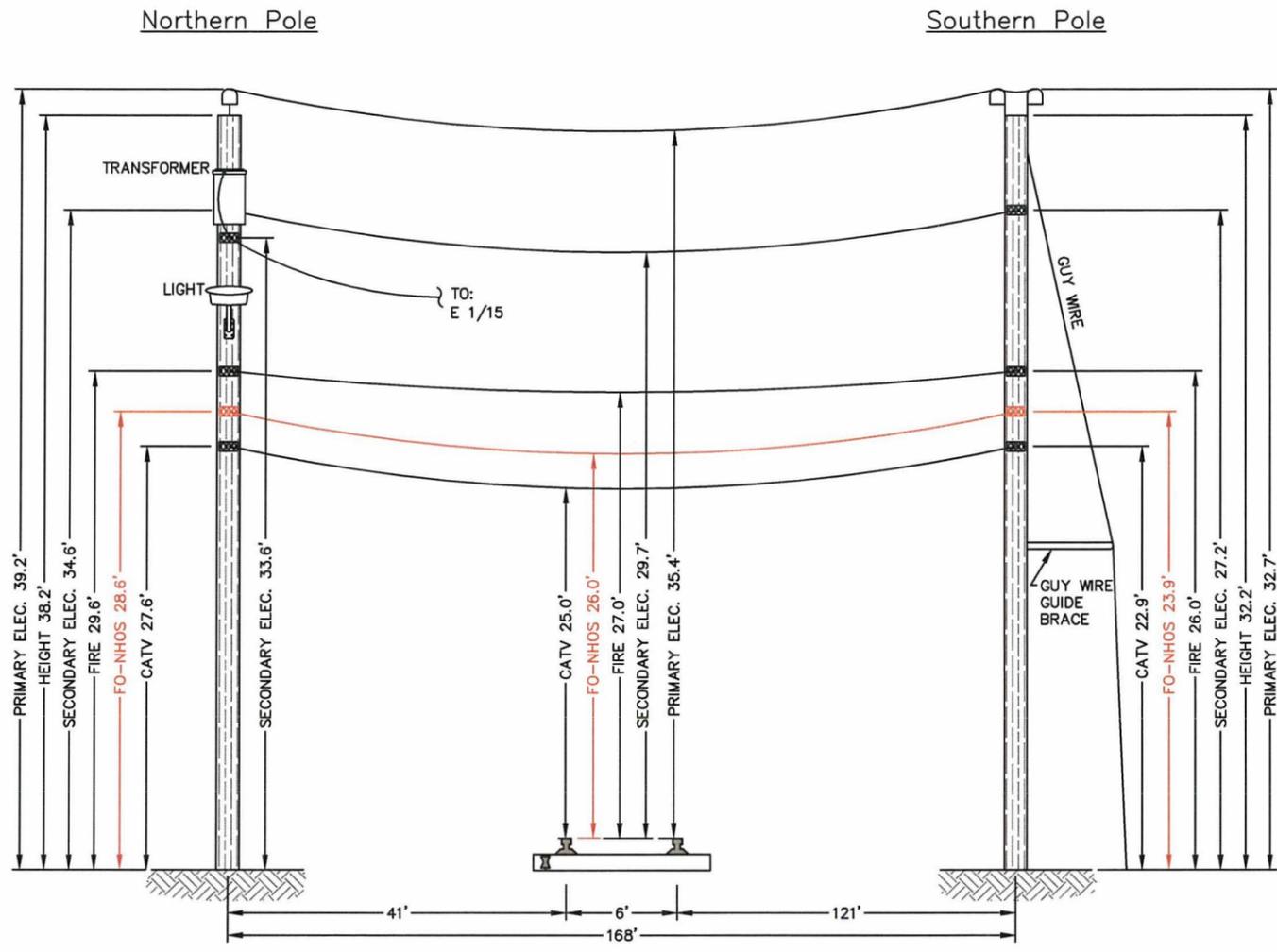
Project #TID-213-PRI-15  
 Drawing #AC-TIL-RR-1

Date: 01/25/12  
 Revision # 1

**Proposed  
 Railroad Crossing  
 Tilton, NH**

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

Sheet 1 of 2



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)

- Notes:**
- The heights of structures shown herein are based on field measurements taken with a Nikon 362 total station during a site survey on 07/20/11.
  - Vertical distances are representative of attachment heights after utility make ready moves are completed.



Spanmaster® Release 3.1 Sag / Tension Computations  
09/01/11 Waveguide

Waveguide  
River and Rail Crossings

Selected Cables	X-SECT AREA (sq.in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFFEXP. COEFF. (1/F)	CABLE WEIGHT (lb/ft)	E'A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-288-LN Bundle	0.5782	2.70E+05	0.858	1.13E-05	0.1960	155982	651
			1.108		0.3170		

**NESC RESULTS**

Loading Condition	Temp (F)	Ice Load (lb/ft)	Ice Thick (in)	Wind Constant (lb/ft)	Horz Wind Load (lb/ft)	Result Load + Const (lb/ft)	Sag (ft)	Tension (lb)	% Len Ctg From Input Conditions	Sag @ Point #4 (ft)	Horz Sag Comp (ft)	Vert Sag Comp (ft)	Vector Angle Deg
Rule 251 - Heavy	0.0	1.000	.50	.3	4.0	1.793	3.47	1819	0.09	3.48	1.63	3.06	28.1
232A1	120.0	0.000	.00	.0	0.0	0.317	2.08	538	0.01	2.08	0.00	2.08	0.0

Span Length =	Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
168.00 ft					
Span Sag = 1.68 ft (20.2 in)					
Span Tension = 666 lb	-40.0	1.04	1,076	-0.02	N/A
Max Load = 6,650 lb	-30.0	1.08	1,033	-0.02	N/A
Usable load (60%) = 3,990 lb	-20.0	1.13	991	-0.01	N/A
Catenary Length = 168.045 ft	-10.0	1.18	950	-0.01	N/A
Stress Free Length @	.0	1.23	909	-0.01	N/A
Installed Temperature = 167.923 ft	10.0	1.28	870	-0.01	N/A
	20.0	1.34	832	-0.01	N/A
	30.0	1.40	796	-0.01	N/A
	40.0	1.47	761	-0.01	N/A
	50.0	1.54	727	0.00	N/A
	60.0	1.61	695	0.00	N/A
	70.0	1.68	665	0.00	N/A
	80.0	1.76	636	0.00	N/A
	90.0	1.83	609	0.01	N/A
	100.0	1.91	584	0.01	N/A
	110.0	1.99	560	0.01	N/A
	120.0	2.08	538	0.01	N/A
	130.0	2.16	518	0.02	N/A
	140.0	2.24	498	0.02	N/A

Unloaded Strand  
Sag = .88 ft (10.5 in) 0.52 %  
Tension = 488 lb



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

**Construction Notes:**

NHOS proposes to install a 1/4 inch 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 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 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 264 and as directed by pole owners.



E-64/7 - T-NT/NT

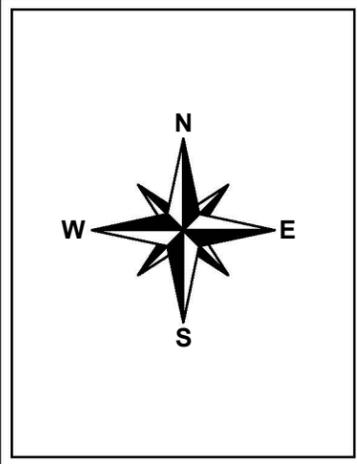
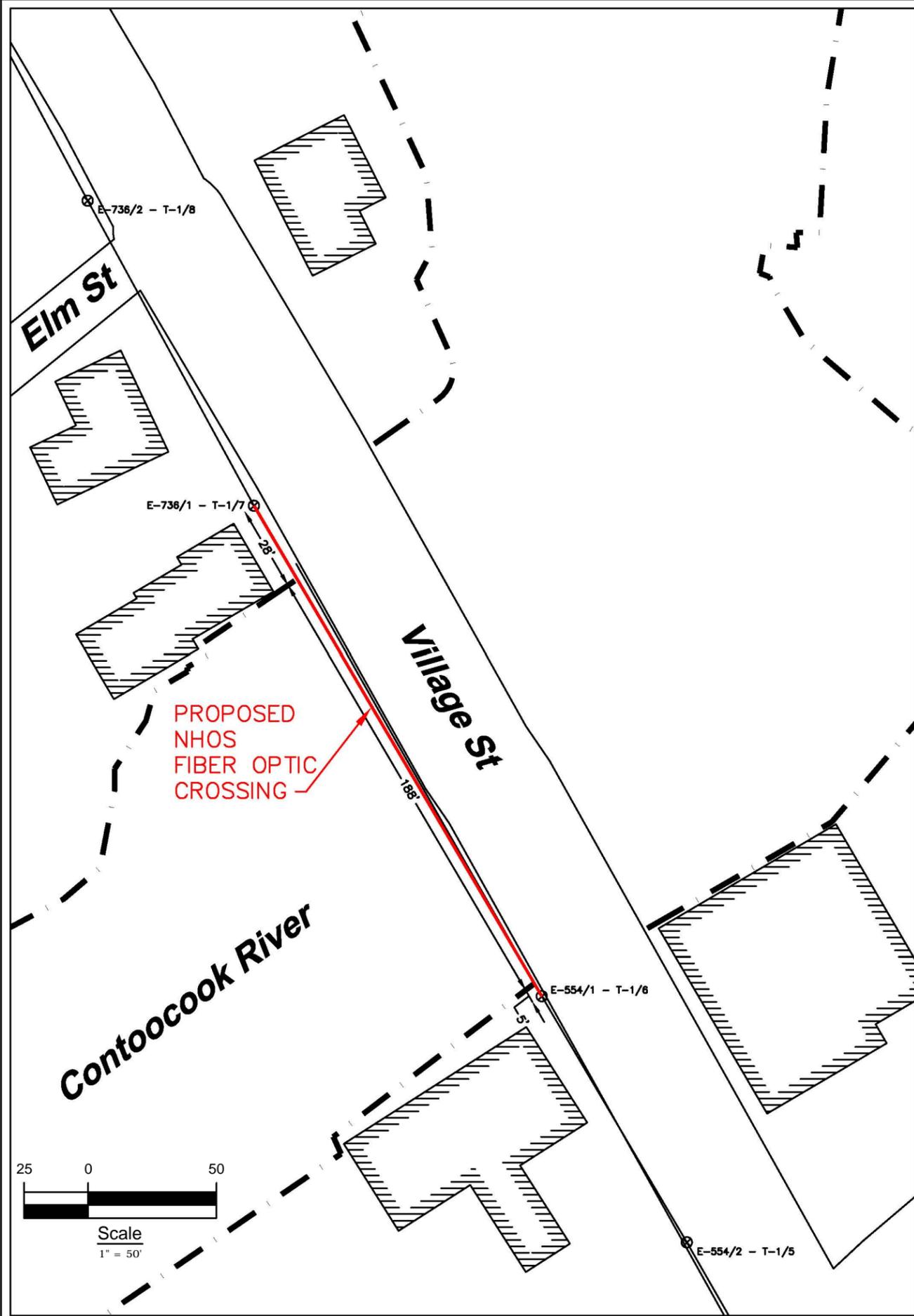
New Hampshire Optical Systems, Inc.  
99 Pine Hill Rd.  
Nashua, NH 03063  
(603-821-6467)

Project #TID-213-PRI-15  
Drawing #AC-TIL-RR-1

Date: 01/25/12  
Revision # 1

**Proposed Railroad Crossing**  
Tilton, NH

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



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

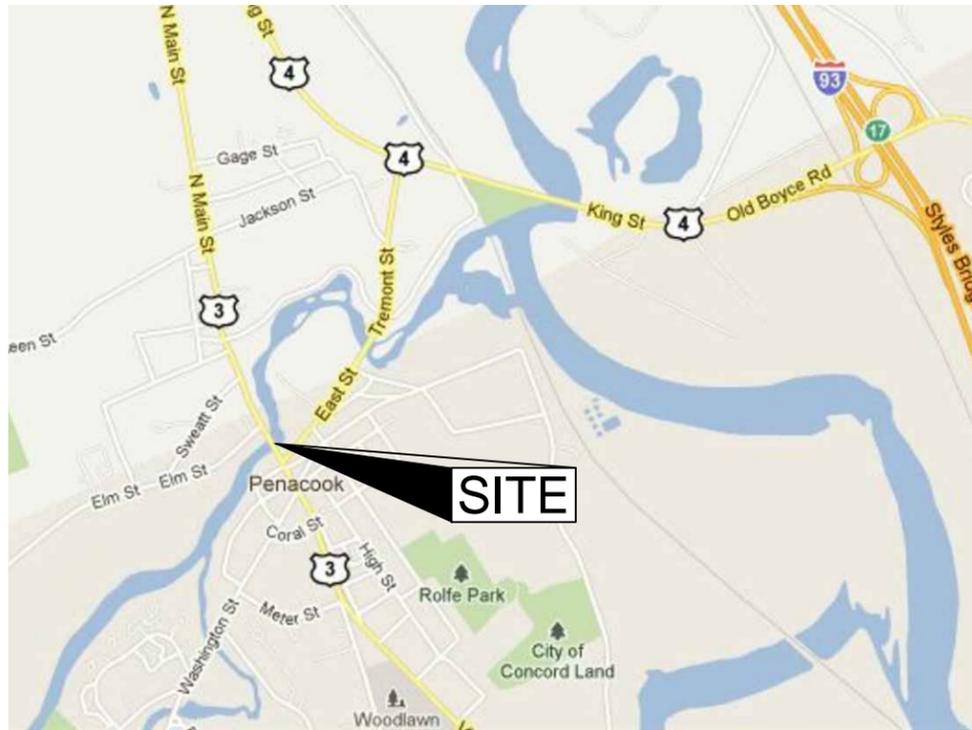
Project #TID-8 - Primary 15  
 Drawing #AC-CON-RIV-1

Date: 01/25/12  
 Revision # 1

Proposed  
 Stream Crossing  
 Concord, NH

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

Sheet 1 of 2



LOCUS MAP  
(Not to Scale)



Spanmaster® Release 3.1 Sag / Tension Computations

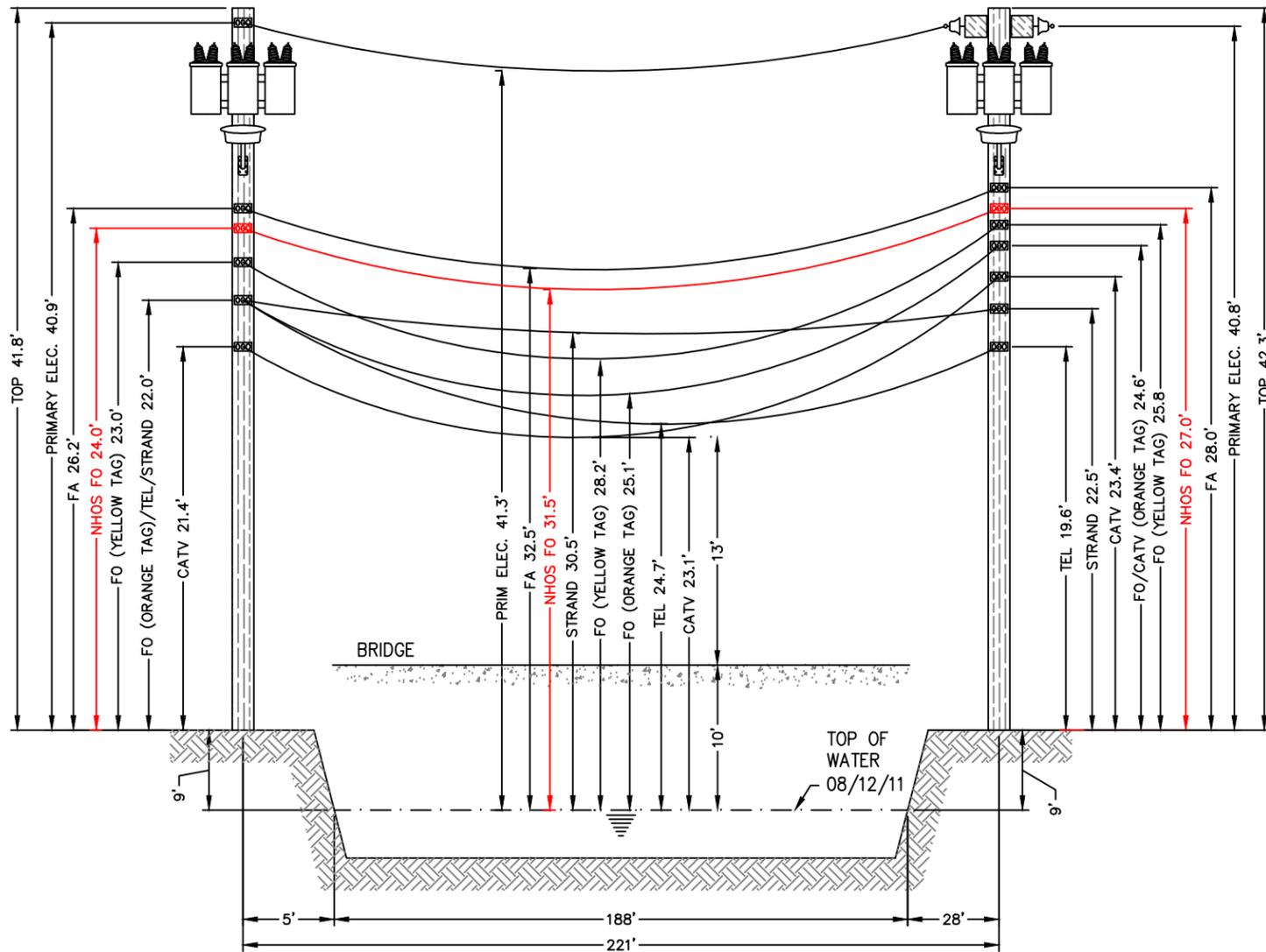
Waveguide  
River and Rail Crossings  
09/01/11 Waveguide

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"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-288-LN Bundle	0.5782	2.70E+05	0.858	1.13E-05	0.1960	155982	651
			1.108	0.3170			

**NESC RESULTS**

Loading Condition	Temp. (F)	Ice Load (lb/ft)	Ice Thick (in)	Wind Constant (lb/ft)	Horz Load (lb/ft)	Result Sag (ft)	Tension (lb)	% Len Chg From Input Conditions	Sag @ 110.5 ft	Horz Sag Comp (ft)	Vert Sag Comp (ft)	Vector Angle (Deg)	
Rule 251 - Heavy	0.0	1.000	.50	.3	4.0	1.793	4.94	2209	0.11	4.96	2.33	4.36	28.1
232A1	120.0	0.000	.00	.0	0.0	0.317	2.66	728	0.01	2.66	0.00	2.66	0.0

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
Span Length = 221.00 ft				
Span Sag = 2.21 ft (26.5 in)				
Span Tension = 876 lb				
Max Load = 6,650 lb				
Usable load (60%) = 3,990 lb				
Catenary Length = 221.059 ft				
Stress Free Length @ Installed Temperature = 220.848 ft				
10.0	1.77	1,093	-0.01	N/A
20.0	1.83	1,054	-0.01	N/A
30.0	1.90	1,016	-0.01	N/A
40.0	1.97	979	-0.01	N/A
50.0	2.05	943	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	2.38	812	0.00	N/A
100.0	2.47	782	0.01	N/A
110.0	2.56	754	0.01	N/A
120.0	2.66	728	0.01	N/A
130.0	2.75	702	0.01	N/A
140.0	2.85	678	0.02	N/A



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

E-736/1 - T-1/7  
(Existing joint owned utility pole (Fairpoint/Unitil) in existing Right-of-Way)



E-554/1 - T-1/6

**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 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 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 264 and as directed by pole owners.



