

APPENDIX 13

NORTHERN PASS TRANSMISSION LLC PETITION TO CROSS LAND OWNED BY THE STATE

**STATE OF NEW HAMPSHIRE
BEFORE THE
PUBLIC UTILITIES COMMISSION**

NORTHERN PASS TRANSMISSION LLC

DOCKET NO. DE 15- _____

PETITION TO CROSS LAND OWNED BY THE STATE

Northern Pass Transmission LLC (NPT) requests, pursuant to RSA 371:17, that the New Hampshire Public Utilities Commission (Commission) grant licenses to construct and maintain electric lines at fourteen locations over and across lands owned by the State of New Hampshire in Stark, Northumberland, Lancaster, Dalton, Bethlehem, New Hampton, Hill, Franklin, Canterbury, Pembroke, and Allenstown, New Hampshire. Eight crossings are over land owned by the Department of Transportation (DOT), five crossings are over land owned by the Department of Resources and Economic Development (DRED), and one crossing is over land owned by the Adjutant General (AG).

1. NPT files this petition, pursuant to RSA 162-H:7, VII, with its application to the New Hampshire Site Evaluation Committee (SEC) for a Certificate of Site and Facility to construct and operate a 192-mile high voltage electric transmission line comprising a +/- 320 kV direct current line from the Canadian border at Pittsburg to the City of Franklin (DC Line) and a 345 kV alternating current line from the City of Franklin to the Town of Deerfield (AC Line), with related infrastructure (collectively, the Project). NPT understands that that the petition will be forwarded to the Commission pursuant to RSA 162-H:7, IV, and that the Commission will then docket the petition for its own administrative purposes.

2. The DC Line will cross over the Nash Stream State Forest, the Percy State Forest, the Cape Horn State Forest, the Groveton Branch of state-owned railroad at three locations, a

State Police firing range on DOT land, the William H. Thomas State Forest, and a DOT rail trail. The AC Line will cross over vacant land owned by DOT, the Concord-Lincoln Line of state-owned railroad at two locations, land owned by the Adjutant General, and Bear Brook State Park. The locations of the crossings are shown on the maps provided as Attachment A. Also provided as Attachment B is a master index of the crossings, which includes NPT and Public Service Company of New Hampshire d/b/a Eversource (PSNH) facilities. PSNH is contemporaneously filing a petition to cross land owned by the state for its facilities identified in Attachment B. In addition, fourteen appendices are included that provide a detailed description of each crossing, along with relevant construction details, material specifications, and design drawings.

3. RSA 371:17 requires any utility, corporation or individual seeking to construct and maintain cable, conduit or poles and associated wires and fixtures over, under or across land owned by the state to petition the Commission for approval of such crossing. Pursuant to RSA 371:20, the Commission shall grant such a petition following its review and determination that the license “may be exercised without substantially affecting the public rights in said... lands.”

4. NPT has also contemporaneously filed a Petition to Commence Business as a Public Utility.

5. In Dockets No. DG 00-145 and DG 00-207, the Commission considered a petition by EnergyNorth Natural Gas, Inc. (ENGI) to construct and maintain a natural gas pipeline under Little Cohas Brook and across land owned by the State in Londonderry, i.e., an abandoned railroad bed owned by the Department of Transportation. In that case, the Town of Londonderry argued that ENGI was required to show that the crossing was necessary in order to meet the reasonable requirements of service to the public. The Commission rejected that argument. It held that “the proper standard for reviewing petitions for licenses pursuant to RSA 371:17 is set

forth in RSA 371:20: whether the license petitioned for may be exercised without substantially affecting the public rights in said waters or lands.” The Commission also pointed out that “even private corporations and individuals may petition the Commission under RSA 371:17 for private purposes” and that the Commission had previously determined that “service by a public utility to even a single customer constitutes ‘service to the public.’” See Order No. 23, 657 (March 22, 2001) at p. 21.