E-736/1 - T-1/7

**Notes:**

- The heights of structures shown hereon are based on field measurements taken with a Nikon 362 total station during a site survey on 08/12/11.
- The horizontal distance between the nearest bridge edge and existing overhead wires ranges from 1' to 3'.
- 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.
- The smallest vertical distance from the top of bridge deck to the lowest existing overhead wires is approximately 13'.
- The vertical distance between the top of water and bridge deck is approximately 10'.
- Vertical distances are representative of attachment heights after utility make ready moves are completed.



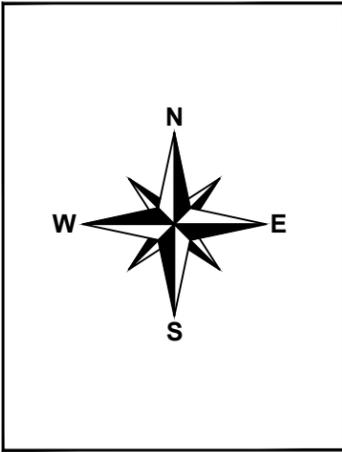
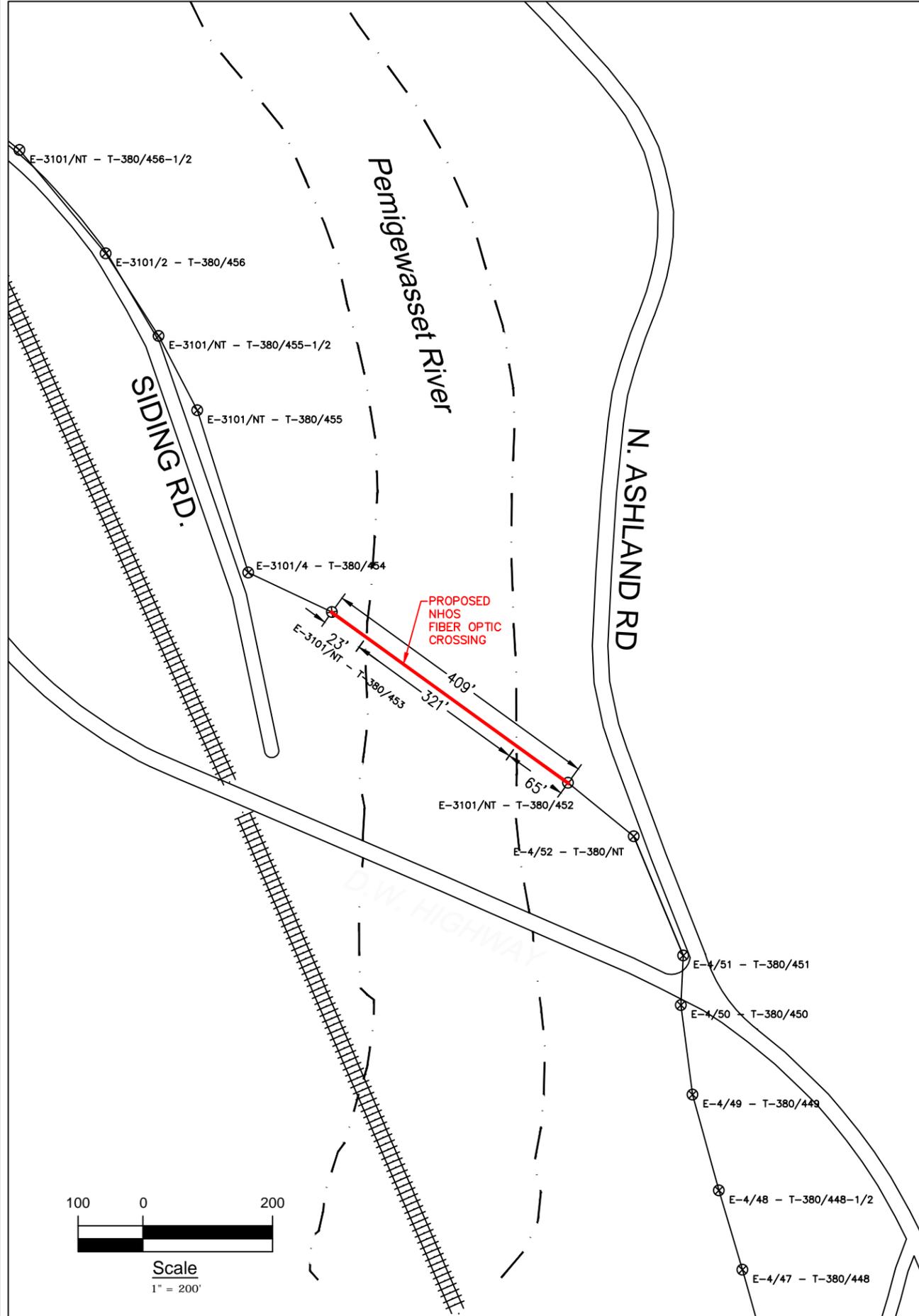
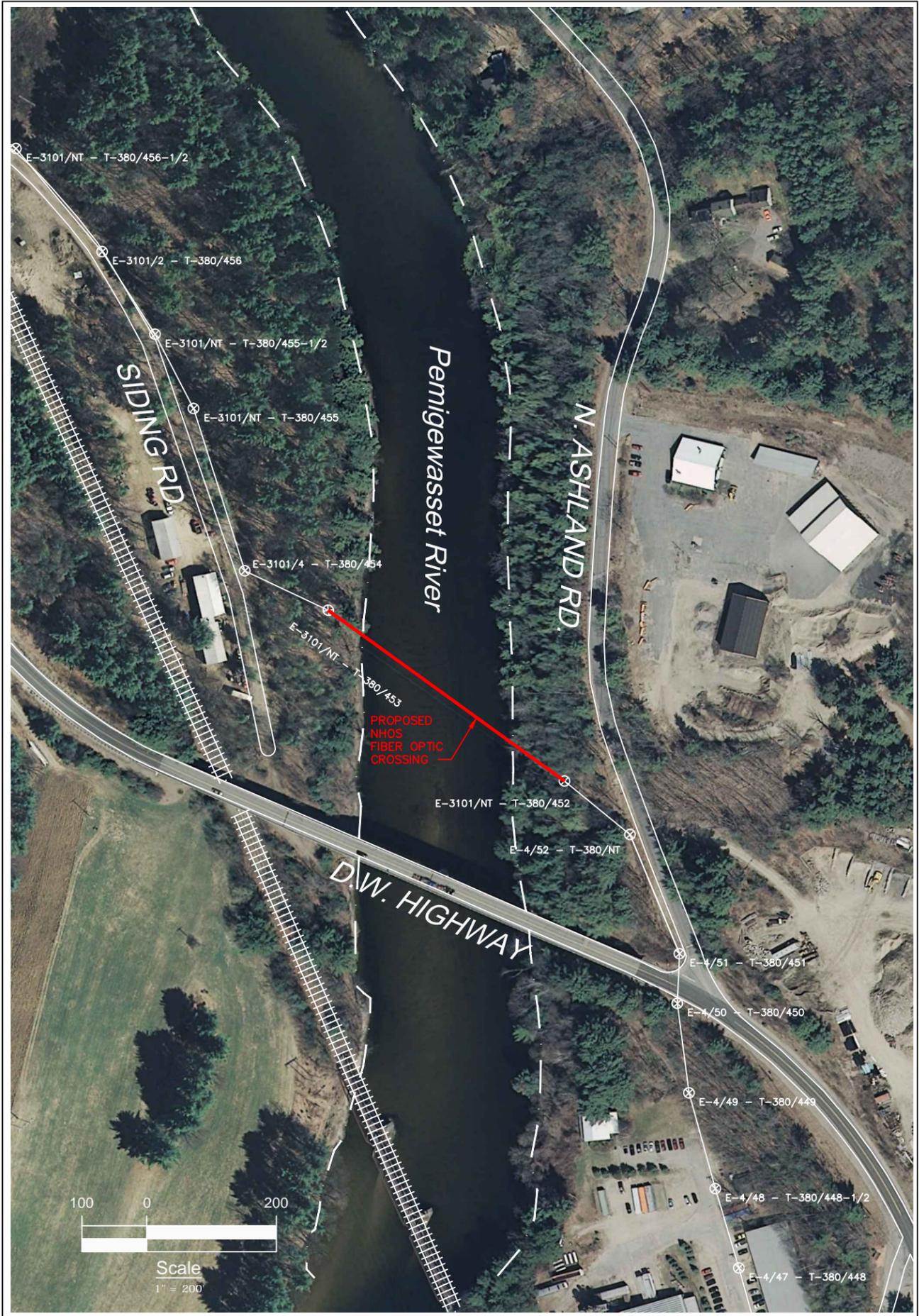
New Hampshire Optical Systems, Inc.  
99 Pine Hill Rd.  
Nashua, NH 03063  
(603-821-6467)

Project #TID-8 - Primary 15  
Drawing #AC-CON-RIV-1

Date: 01/25/12  
Revision # 1

**Proposed Stream Crossing**  
Concord, NH

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



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

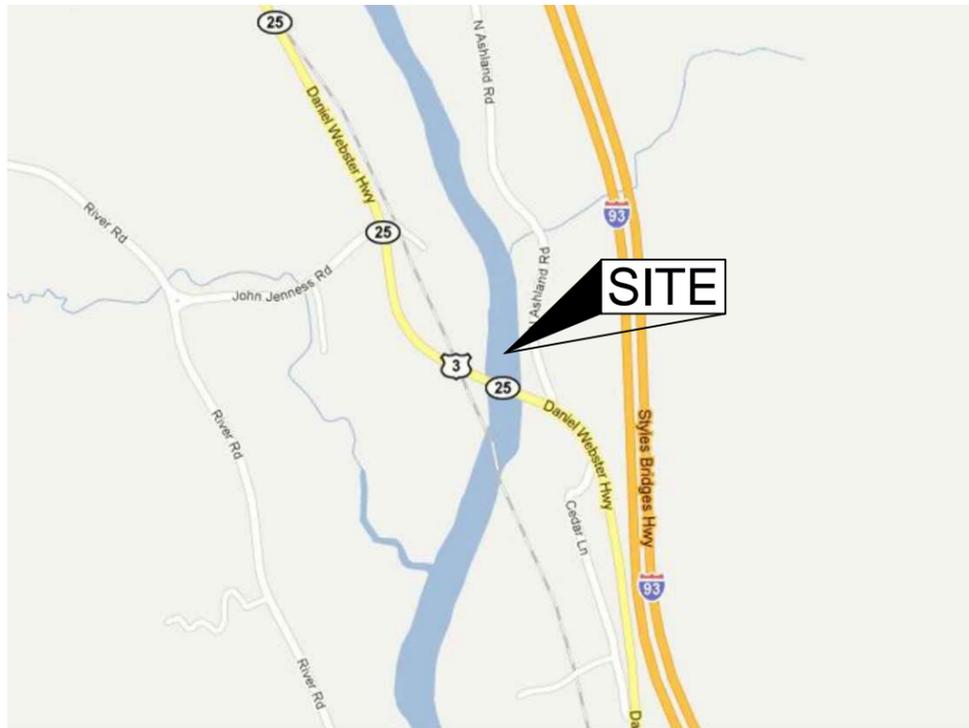
Project #TID-27  
 Drawing #AC-ASH-RIV-1

Date: 01/26/12  
 Revision # 1

**Proposed Crossing  
 Pemigewasset River  
 Ashland, NH**

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

Sheet 1 of 2



LOCUS MAP  
(Not to Scale)



Spanmaster® Release 3.1 Sag / Tension Computations  
09/01/11 Waveguide

Waveguide  
River and Rail Crossings

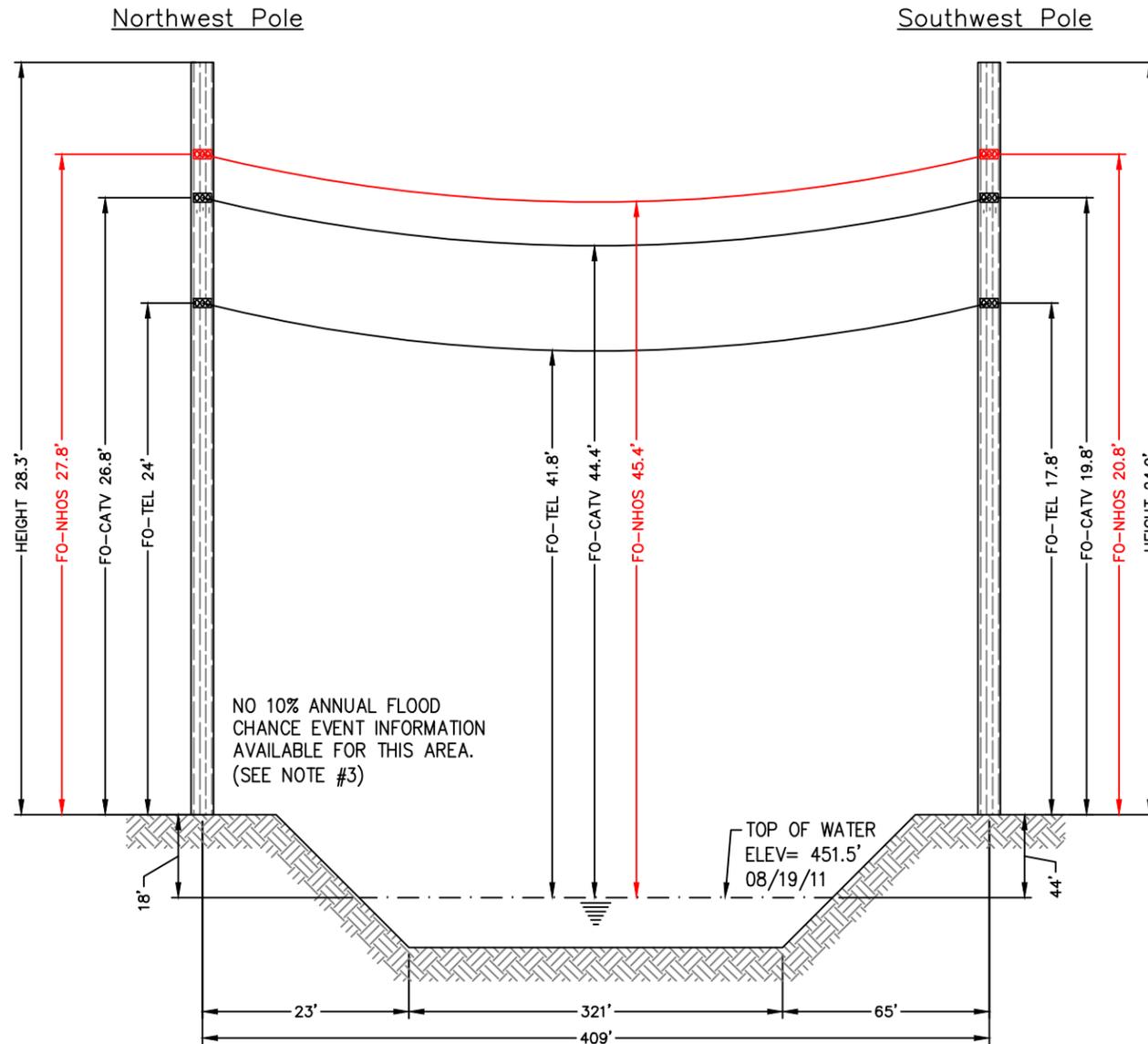
Selected Cables	X-SECT AREA (sq.in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF.EXP. COEFF. (1/F)	CABLE WEIGHT (lb/ft)	E'A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-288-LN Bundle	0.5782	2.70E+05	1.108	1.13E-05	0.1960	155982	651

**NESC RESULTS**

Loading Condition	Temp. (F)	Ice Load (lb/ft)	Ice Thick (in)	Wind Constant (lb/ft)	Horz Wind Load (lb/ft)	Result Load + Const (lb/ft)	Sag (ft)	Tension (lb)	% Len Chg From Input Conditions	Sag @ 204.5 ft	Horz Sag Comp (ft)	Vert Sag Comp (ft)	Vector Angle Deg
Rule 251 - Heavy	0.0	1.000	.50	.3	4.0	1.793	10.85	3442	0.16	10.89	5.11	9.57	28.1
232A1	120.0	0.000	.00	.0	0.0	0.317	4.63	1429	0.01	4.64	0.00	4.63	0.0

Span Length = 409.00 ft	Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
Span Sag = 4.09 ft (49.1 in)	-40.0	3.17	2,080	-0.01	N/A
Span Tension = 1,621 lb	-30.0	3.24	2,035	-0.01	N/A
Max Load = 6,650 lb	-20.0	3.32	1,991	-0.01	N/A
Usable load (60%) = 3,990 lb	-10.0	3.39	1,947	-0.01	N/A
Catenary Length = 409.109 ft	.0	3.47	1,904	-0.01	N/A
Stress Free Length @ Installed Temperature = 408.386 ft	10.0	3.55	1,861	-0.01	N/A
	20.0	3.63	1,819	-0.01	N/A
	30.0	3.72	1,777	0.00	N/A
	40.0	3.81	1,736	0.00	N/A
	50.0	3.90	1,695	0.00	N/A
	60.0	3.99	1,655	0.00	N/A
	70.0	4.09	1,616	0.00	N/A
	80.0	4.19	1,577	0.00	N/A
	90.0	4.30	1,539	0.00	N/A
	100.0	4.40	1,502	0.00	N/A
	110.0	4.51	1,465	0.01	N/A
	120.0	4.63	1,429	0.01	N/A
	130.0	4.74	1,394	0.01	N/A
	140.0	4.86	1,360	0.01	N/A

Unloaded Strand  
Sag = 1.78 ft (21.3 in) 0.43 %  
Tension = 1,423 lb



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

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



E-3101/NT - T-380/453

**Construction Notes:**

NHOS proposes to install a 1/4 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 (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 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 264 and as directed by pole owners.



E-3101/NT - T-380/452

**Notes:**

- The heights of structures shown hereon are based on field measurements taken with a Nikon 362 total station during a site survey on 08/19/11. The elevations shown hereon are based on NHDOT Geodetic Disk #057-00300 found on the South West bridge abutment. This disk has a published elevation of 508.90' (NGVD29)
- The waterway is classified as suitable for sail boating and per NESC Table 232-1 a vertical clearance of 22' must be maintained between the lowest conductor and 10 year floodplain.
- Based on the FEMA Flood Profile for the Pemigewasset River page 123P, 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 NOT AVAILABLE". Based on the FEMA Flood Profile the stream bed elevation is 447' and the 1% (100 year) Annual chance flood event elevation is 480'.
- The horizontal distance between the nearest bridge and the existing overhead wires ranges from 210' to 269'.
- The vertical distance between the top of water and lowest existing wire was approximately 42' at the time of survey.
- Vertical distances are representative of attachment heights after utility make ready moves are completed.



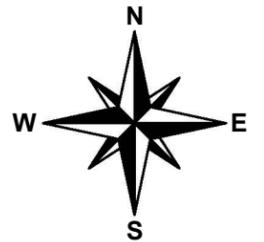
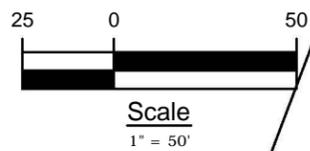
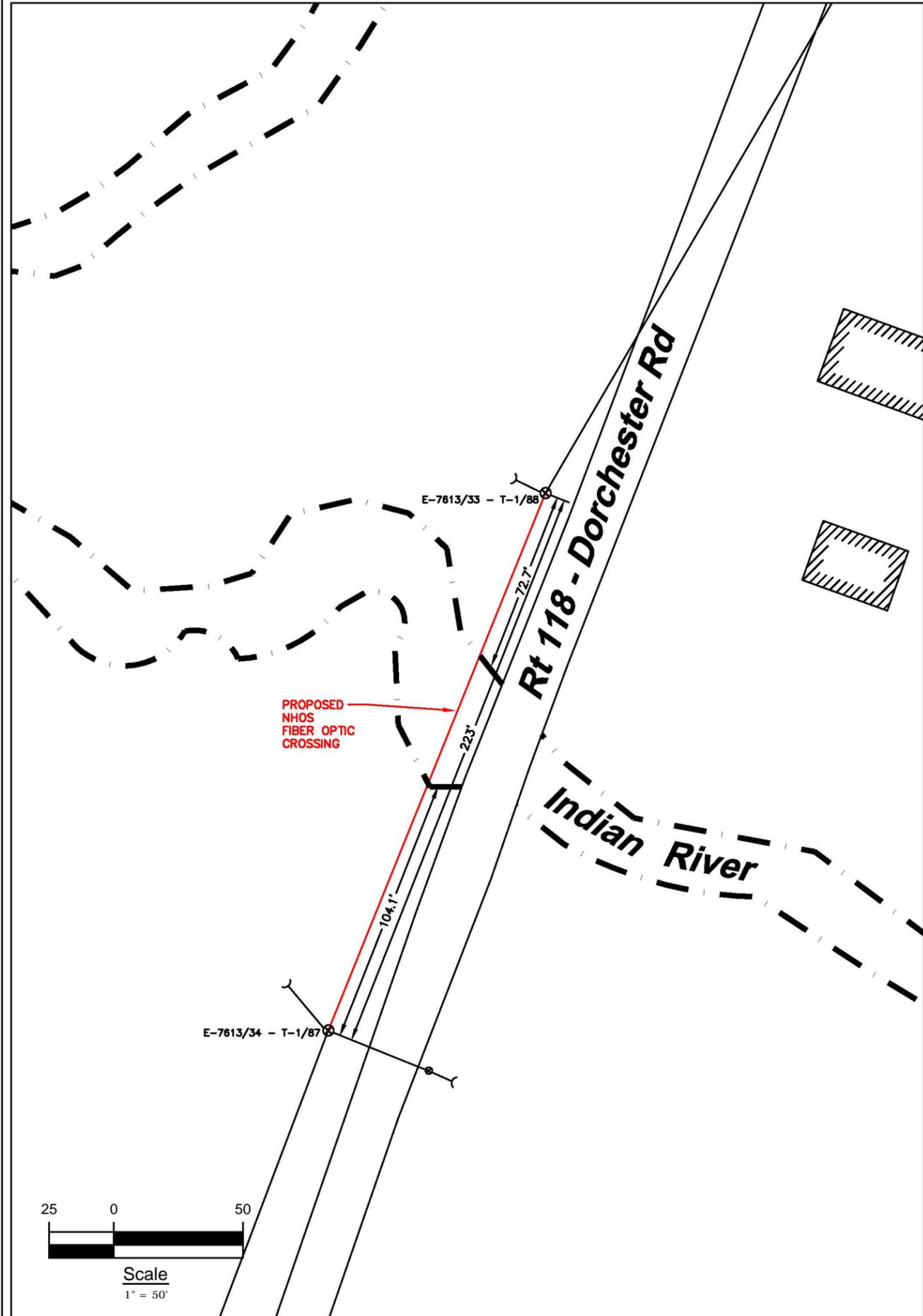
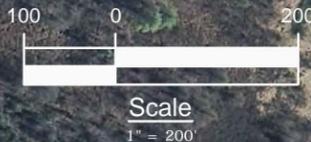
New Hampshire Optical Systems, Inc.  
99 Pine Hill Rd.  
Nashua, NH 03063  
(603-821-6467)

Project #TID-27  
Drawing #AC-ASH-RIV-1

Date: 01/26/12  
Revision # 1

**Proposed Crossing**  
Pemigewasset River  
Ashland, NH

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



**NHOS**  
New Hampshire Optical Systems

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

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

Date: 01/26/12  
Revision # 1

Proposed  
Indian River Crossing  
Canaan, NH

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

Sheet 1 of 2



LOCUS MAP  
(Not to Scale)



Spanmaster® Release 3.1 Sag / Tension Computations  
09/01/11 Waveguide

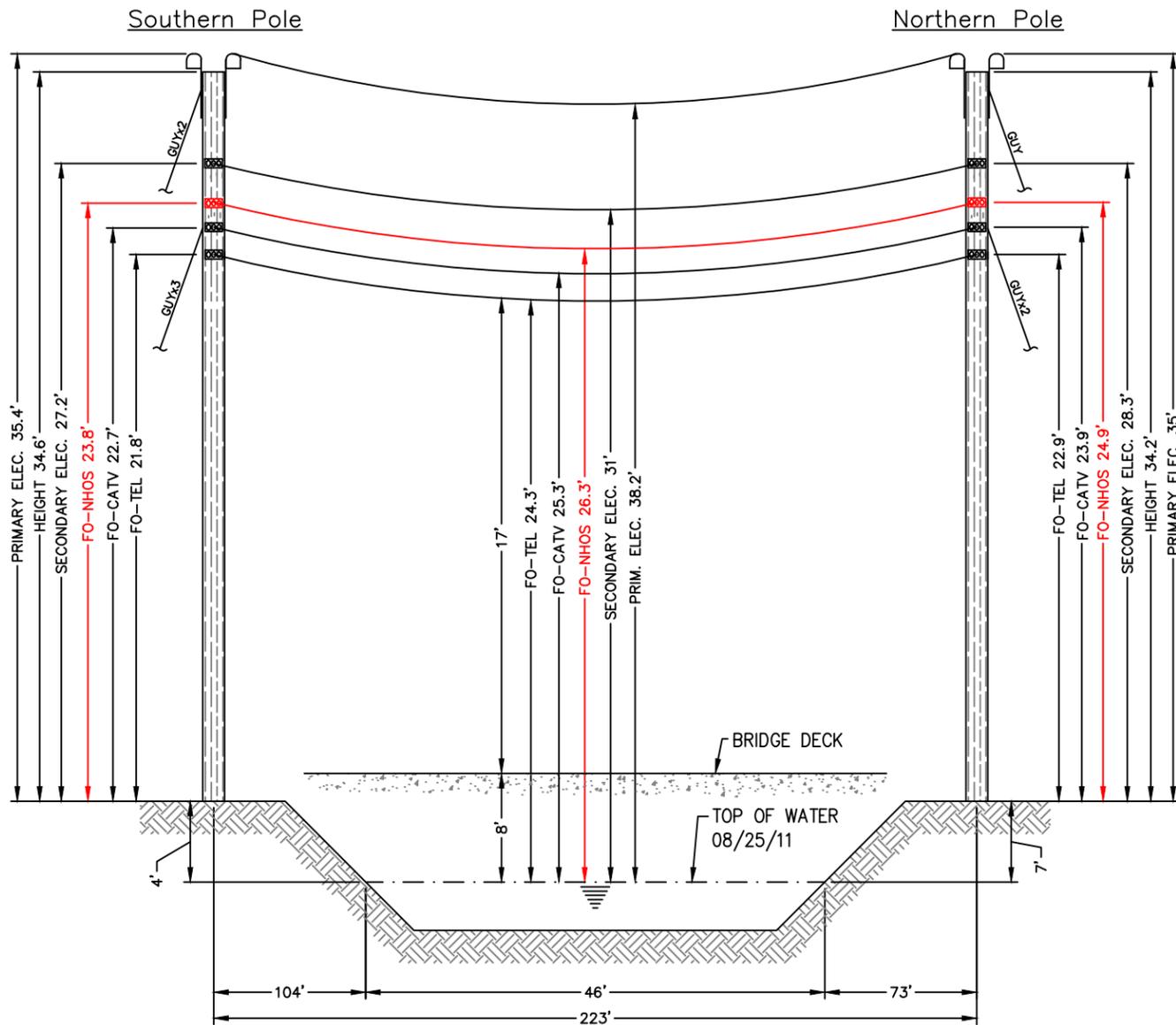
Waveguide  
River and Rail Crossings

Selected Cables	X-SECT AREA (sq.in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF.EXP. COEFF. (1/F)	CABLE WEIGHT (lb/ft)	E*A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-144-LN Bundle	0.4307	3.50E+05	0.741	1.09E-05	0.1520	150720	640
			0.991		0.2730		

**NESC RESULTS**

Loading Condition	Temp. (F)	Ice Load (lb/ft)	Ice Thick (in)	Wind Constant (lb/ft)	Horz Wind Load (lb/ft)	Result Load + Const (lb/ft)	Sag (ft)	Tension (lb)	% Len Chg From Input Conditions	Sag @ 111.5 ft	Horz Sag Comp (ft)	Vert Sag Comp (ft)	Vector Angle (Deg)
Rule 251 - Heavy	0.0	0.927	.50	.3	4.0	1.671	4.97	2086	0.11	4.98	2.41	4.35	28.9
232A1	120.0	0.000	.00	.0	0.0	0.273	2.72	623	0.01	2.72	0.00	2.72	0.0

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance	
Span Length = 223.00 ft					
Span Sag = 2.23 ft (26.8 in)					
Span Tension = 761 lb					
Max Load = 6,650 lb	-40.0	1.44	1,180	-0.02	N/A
Usable load (60%) = 3,990 lb	-30.0	1.49	1,136	-0.01	N/A
Catenary Length = 223.059 ft	-20.0	1.55	1,094	-0.01	N/A
Stress Free Length @ Installed Temperature = 222.874 ft	-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
Unloaded Strand	30.0	1.89	896	-0.01	N/A
Sag = 1.26 ft (15.2 in) 0.57 %	40.0	1.97	860	-0.01	N/A
Tension = 595 lb	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	674	0.01	N/A
	110.0	2.62	648	0.01	N/A
	120.0	2.72	623	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 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 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 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 264 and as directed by pole owners.



E-7613/33 - T-1/88

**Notes:**

- 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.
- The horizontal distance between the existing bridge and the existing overhead wires approximately 9'.
- 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.
- The smallest vertical distance from the top of existing bridge deck to the lowest existing overhead wires is approximately 17'.
- The vertical distance between the top of the water and bridge deck at the time of survey is approximately 8'.
- Vertical distances are representative of attachment heights after utility make ready moves are completed.



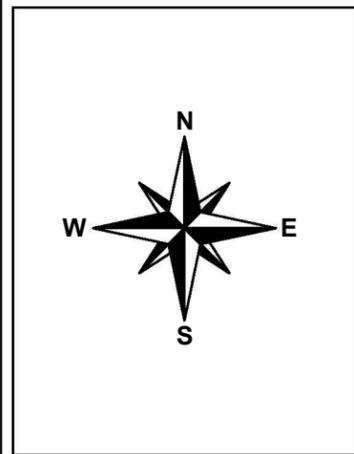
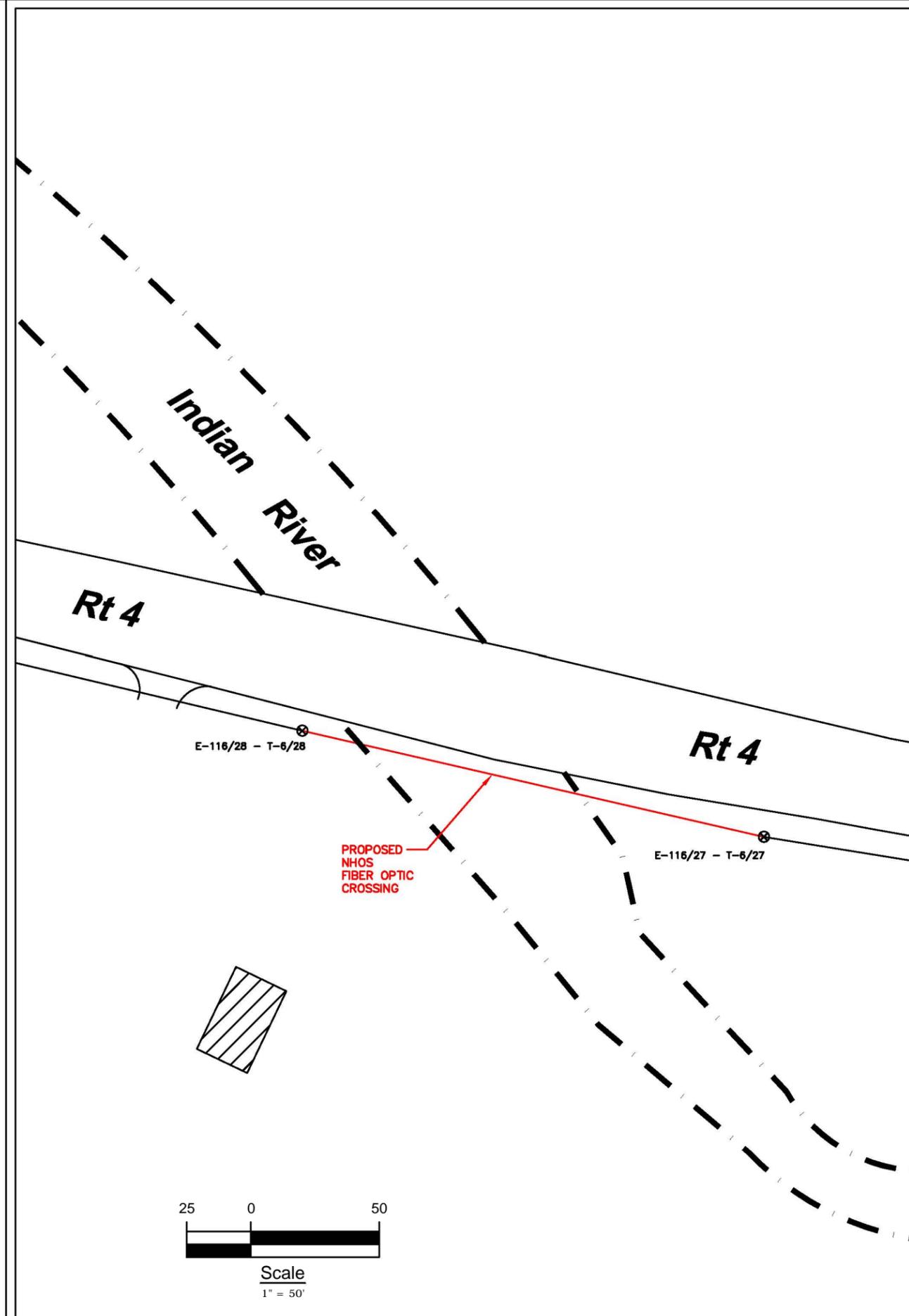
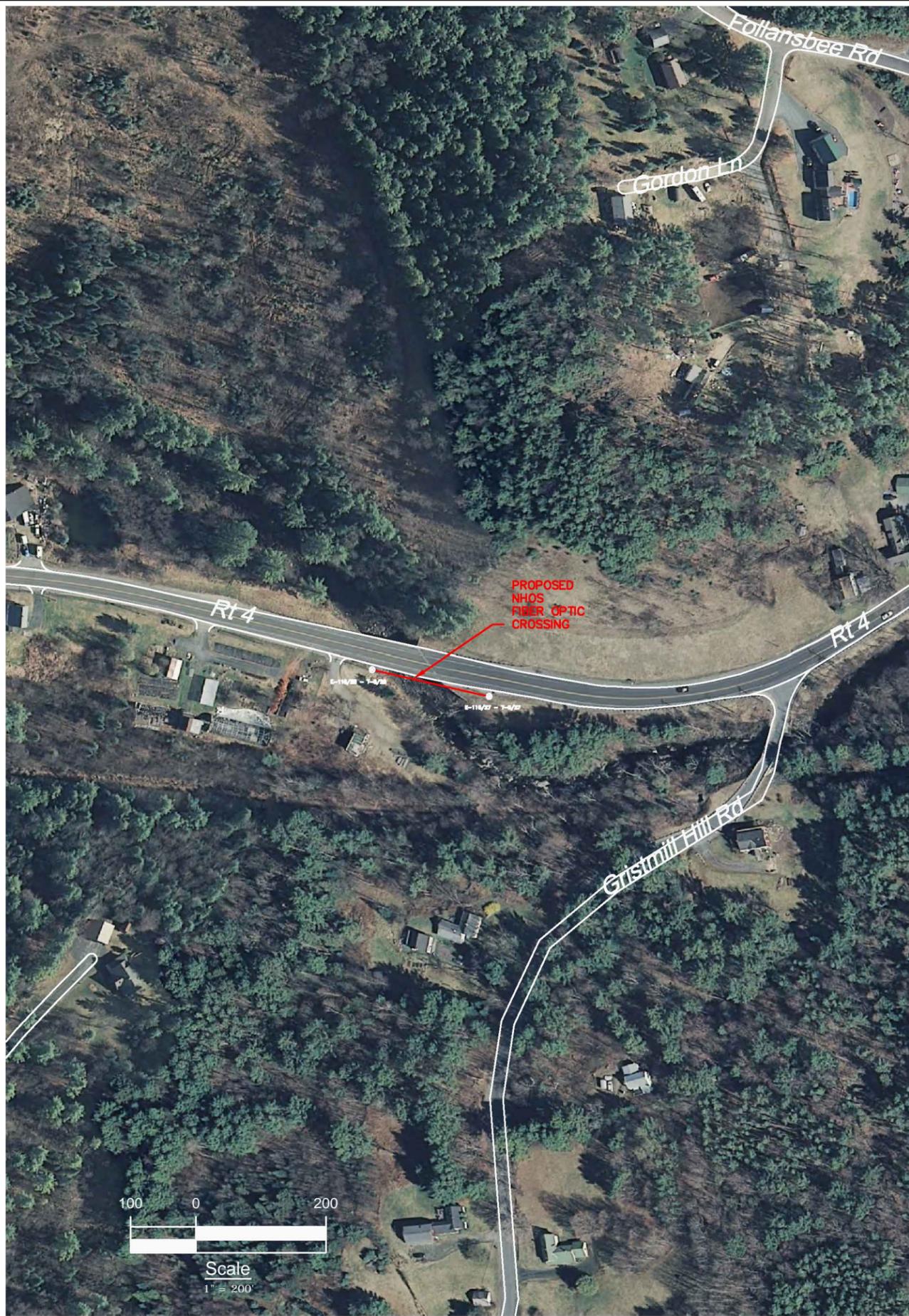
New Hampshire Optical Systems, Inc.  
99 Pine Hill Rd.  
Nashua, NH 03063  
(603-821-6467)