6. NPT proposes to construct and maintain the Project in order to bring 1,090 megawatts of low-cost, renewable energy from Hydro-Québec to the New England power grid. The DC Line will run approximately 158 miles, terminating at a converter station to be built in Franklin, and the AC Line will run approximately 34 miles, terminating at a PSNH substation in Deerfield. While not required in order for the Commission to grant this petition, it is nevertheless the case that at the time NPT is authorized to engage in business in New Hampshire as a utility (by virtue of owning, operating and managing plant and equipment used in the transmission of electricity ultimately sold to the public) and it is granted a Certificate of Site and Facility by the SEC, it will be necessary, in order to meet the reasonable requirements of providing transmission service to the public, consistent with federal and state law, to cross the land owned by the state described above.

7. As explained below, NPT has the necessary rights to utilize the lands on either side of each crossing location. For background purposes, it is noted that the roughly 40-mile portion of the DC Line located between Pittsburg and Dummer, except for two segments totaling approximately eight miles that will be constructed under highways, will be located in new right-of-way (New ROW). NPT has option agreements for a leasehold interest in the approximately

32 miles of the New ROW. NPT does not seek to cross land owned by the State for this portion of the DC Line.

8. The DC Line intersects with PSNH right-of-way at the Dummer Substation. The overhead portions of the DC Line located between Dummer and Bethlehem, and between Bridgewater and Franklin, as well as the entirety of the AC Line, will be located within PSNH right-of-way (Existing ROW). NPT's use of the right-of-way for the Project pursuant to a lease agreement between NPT and PSNH is the subject of another petition that has been contemporaneously filed with the Commission. All fourteen crossings are located within the Existing ROW.

9. NPT has contemporaneously filed a petition with the DOT Bureau of Rails and Trails for permission to cross over the five state-owned railroad and one rail trail locations.

10. The proposed crossings will be constructed, maintained and operated by NPT in accordance with the 2012 National Electrical Safety Code (NESC) C2-2012, consistent with Puc 306.01(b)(1). Furthermore, those standards, as applied to railroads, are more stringent than the minimum clearance requirement set forth in RSA 373:39. Accordingly, the rights granted by the license sought in this Petition can be exercised by without substantially affecting the rights of the public to use the lands at the proposed crossings, and the use and enjoyment by the public will not be diminished as a result of NPT's plan to construct and maintain the Project as proposed.

WHEREFORE, NPT respectfully requests that the Commission:

- A. Find that the licenses petitioned for may be exercised without substantially affecting the public rights in the lands owned by the state that are the subject of this petition;
- B. Grant NPT licenses to construct and maintain electric lines over, under, or across the lands owned by the state identified in the petition;
- C. Issue an Order *Nisi* granting such licenses, consistent with Commission practice;
- D. Cause due notice to be given, pursuant to RSA 371:19, to the Attorney General and to such abutting owners of land as the Commission may designate; and
- E. Grant such other and further relief as may be just and equitable.

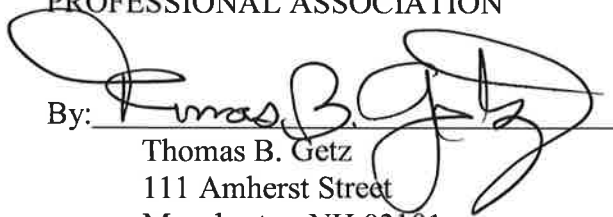
Respectfully submitted,

NORTHERN PASS TRANSMISSION LLC

By its Attorneys,
DEVINE, MILLIMET & BRANCH,
PROFESSIONAL ASSOCIATION

Dated: October 16, 2015

By:


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Manchester, NH 03101
(603) 695-8542
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ATTACHMENT A

PROJECT MAPS

Project Area

State Land Crossing

Existing Substation

Proposed Converter Station

Transition Station

Proposed Route

Existing Transmission ROW

Scenic Roads/Byways

City/Village

Town Boundary

LEGEND

County Boundary

State Boundary

Appalachian Trail

Public Lands and Conservation Easements

Primary Protecting Agency

Federal

State

Municipal/County

Other Public/Quasi-Public

Private

State Land Crossing Locations	
Line List #	State Land Name
2030	State of New Hampshire-Dept. of Resources & Economic Development
2034	State of New Hampshire-Dept. of Resources & Economic Development
2037	State of New Hampshire-Dept. of Resources & Economic Development
2236	State of New Hampshire-Bureau of Rail & Transit
2819	State of New Hampshire-Bureau of Rail & Transit
3109	State of New Hampshire-Bureau of Rail & Transit
12519	State of New Hampshire-Dept. of Resources & Economic Development
12547	State of New Hampshire-Dept. of Resources & Economic Development

Source: USGS 1:100,000 Topographic Quadrangles; NH GRANIT GIS Data; Vermont Center for Geographic Information; Esri; Burns & McDonnell.

Revised August 31, 2015

Project Area

State Land Crossing

Existing Substation

Proposed Converter Station

Transition Station

Proposed Route

Existing Transmission ROW

Scenic Roads/Byways

City/Village

Town Boundary

County Boundary

State Boundary

Appalachian Trail

Public Lands and Conservation Easements

Primary Protecting Agency

Federal

State

Municipal/County

Other Public/Quasi-Public

Private

State Land Crossing Locations

Line List #	State Land Name
6145	State of New Hampshire-Dept. of Transportation
6703	State of New Hampshire-Dept. of Resources & Economic Development William H. Thomas State Forest
6704	State of New Hampshire-Dept. of Resources & Economic Development William H. Thomas State Forest
6705	State of New Hampshire-Dept. of Resources & Economic Development William H. Thomas State Forest
7317.01	State of New Hampshire-Bureau of Rail & Transit

Source: USGS 1:100,000 Topographic Quadrangles; NH GRANIT GIS Data; Vermont Center for Geographic Information; Esri; Burns & McDonnell.

Revised August 31, 2015

Project Area

State Land Crossing

Existing Substation

Proposed Converter Station

Transition Station

Proposed Route

Existing Transmission ROW

Scenic Roads/Byways

City/Village

Town Boundary

County Boundary

State Boundary

Appalachian Trail

Airport

Public Lands and Conservation Easements

Primary Protecting Agency

Federal

State

Municipal/County

Other Public/Quasi-Public

Private

Map Index

State Land Crossing Locations

Line List #	State Land Name
7075	State of New Hampshire-Bureau of Rail & Transit
7076	State of New Hampshire-Dept. of Transportation
7317.01	State of New Hampshire-Bureau of Rail & Transit
7616.1	State of New Hampshire-Bureau of Rail & Transit
8954	State of New Hampshire-Adjutant General's Department
8957	State of New Hampshire-Adjutant General's Department
9300	State of New Hampshire-Dept. of Resources & Economic Development

NORTH

7,000 3,500 0 7,000

Feet

Northern Pass

State Land Crossings

South Section

Source: USGS 1:100,000 Topographic Quadrangles; NH GRANIT GIS Data; Vermont Center for Geographic Information; Esri; Burns & McDonnell.