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

Date: 01/26/12  
Revision # 1

Proposed  
Indian River Crossing  
Canaan, NH

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



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

Project #TID-32-PRI-15  
 Drawing #AC-CAN-RIV-2

Date: 01/26/12  
 Revision # 1

Proposed  
 Indian River Crossing  
 Canaan, NH

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

Sheet 1 of 2



LOCUS MAP  
(Not to Scale)



Spanmaster® Release 3.1 Sag / Tension Computations

Waveguide  
River and Rail Crossings

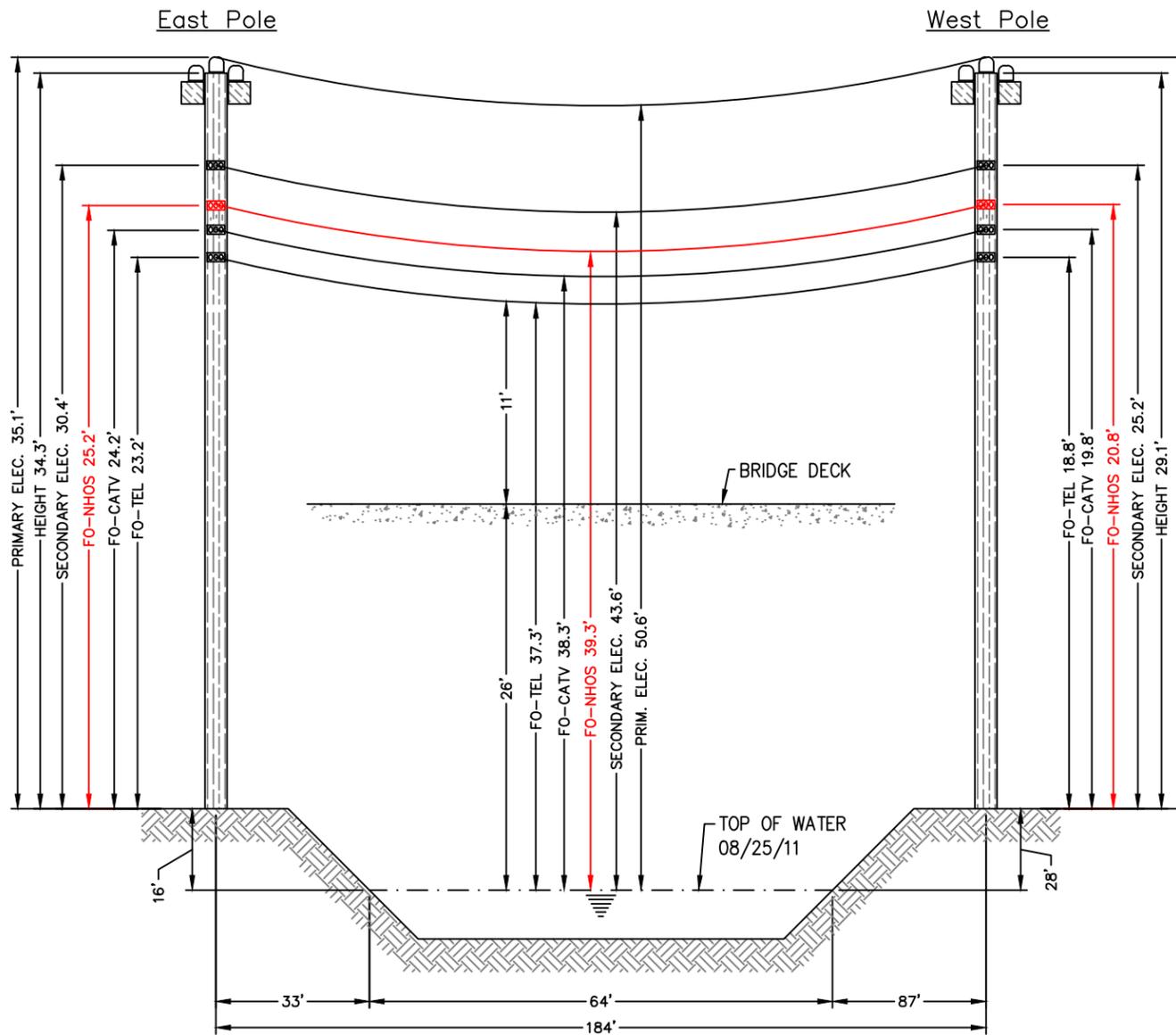
Selected Cables	X-SECT AREA (sq.in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFFEXP. COEFF. (1/F)	CABLE WEIGHT (lb/ft)	E*A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-288-LN Bundle	0.5782	2.70E+05	1.108	1.13E-05	0.1960	155982	651

**NEC RESULTS**

Loading Condition	Temp. (F)	Ice Load (lb/ft)	Ice Thick (in)	Wind Constant (lb/ft)	Horz Wind Load (lb/ft)	Result Load + Const (lb/ft)	Sag (ft)	Tension (lb)	% Len Chg From Input Conditions	Sag @ 92.1 ft	Horz Sag Comp (ft)	Vert Sag Comp (ft)	Vector Angle (Deg)
Rule 251 - Heavy 232A1	0.0	1.000	.50	.3	4.0	1.793	3.91	1941	0.09	3.92	1.84	3.45	28.1

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	1.17	1,146	-0.02	N/A
-30.0	1.22	1,103	-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	1.49	901	-0.01	N/A
30.0	1.55	864	-0.01	N/A
40.0	1.62	828	-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

Span Length = 184.20 ft  
 Span Sag = 1.84 ft (22.1 in)  
 Span Tension = 730 lb  
 Max Load = 6,650 lb  
 Usable load (60%) = 3,990 lb  
 Catenary Length = 1019 ft  
 Stress Free Length @ Installed Temperature = 184.102 ft  
 Unloaded Strand Sag = .94 ft (11.2 in) 0.51 %  
 Tension = 549 lb



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 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 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 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 264 and as directed by pole owners.



E-116/27 - T-6/27

**Notes:**

- 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.
- The horizontal distance between the existing bridge and the existing overhead wires ranges from 8' to 10'.
- 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.
- The smallest vertical distance from the top of existing bridge deck to the lowest existing overhead wires is approximately 11'.
- The vertical distance between the top of water and bridge deck is approximately 26'.
- Vertical distances are representative of attachment heights after utility make ready moves are completed.



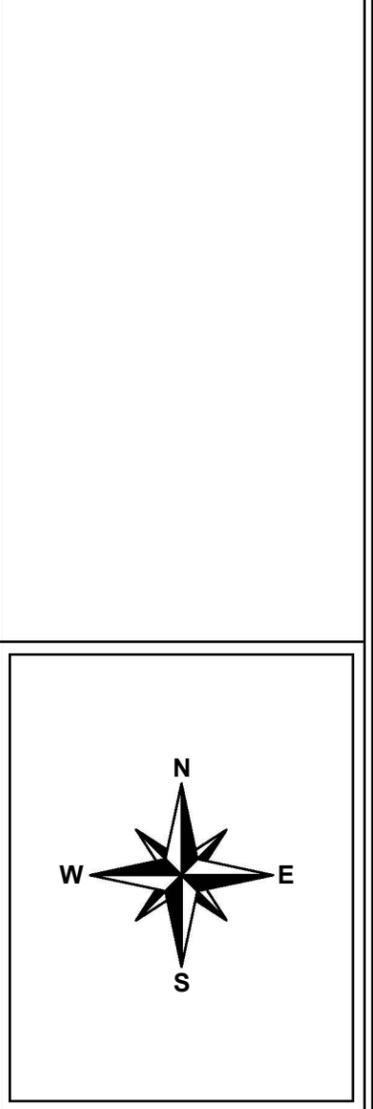
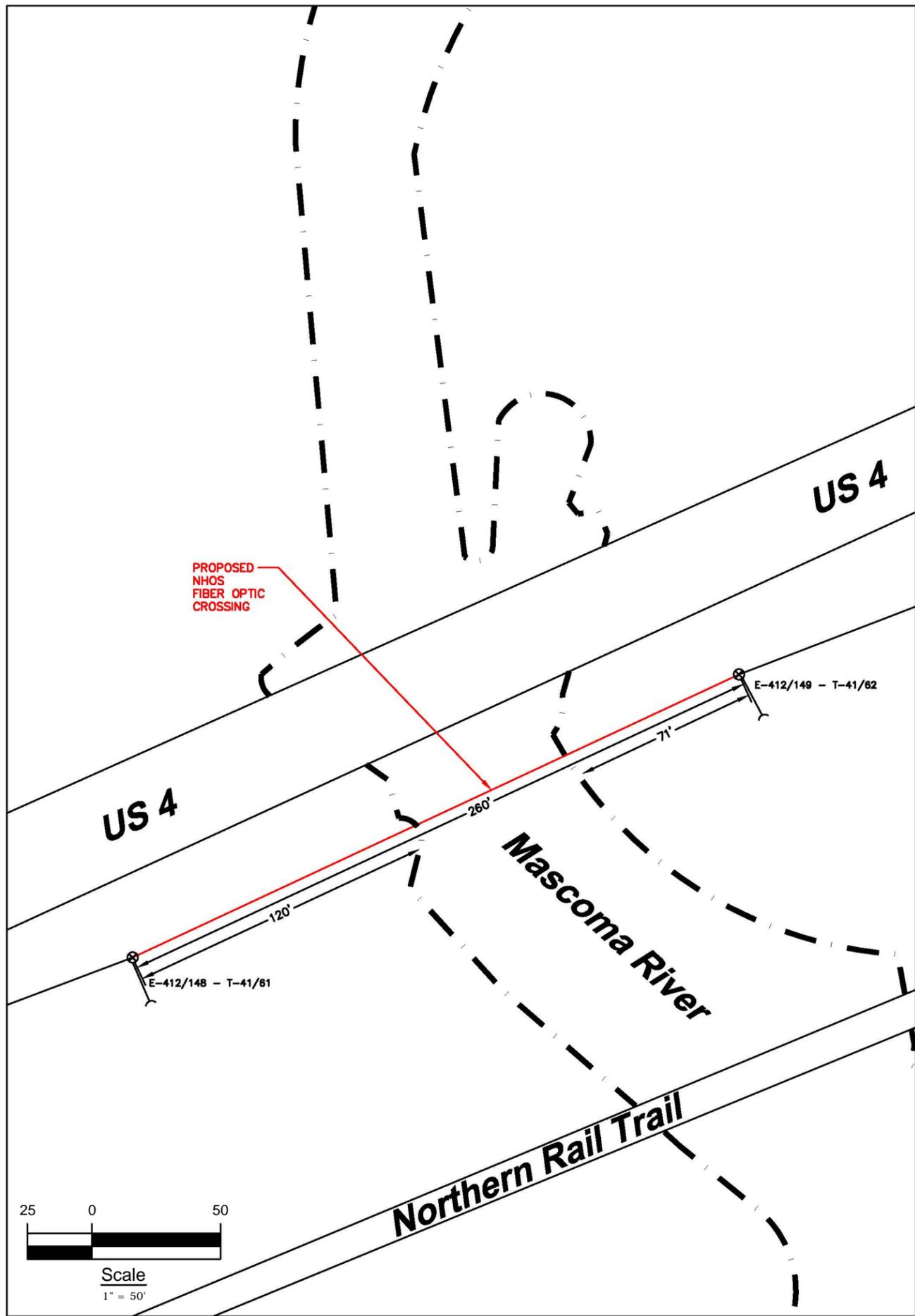
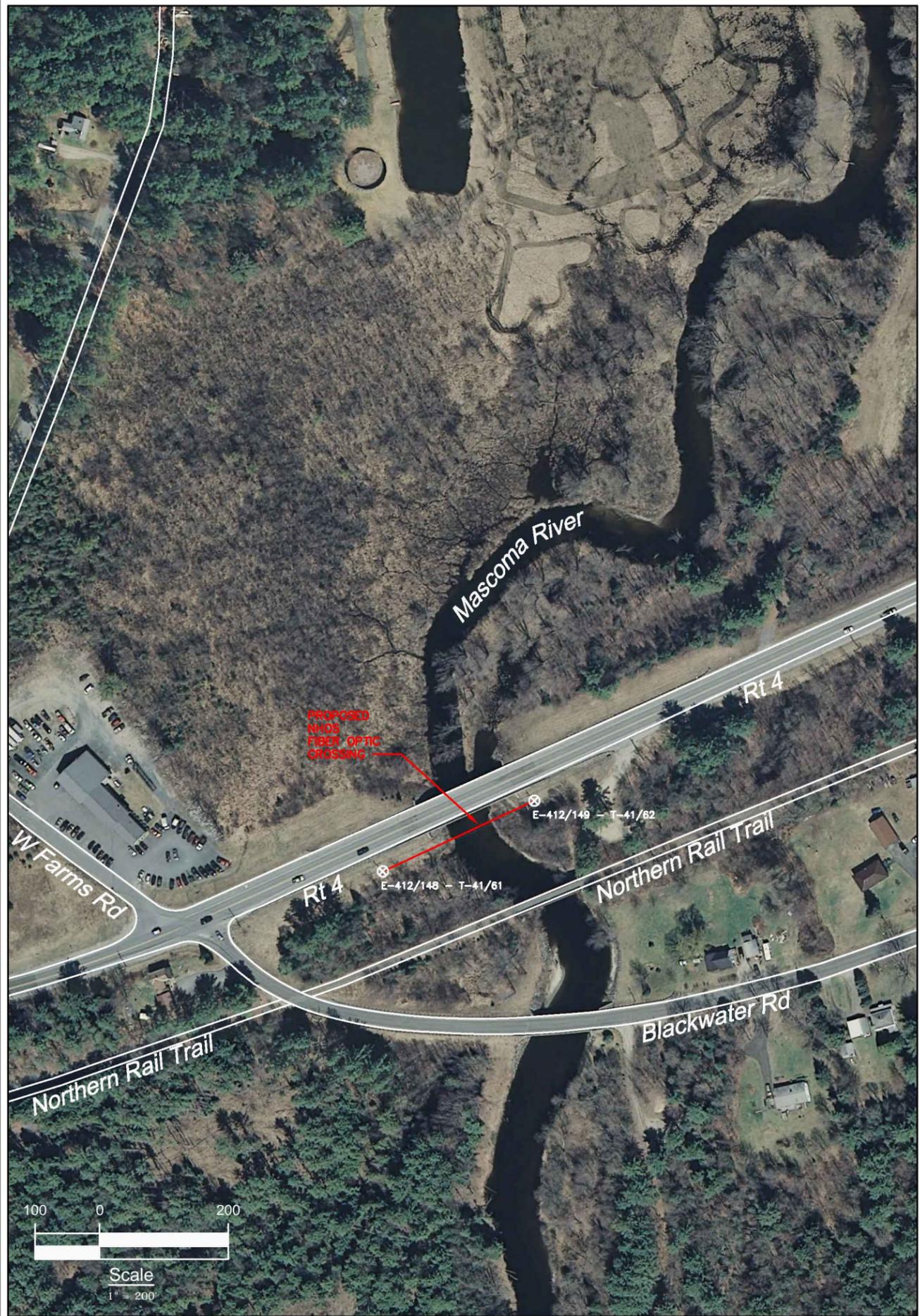
New Hampshire Optical Systems, Inc.  
 99 Pine Hill Rd.  
 Nashua, NH 03063  
 (603-821-6467)

Project #TID-32-PRI-15  
 Drawing #AC-CAN-RIV-2

Date: 01/26/12  
 Revision # 1

Proposed  
 Indian River Crossing  
 Canaan, NH

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



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

Project #TID-36-PRI-15  
 Drawing #AC-CAN-RIV-6

Date: 01/26/12  
 Revision # 1

Proposed  
 Mascoma River Crossing  
 Canaan, NH

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

Sheet 1 of 2



LOCUS MAP  
(Not to Scale)



Spanmaster® Release 3.1 Sag / Tension Computations  
09/01/11 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)	E*A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-144-LN Bundle	0.4307	3.50E+05	0.741	1.09E-05	0.1520	150720	640
			0.991		0.2730		

**NESC RESULTS**

Loading Condition	Temp. (F)	Ice Load (lb/ft)	Ice Thick (in)	Wind Constant (lb/ft)	Horiz. Wind Load (lb/sq ft)	Result. Load + Const (lb/ft)	Tension (lb)	% Len Chg From Input Conditions	Sag @ Point 130 (ft)	Horz. Sag Comp (ft)	Vert. Sag Comp (ft)	Vector Angle (Deg)	
Rule 251 - Heavy	0.0	0.927	.50	.3	4.0	1.671	6.06	2325	0.12	6.08	2.93	5.30	28.9
232A1	120.0	0.000	.00	.0	0.0	0.273	3.12	738	0.01	3.13	0.00	3.12	0.0

Span Length = 260.00 ft  
Span Sag = 2.60 ft (31.2 in)  
Span Tension = 887 lb  
Max Load = 6,650 lb  
Usable load (60%) = 3,990 lb  
Catenary Length = 260.069 ft  
Stress Free Length @  
Installed 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	1.75	1,315	-0.01	N/A
-30.0	1.81	1,271	-0.01	N/A
-20.0	1.87	1,229	-0.01	N/A
-10.0	1.94	1,187	-0.01	N/A
.0	2.01	1,145	-0.01	N/A
10.0	2.08	1,105	-0.01	N/A
20.0	2.16	1,066	-0.01	N/A
30.0	2.24	1,028	-0.01	N/A
40.0	2.33	990	-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)



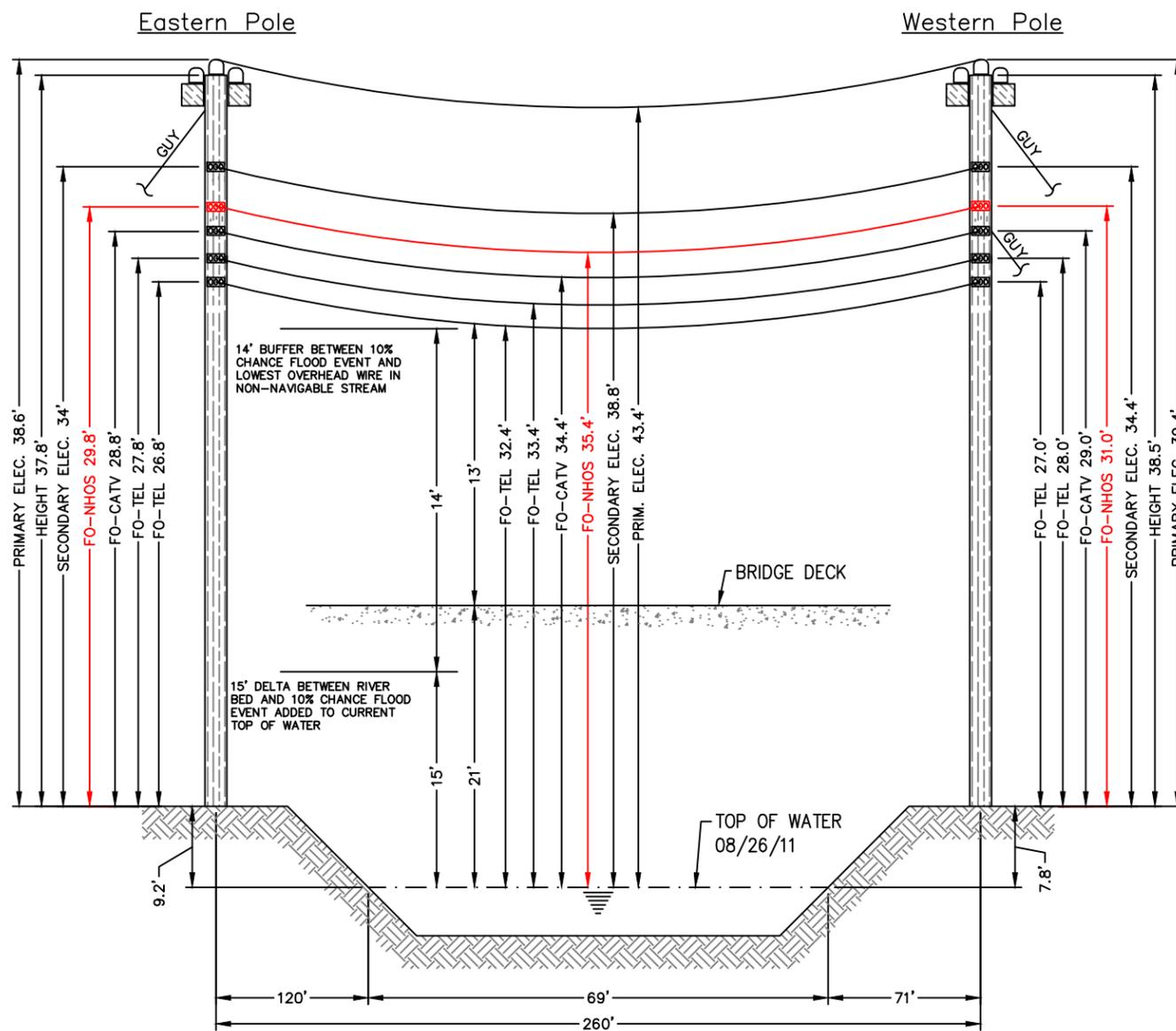
E-412/148 - T-41/61

**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 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 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 264 and as directed by pole owners.



E-412/149 - T-41/62



**Notes:**

- The heights of structures shown hereon are based on field measurements taken with a Nikon 362 total station during a site survey on 08/26/11.
- The horizontal distance between the existing bridge and the existing overheads is approximately 29'.
- 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.
- The smallest vertical distance from the top of existing bridge deck to the lowest existing overhead wires is 13'.
- The vertical distance between the top of water and bridge deck is approximately 21'.
- The waterway is classified as not suitable for sail boating and per NESC Table 232-1 a vertical clearance of 14' must be maintained between the lowest conductor and 10 year floodplain.
- Based on the FEMA Flood Profile for the Mascoma River (Page 91P) 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. Based on the FEMA Flood Profile the stream bed elevation is 788' and the 10 year flood event elevation is 803'.
- Vertical distances are representative of attachment heights after utility make ready moves are completed.



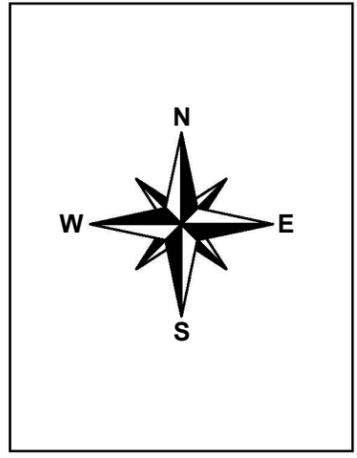
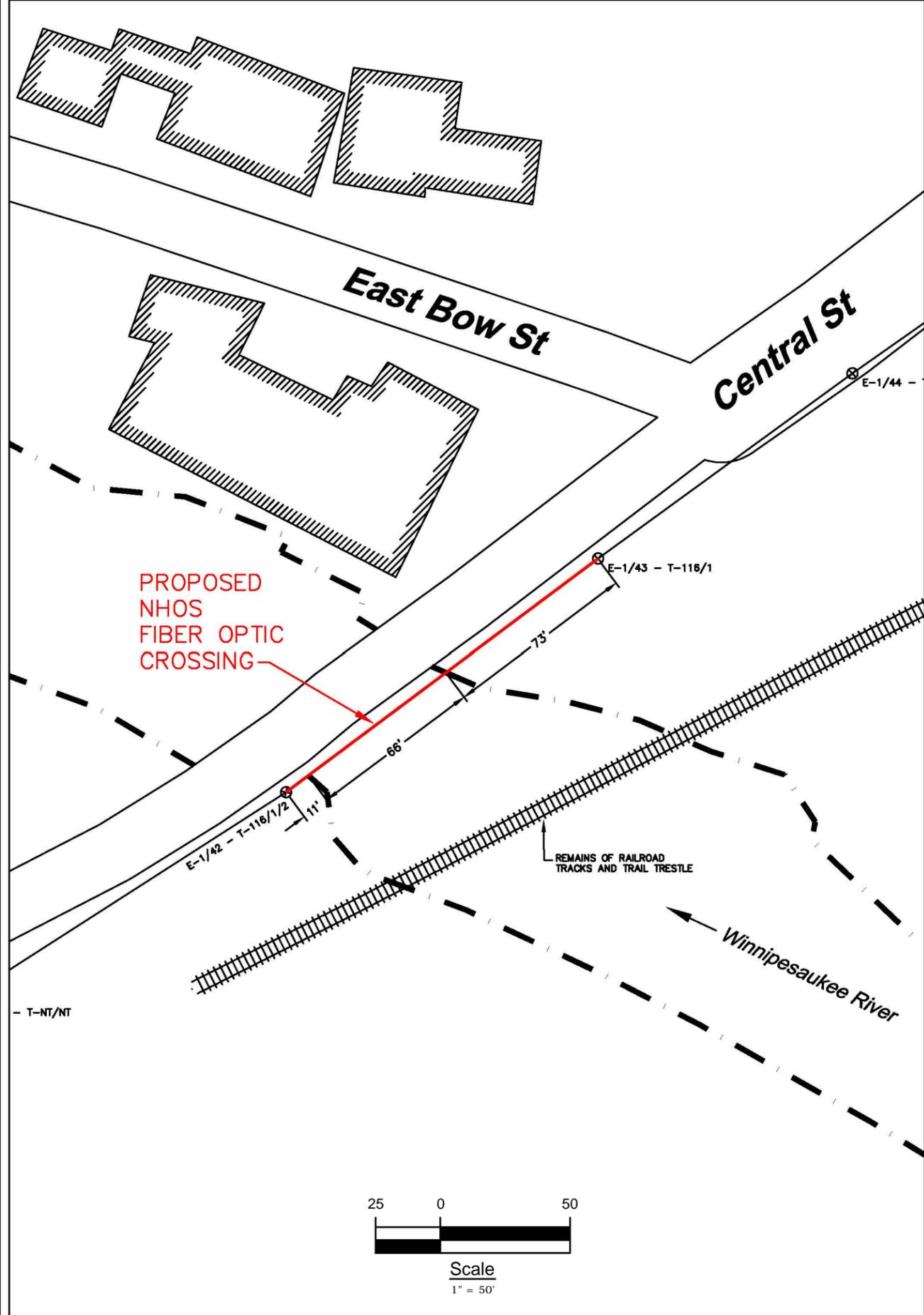
New Hampshire Optical Systems, Inc.  
99 Pine Hill Rd.  
Nashua, NH 03063  
(603-821-6467)

Project #TID-36-PRI-15  
Drawing #AC-CAN-RIV-6

Date: 01/26/12  
Revision # 1

Proposed  
Mascoma River Crossing  
Canaan, NH

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



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

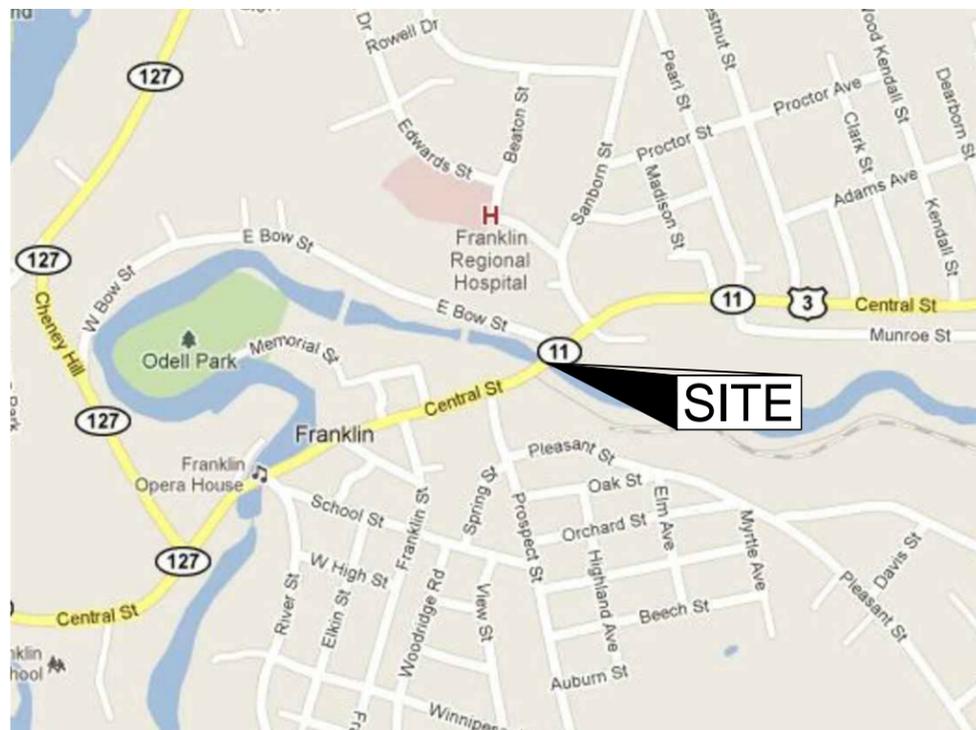
Project #TID-14 - Primary 15  
Drawing #AC-FRA-RIV-2

Date 09/20/11  
Revision #

**Proposed Stream Crossing Franklin, NH**

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

Sheet 1 of 2



LOCUS MAP  
(Not to Scale)



Spanmaster® Release 3.1 Sag / Tension Computations

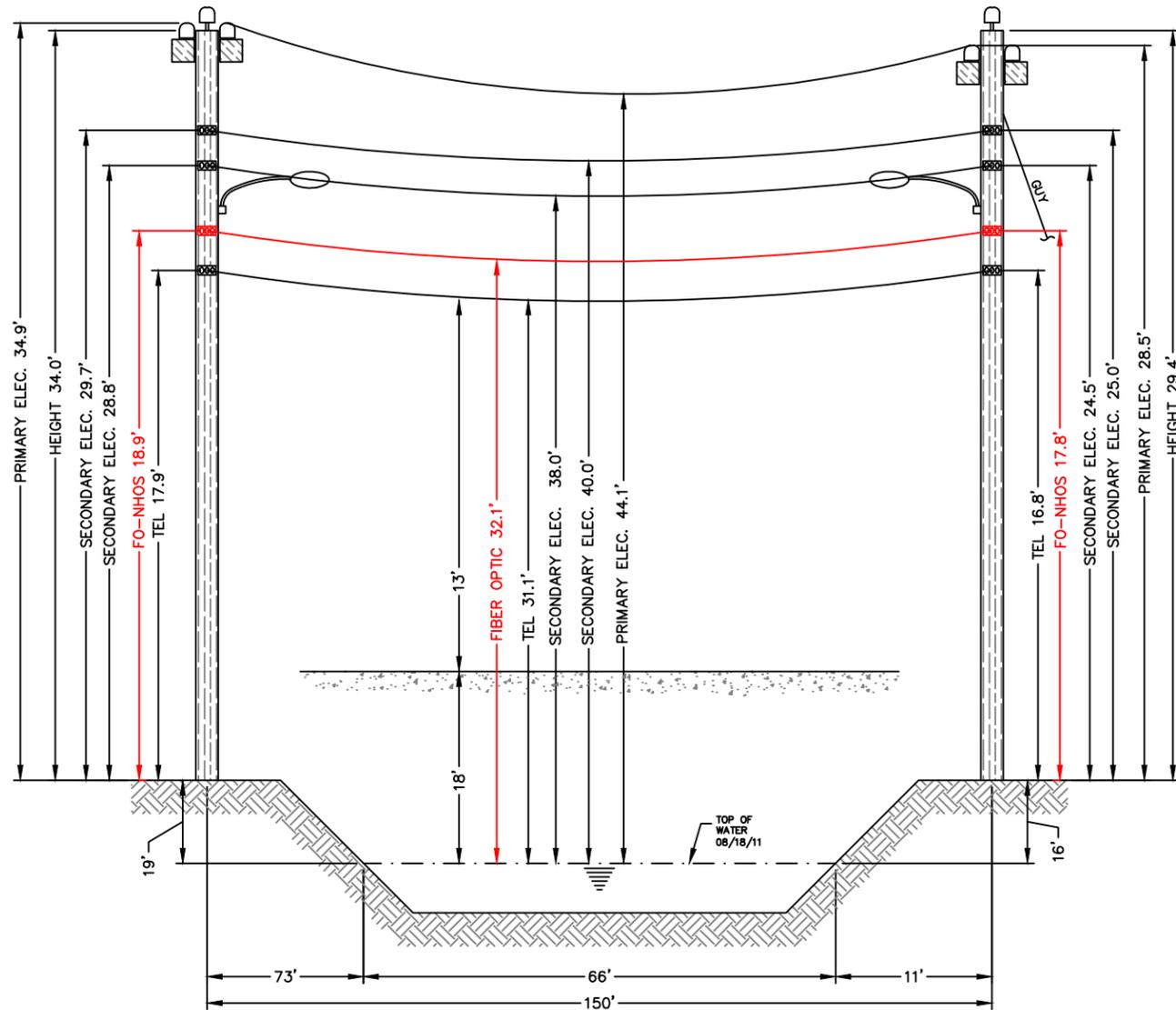
Waveguide  
River and Rail Crossings

Selected Cables	X-SECT AREA (sq.in)	EFF MODULUS (psi)	NOMINAL DIAM (in)	EFF.EXP. COEFF. (1/F)	CABLE WEIGHT (lb/ft)	E'A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-288-LN Bundle	0.5782	2.70E+05	1.108	1.13E-05	0.1960	155982	651

**NESC RESULTS**

Loading Condition	Temp. (F)	Ice Load (lb/ft)	Ice Thick (in)	Wind Constant (lb/ft)	Horz Wind Load (lb/ft)	Result Load (lb/ft)	Sag (ft)	Tension (lb)	% Len Chg From Input Conditions	Sag @ 7% (ft)	Horz Sag Comp (ft)	Vert Sag Comp (ft)	Vector Angle Deg
Rule 251 - Heavy	0.0	1.000	.50	.3	4.0	1.793	3.00	1680	0.08	3.00	1.41	2.64	28.1
232A1	120.0	0.000	.00	.0	0.0	0.317	1.88	475	0.02	1.88	0.00	1.88	0.0

Span Length = 150.00 ft	Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
Span Sag = 1.50 ft (18.0 in)	-40.0	.89	999	-0.02	N/A
Span Tension = 594 lb	-30.0	.93	956	-0.02	N/A
Max Load = 6,650 lb	-20.0	.97	913	-0.02	N/A
Usable load (60%) = 3,990 lb	-10.0	1.02	872	-0.01	N/A
Catenary Length = 150.040 ft	.0	1.07	832	-0.01	N/A
Stress Free Length @ Installed Temperature = 149.943 ft	10.0	1.12	793	-0.01	N/A
	20.0	1.18	756	-0.01	N/A
	30.0	1.24	720	-0.01	N/A
	40.0	1.30	686	-0.01	N/A
	50.0	1.36	654	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	496	0.01	N/A
	120.0	1.88	475	0.02	N/A
	130.0	1.95	456	0.02	N/A
	140.0	2.03	439	0.02	N/A



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

E-1/42 - T-116/2  
(Existing joint owned utility pole (Fairpoint/PSNH) in existing Right-of-Way)



E-1/43 - T-116/1

**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 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 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 264 and as directed by pole owners.



E-1/42 - T-116/2

**Notes:**

- The heights of structures shown hereon are based on field measurements taken with a Nikon 362 total station during a site survey on 08/18/11.
- The horizontal distance between the nearest bridge edge and the existing overhead wires ranges from 6' to 7'.
- 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
- The smallest vertical distance from the top of existing bridge deck to the lowest existing overhead wires is 13'.
- The vertical distance between the top of water and bridge deck is approximately 18'.
- Vertical distances are representative of attachment heights after utility make ready moves are completed.



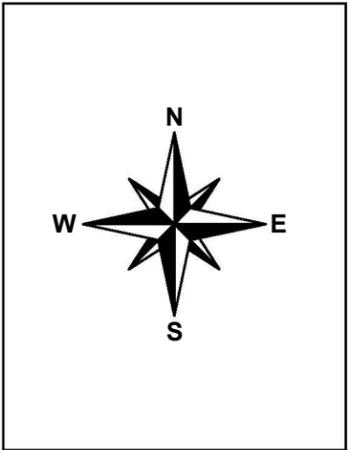
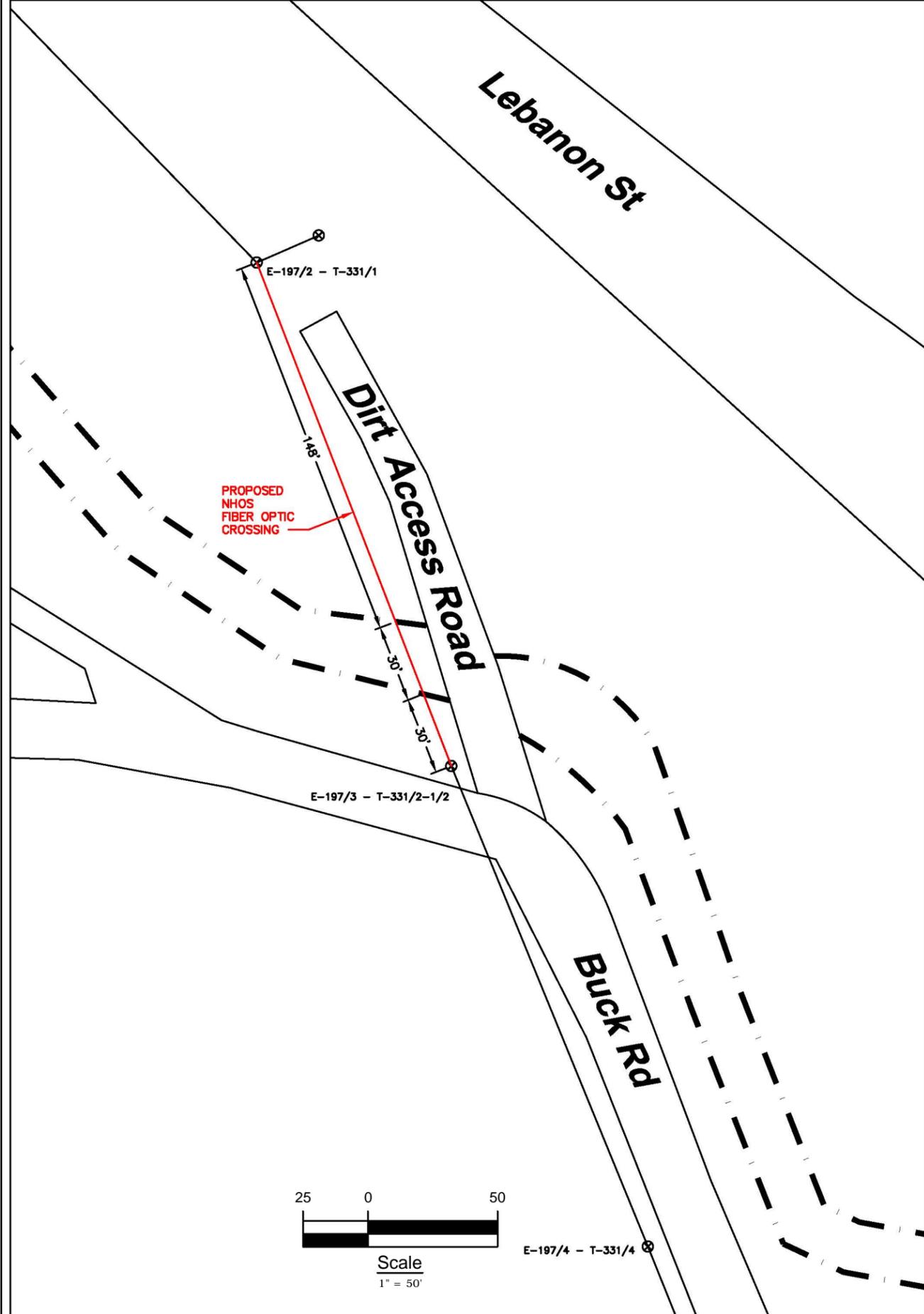
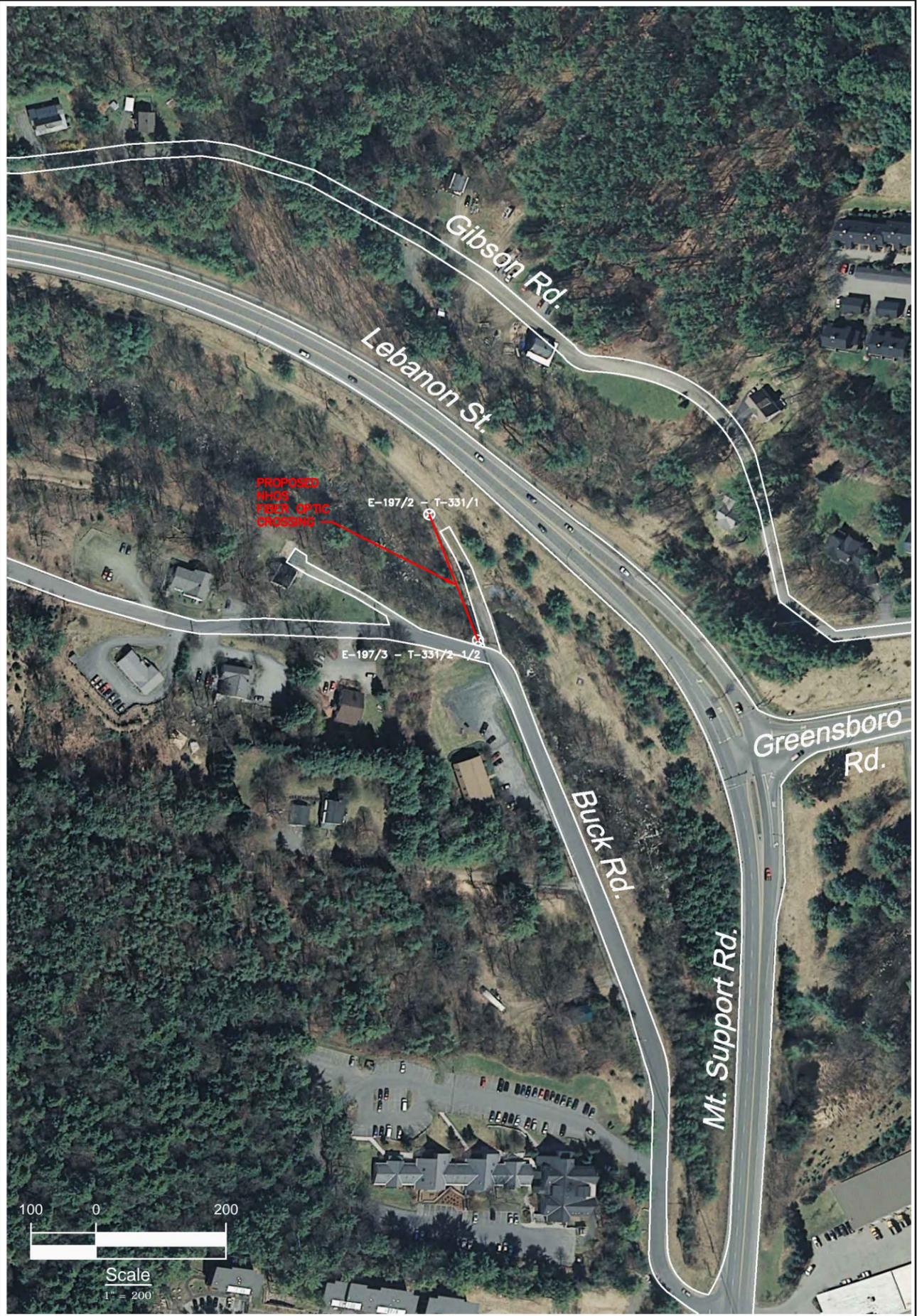
New Hampshire Optical Systems, Inc.  
99 Pine Hill Rd.  
Nashua, NH 03063  
(603-821-6467)

Project #TID-14 - Primary 15  
Drawing #AC-FRA-RIV-2

Date 09/20/11  
Revision #

**Proposed  
Stream Crossing  
Franklin, NH**

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



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

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

Date: 01/25/12  
 Revision # 1

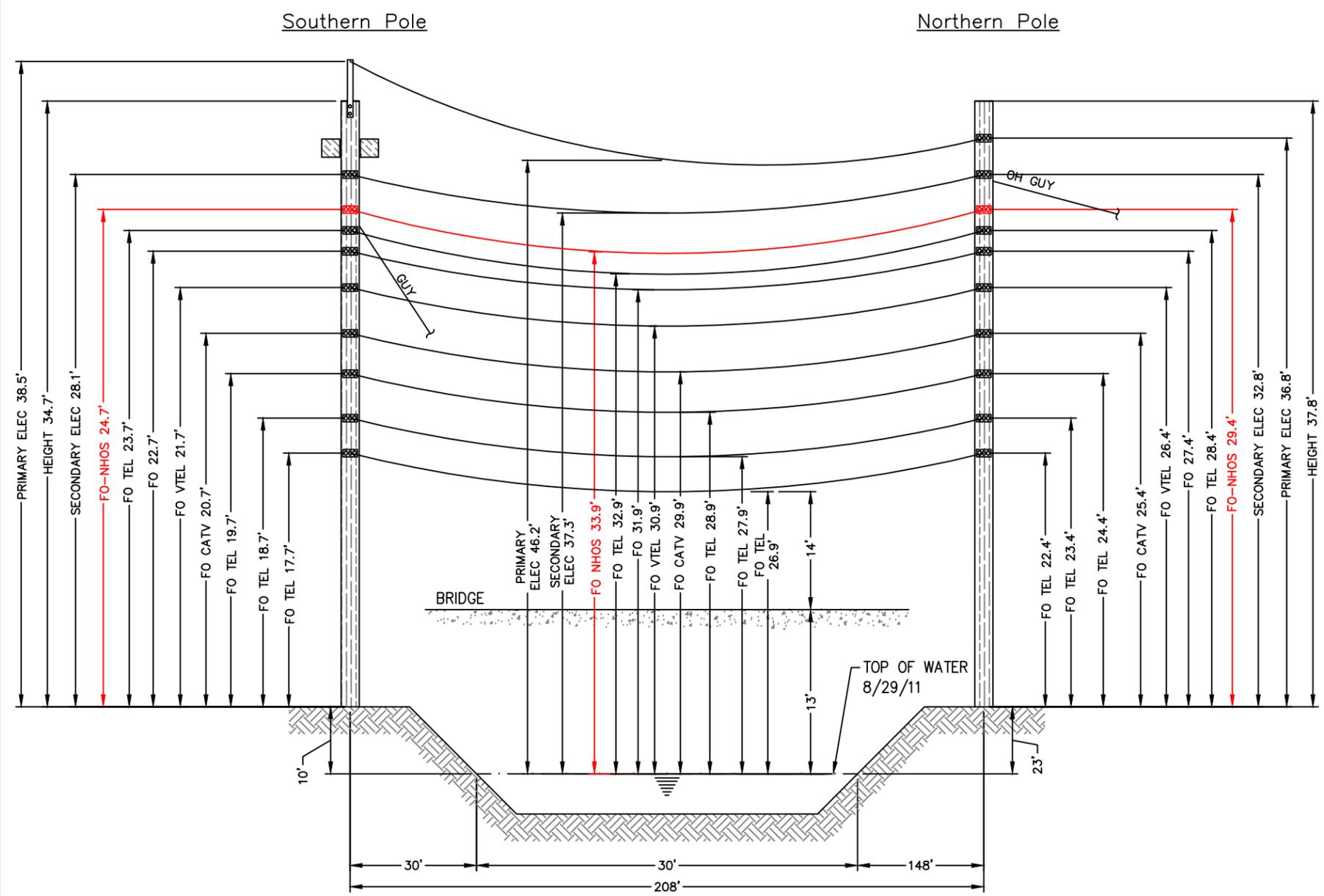
Proposed  
 Stream Crossing  
 Hanover, NH

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

Sheet 1 of 2



LOCUS MAP  
(Not to Scale)



- Notes:**
- The heights of structures shown herein are based on field measurements taken with a Nikon 362 total station during a site survey on 08/29/11.
  - The horizontal distance between the nearest bridge edge and the existing overhead wires ranges from 10' to 11'.
  - 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.
  - The smallest vertical distance from the top of existing bridge deck to the lowest existing overhead wires is 14'.
  - The vertical distance between the top of water and bridge deck is approximately 13'.
  - Vertical distances are representative of attachment heights after utility make ready moves are completed.



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)	E'A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-288-LN Bundle	0.5782	2.70E+05	0.858	1.13E-05	0.1960	155982	651
			1.108		0.3170		

**NESC RESULTS**

Loading Condition	Temp. (F)	Ice Load (lb/ft)	Ice Thick (in)	Wind Constant (lb/ft)	Horz Wind Load (lb/ft)	Result Load (lb/ft)	Sag (ft)	Tension (lb)	% Len Chg From Input Conditions	Sag @ Point 104 (ft)	Horz Sag Comp (ft)	Vert Sag Comp (ft)	Vector Angle (Deg)
Rule 251 - Heavy	0.0	1.000	.50	.3	4.0	1.793	4.57	2115	0.10	4.58	2.15	4.03	28.1
232A1	120.0	0.000	.00	.0	0.0	0.317	2.52	681	0.01	2.52	0.00	2.52	0.0

	Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
Span Length = 208.00 ft					
Span Sag = 2.08 ft (25.0 in)					
Span Tension = 824 lb	-40.0	1.37	1,247	-0.02	N/A
Max Load = 6,650 lb	-30.0	1.42	1,204	-0.01	N/A
Usable load (60%) = 3,990 lb	-20.0	1.47	1,162	-0.01	N/A
Catenary Length = 208.055 ft	-10.0	1.53	1,120	-0.01	N/A
Stress Free Length @ Installed Temperature = 207.868 ft	.0	1.59	1,079	-0.01	N/A
Unloaded Strand Sag = 1.02 ft (12.3 in) 0.49 % Tension = 639 lb	10.0	1.65	1,039	-0.01	N/A
	20.0	1.71	1,000	-0.01	N/A
	30.0	1.78	962	-0.01	N/A
	40.0	1.85	925	-0.01	N/A
	50.0	1.92	890	0.00	N/A
	60.0	2.00	856	0.00	N/A
	70.0	2.08	823	0.00	N/A
	80.0	2.16	792	0.00	N/A
	90.0	2.25	762	0.00	N/A
	100.0	2.34	733	0.01	N/A
	110.0	2.43	706	0.01	N/A
	120.0	2.52	681	0.01	N/A
	130.0	2.61	656	0.02	N/A
	140.0	2.70	634	0.02	N/A

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 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 (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 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 264 and as directed by pole owners.



E-197/2 - T-331/1



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

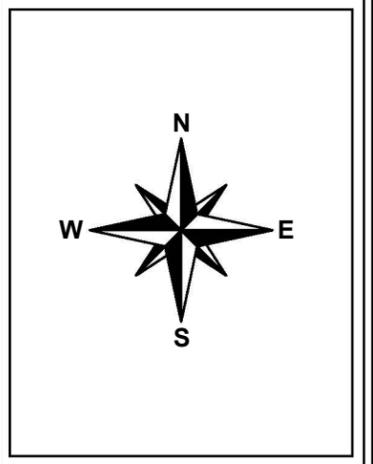
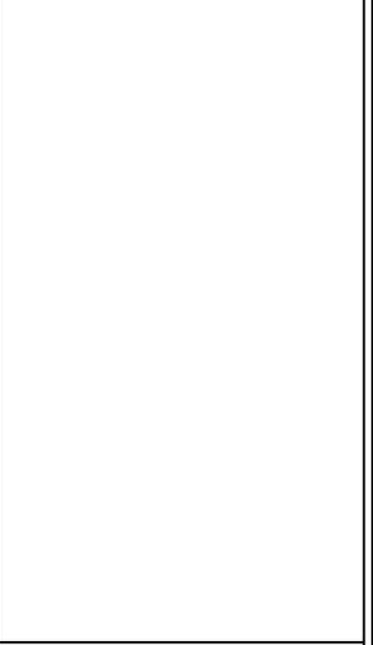
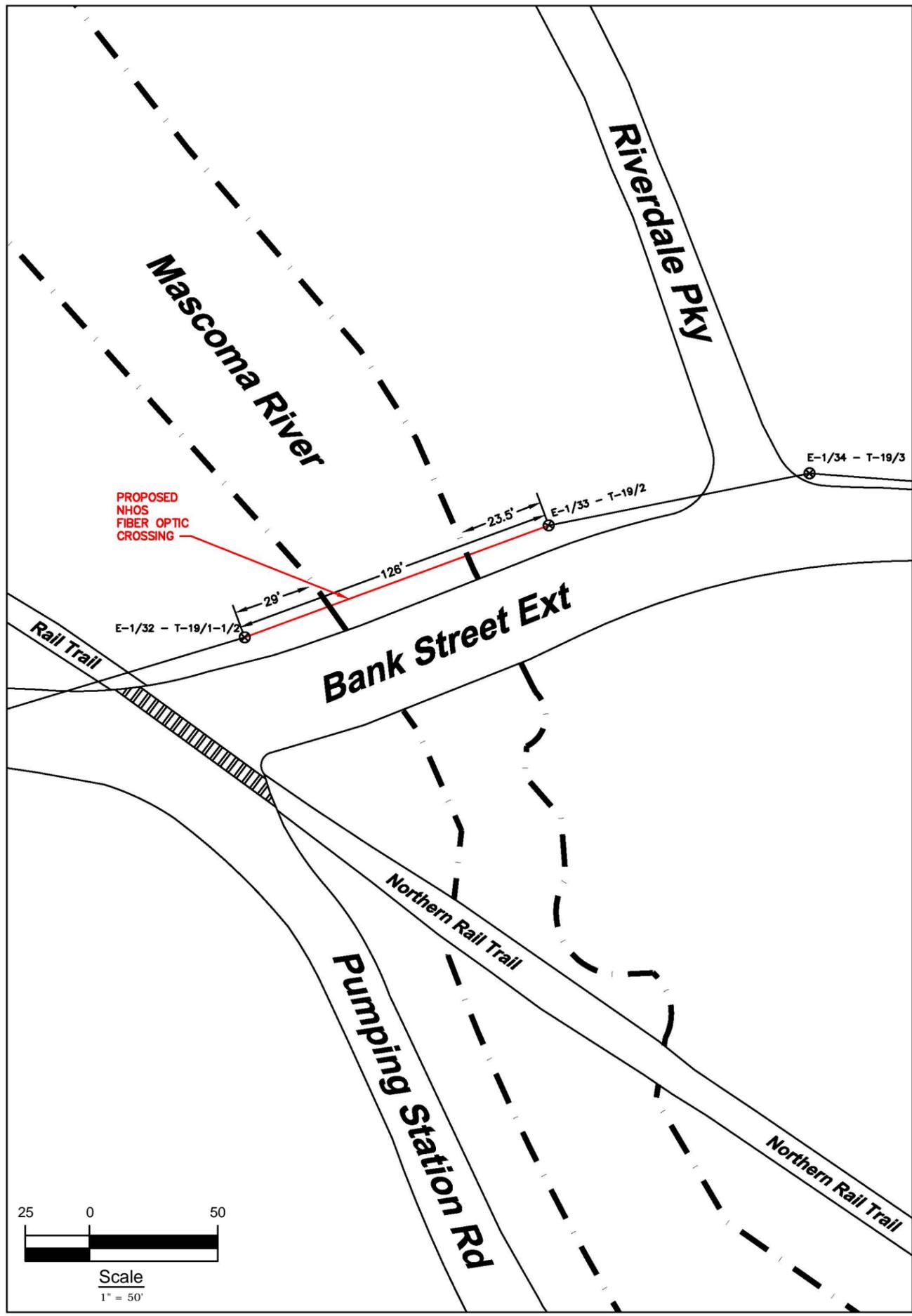
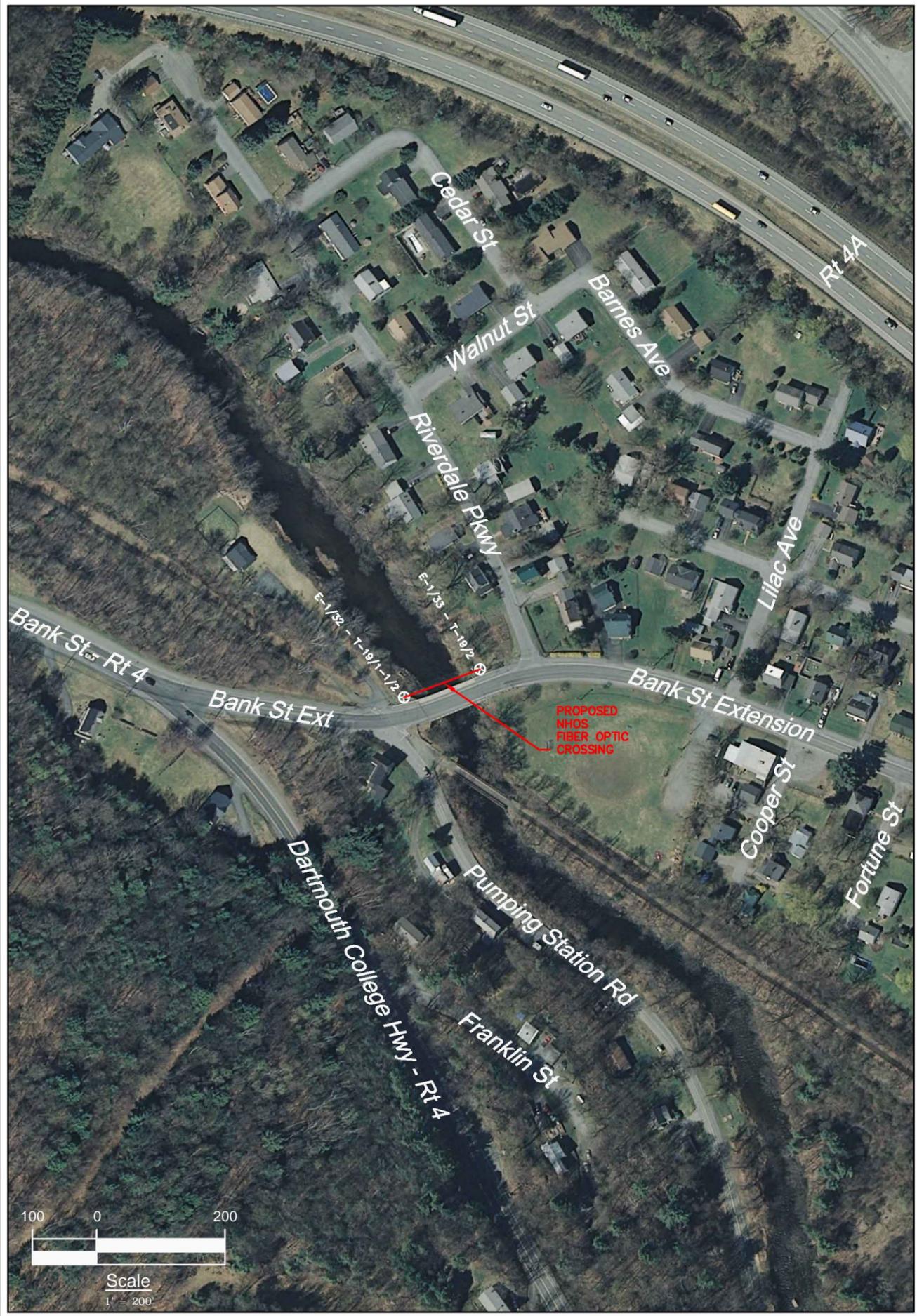
Project # TID-43 - Primary 15  
Drawing #AC-HAN-RIV-1

Date: 01/25/12  
Revision # 1

**Proposed Stream Crossing**  
Hanover, NH

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

Sheet 2 of 2



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

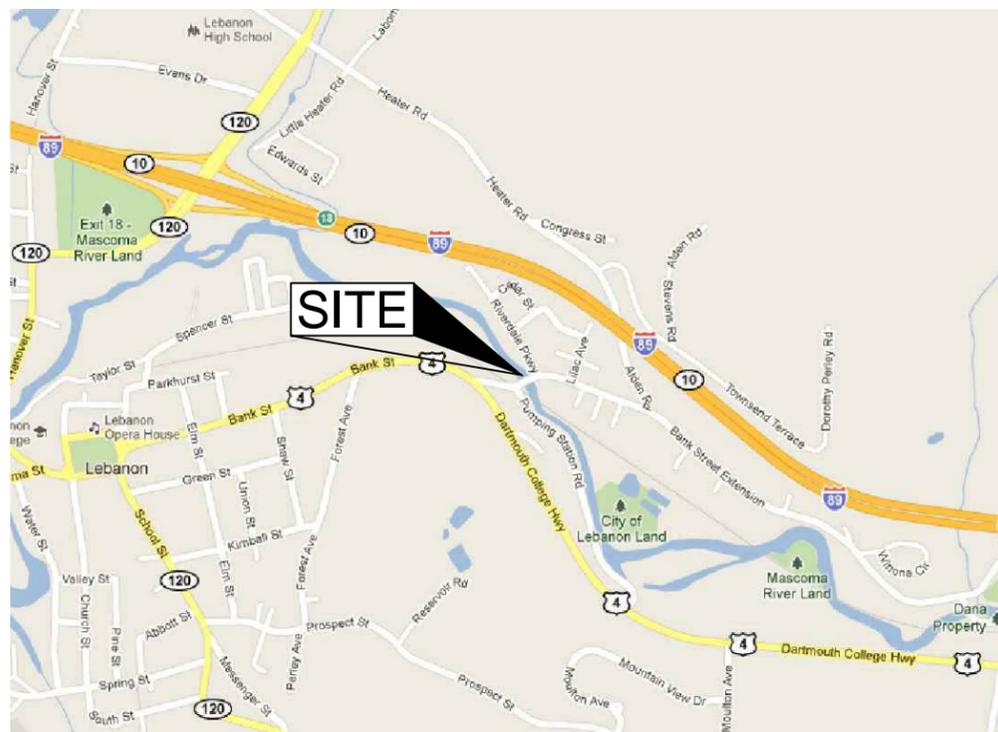
Project # TID-44  
 Drawing # AC-LEB-RIV-4

Date: 01/25/12  
 Revision # 1

Proposed Mascoma  
 River Crossing  
 Lebanon, NH

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

Sheet 1 of 2



LOCUS MAP  
(Not to Scale)



Spanmaster® Release 3.1 Sag / Tension Computations  
09/01/11 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)	E*A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-144-LN Bundle	0.4307	3.50E+05	0.741	1.09E-05	0.1520	150720	640
			0.991		0.2730		

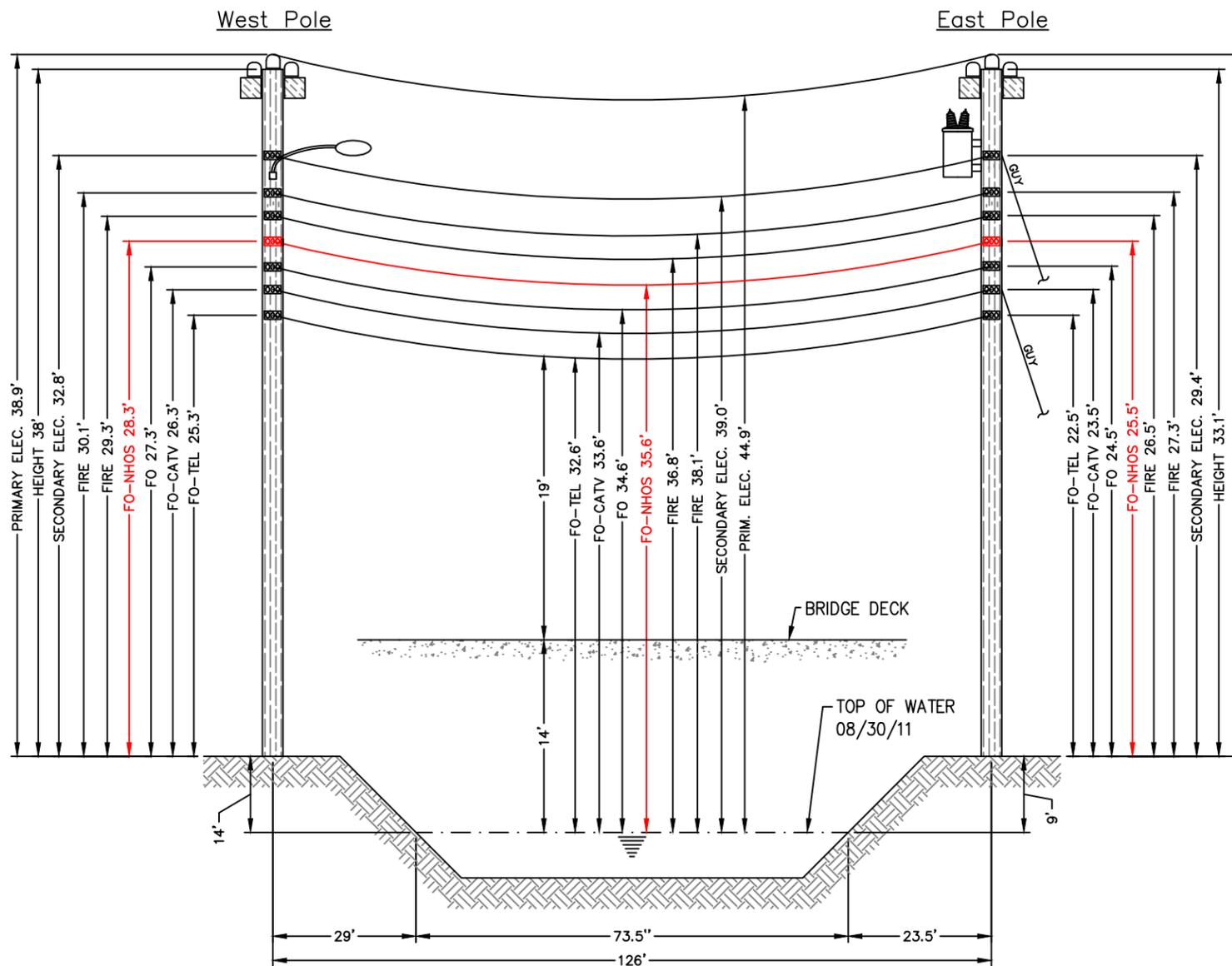
**NESC RESULTS**

Loading Condition	Temp. (F)	Ice Load (lb/ft)	Ice Thick (in)	Wind Constant (lb/ft)	Horz Load (lb/ft)	Result Load + Const (lb/ft)	Sag (ft)	Tension (lb)	% Len Chg From Input Conditions	Sag @ Point 63 (ft)	Horz Sag Comp (ft)	Vert Sag Comp (ft)	Vector Angle (Deg)
Rule 251 - Heavy	0.0	0.927	.50	.3	4.0	1.671	2.36	1402	0.07	2.37	1.14	2.07	28.9
232A1	120.0	0.000	.00	.0	0.0	0.273	1.62	334	0.02	1.62	0.00	1.62	0.0

Span Length = 126.00 ft  
Span Sag = 1.26 ft (15.1 in)  
Span Tension = 430 lb  
Max Load = 6,650 lb  
Usable load (60%) = 3,990 lb  
Catenary Length = 126.034 ft  
Stress Free Length @  
Installed Temperature = 125.974 ft

Unloaded Strand  
Sag = .83 ft (9.9 in) 0.66 %  
Tension = 291 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	.66	816	-0.02	N/A
-30.0	.70	773	-0.02	N/A
-20.0	.74	731	-0.02	N/A
-10.0	.78	690	-0.02	N/A
.0	.83	650	-0.02	N/A
10.0	.88	613	-0.01	N/A
20.0	.94	577	-0.01	N/A
30.0	1.00	543	-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	386	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  
(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)



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

**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 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 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 264 and as directed by pole owners.



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

**Notes:**

- The heights of structures shown hereon are based on field measurements taken with a Nikon 362 total station during a site survey on 08/30/11.
- The horizontal distance between the nearest bridge edge and the existing overhead wires ranges from 6' to 7'.
- The smallest vertical distance from the top of existing bridge structure to the lowest existing overhead wires is approximately 19'.
- The vertical distance between the top of water and bridge deck is approximately 14'.
- 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.
- Vertical distances are representative of attachment heights after utility make ready moves are completed.



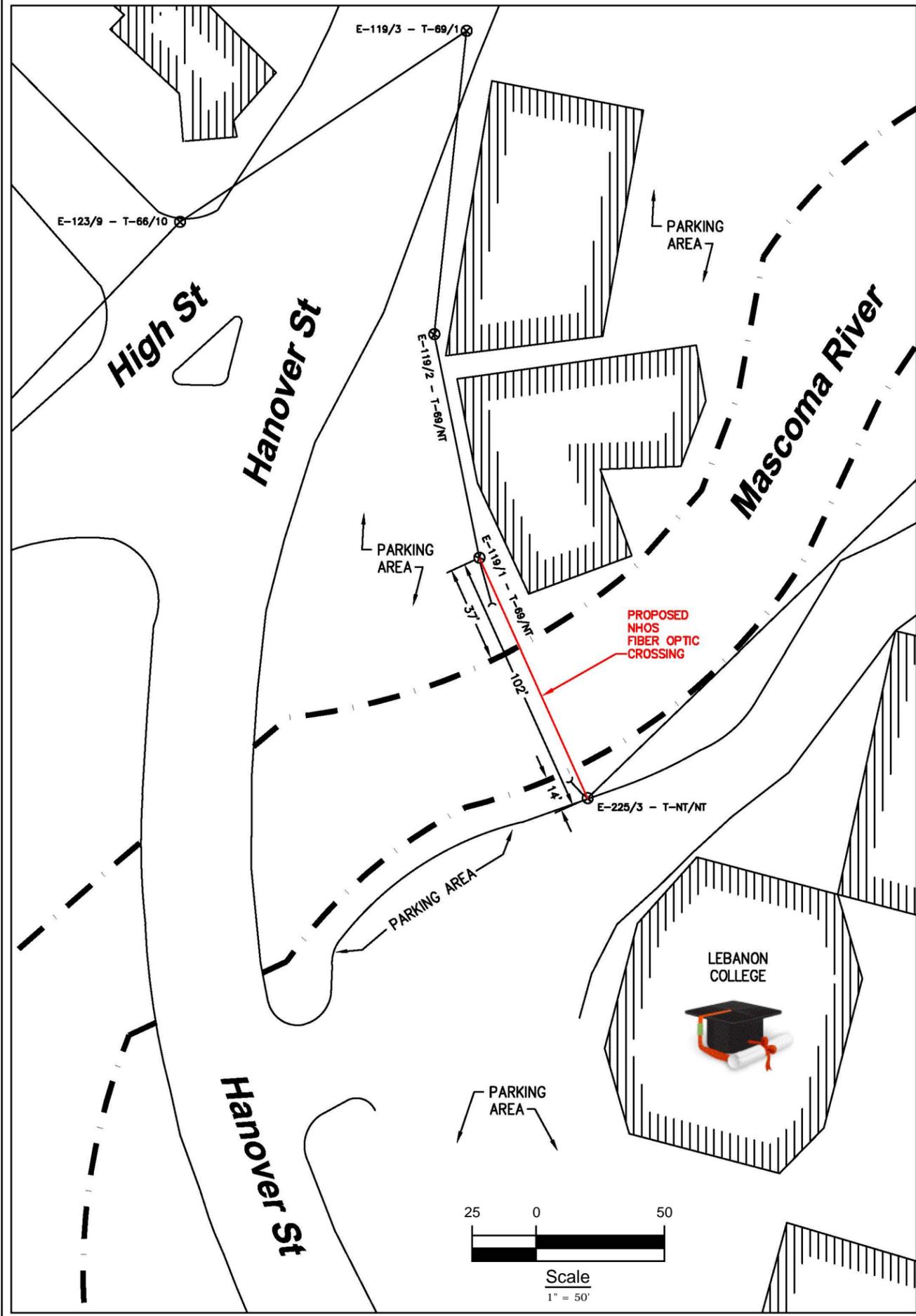
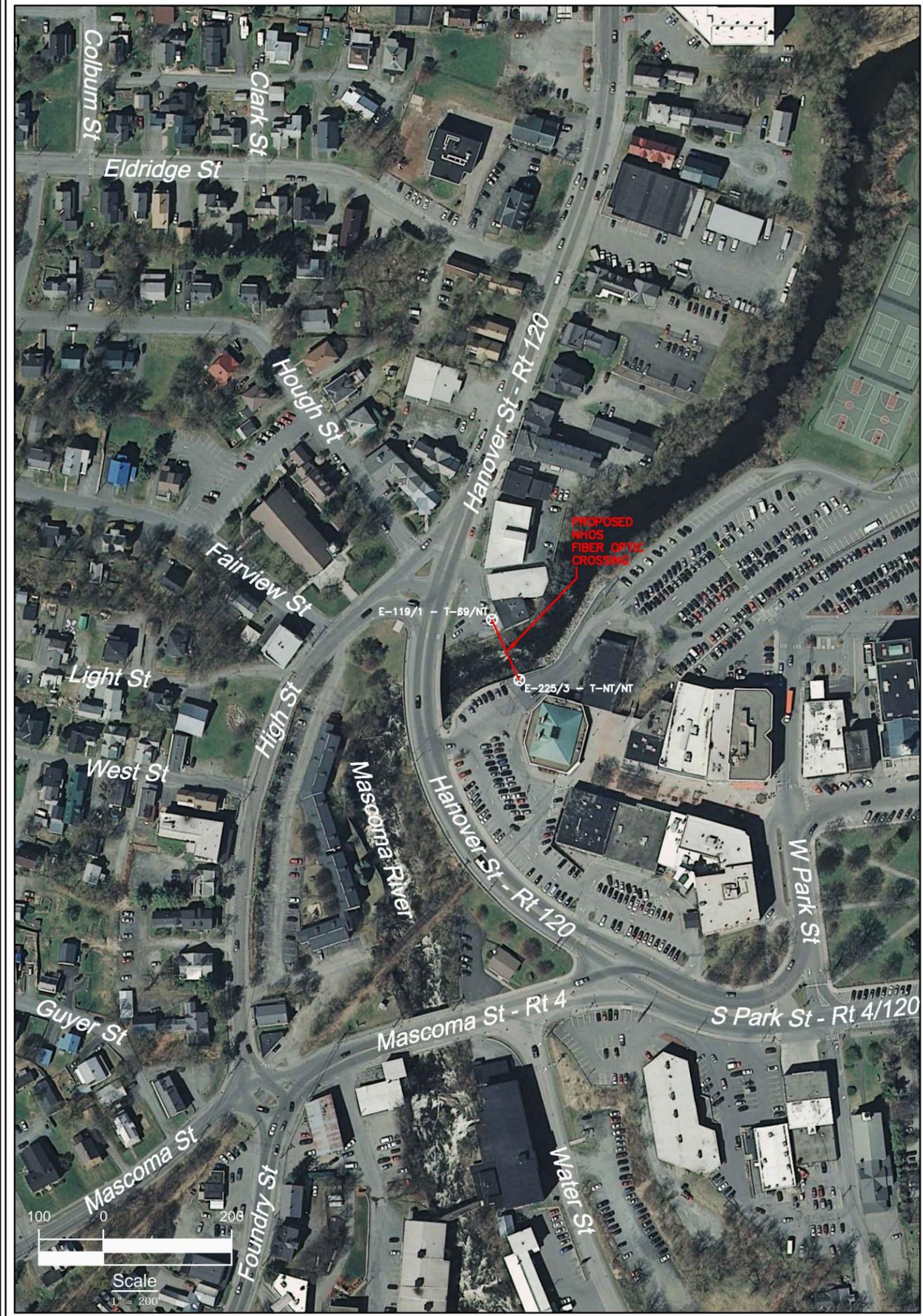
New Hampshire Optical Systems, Inc.  
99 Pine Hill Rd.  
Nashua, NH 03063  
(603-821-6467)

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

Date: 01/25/12  
Revision # 1

Proposed Mascoma  
River Crossing  
Lebanon, NH

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



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

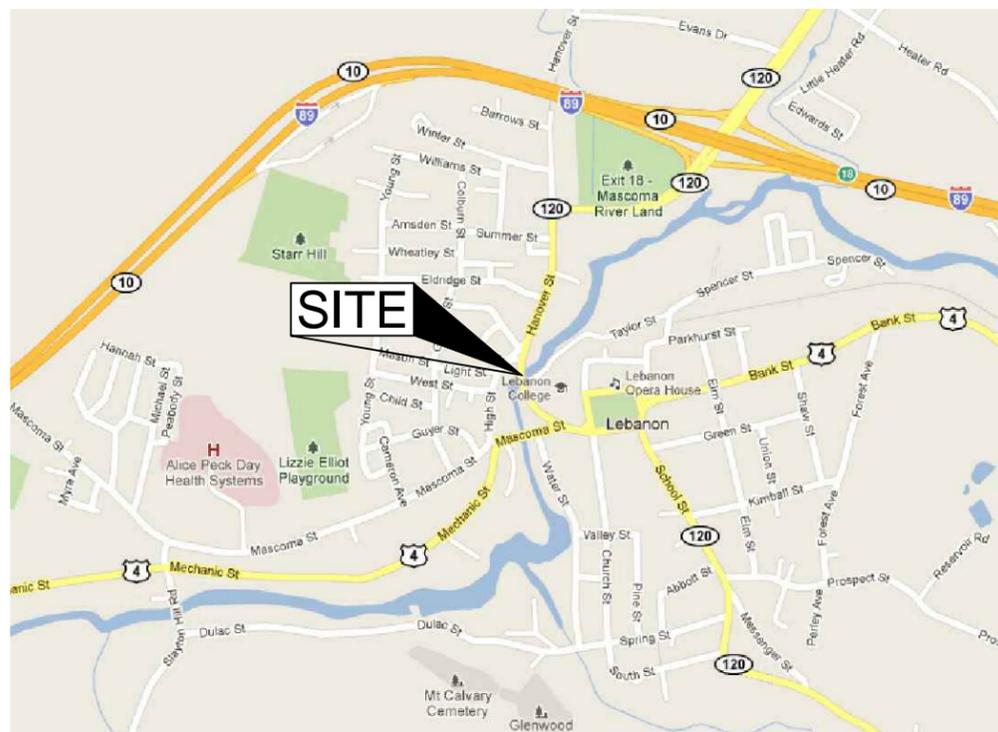
Project # TID-47-PRI-15  
Drawing # AC-LEB-RIV-2

Date: 01/25/12  
Revision # 1

**Proposed Mascoma River Crossing  
Lebanon, NH**

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

Sheet 1 of 2



LOCUS MAP  
(Not to Scale)



Spanmaster® Release 3.1 Sag / Tension Computations  
09/01/11 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)	E*A LOAD BEARING CAPACITY (lbs)	MAX. RATED LOAD (lbs)
1/4"6.6mEHS	0.0352	2.60E+07	0.250	5.60E-06	0.1210	914940	6650
ORF-O-144-LN Bundle	0.4307	3.50E+05	0.741	1.09E-05	0.1520	150720	640
			0.991		0.2730		

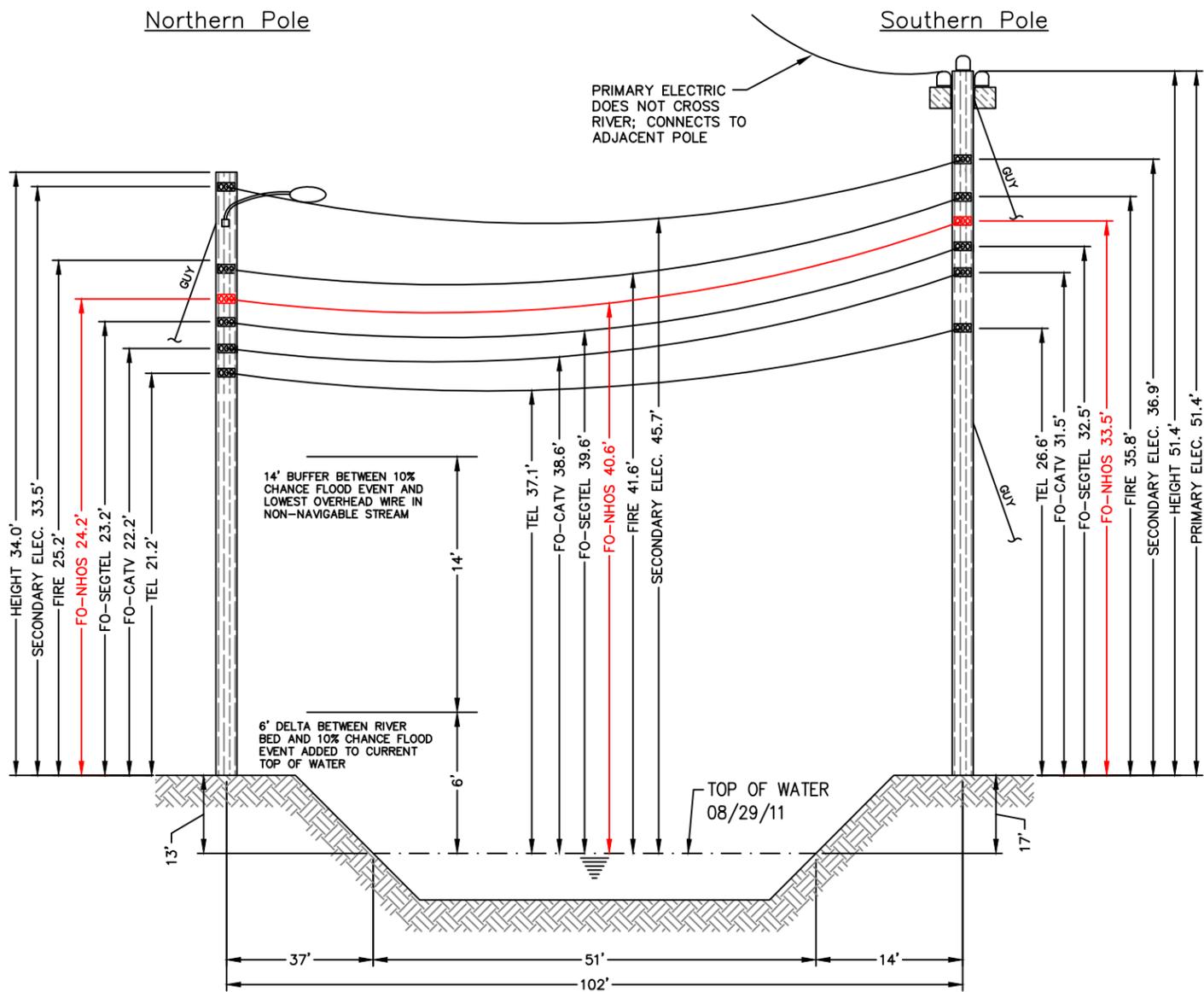
**NESC RESULTS**

Loading Condition	Temp. (F)	Ice Load (lb/ft)	Ice Thick (in)	Wind Constant (lb/ft)	Horz Wind Load (lb/ft)	Result Load + Const (lb/ft)	Sag (ft)	Tension (lb)	% Len Chg From Input Conditions	Sag @ Point 51 ft	Horz Sag Comp (ft)	Vert Sag Comp (ft)	Vector Angle (Deg)
Rule 251 - Heavy	0.0	0.927	.50	.3	4.0	1.671	1.79	1213	0.06	1.79	0.87	1.57	28.9
232A1	120.0	0.000	.00	.0	0.0	0.273	1.34	266	0.02	1.33	0.00	1.34	0.0

Span Length = 102.00 ft  
Span Sag = 1.02 ft (12.2 in)  
Span Tension = 348 lb  
Max Load = 6,650 lb  
Usable load (60%) = 3,990 lb  
Catenary Length = 102.027 ft  
Stress Free Length @  
Installed Temperature = 101.988 ft

Unloaded Strand  
Sag = .71 ft (8.5 in) 0.70 %  
Tension = 222 lb

Temp (F)	Midspan Sag (ft)	Tension (lb)	% Length Change	Clearance
-40.0	.49	723	-0.02	N/A
-30.0	.52	680	-0.02	N/A
-20.0	.56	637	-0.02	N/A
-10.0	.59	597	-0.02	N/A
.0	.64	557	-0.02	N/A
10.0	.68	520	-0.01	N/A
20.0	.73	485	-0.01	N/A
30.0	.78	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)

**Notes:**

- The heights of structures shown hereon are based on field measurements taken with a Nikon 362 total station during a site survey on 08/29/11.
- The horizontal distance between the nearest bridge edge and the existing overhead wires is over 100'.
- The waterway is classified as not suitable for sail boating and per NESC Table 232-1 a vertical clearance of 14' must be maintained between the lowest conductor and 10 year floodplain.
- Based on the FEMA Flood Profile for the Mascoma River (Page 86P) a conservative 10 year flood elevation was calculated by adding the delta between the river bed elevation (562') and the 10 year flood elevation (568') to the surveyed water level and then the 14' buffer (for non-navigable streams) was added to that.
- Vertical distances are representative of attachment heights after utility make ready moves are completed.



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

Project # TID-47-PRI-15  
Drawing # AC-LEB-RIV-2

Date: 01/25/12  
Revision # 1

Proposed Mascoma River Crossing  
Lebanon, NH

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

Sheet 2 of 2



E-119/1 - T-69/NT

**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 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 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 264 and as directed by pole owners.



E-225/3 - T-NT/NT