Revised August 31, 2015

ATTACHMENT B

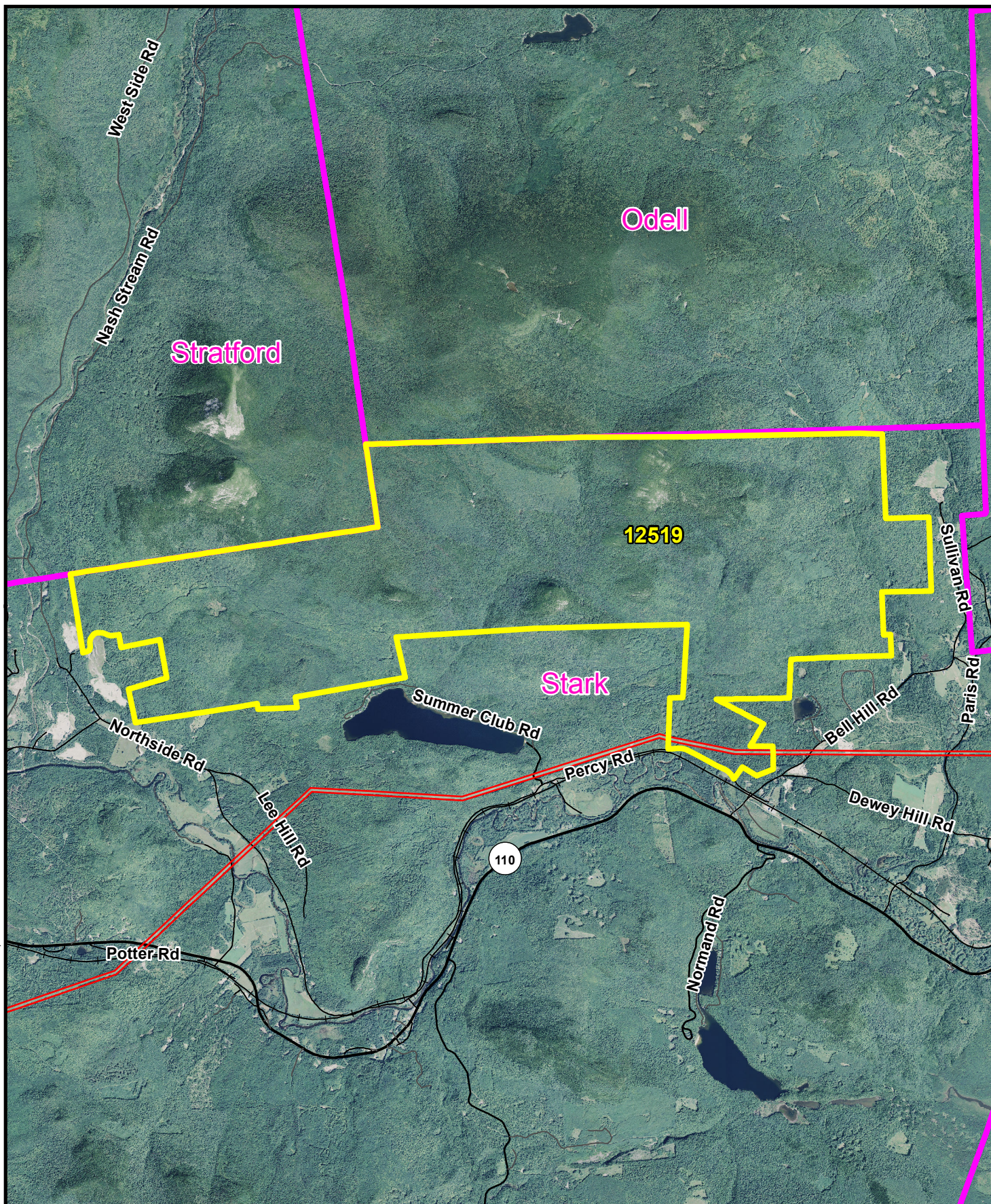
MASTER INDEX

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APPENDIX 1
3720/3731 DC LINE
STRUCTURES DC-395 TO DC-402
STATE OF NEW HAMPSHIRE- DEPARTMENT OF RESOURCES AND ECONOMIC DEVELOPMENT
NASH STREAM STATE FOREST
LL 12519
STARK, NH

1. This crossing is shown on attached drawing 372099005
 - a. This drawing shows a 30' terrain clearance line (offset from ground surface), which is greater than required minimum of 21.7'.
2. The location of the 3720/3731 line is shown on attached maps titled Line List 12519.
3. This portion of the 3720/3731 line will be on steel structures with foundations. The energized conductor (positive pole and negative pole for direct current) is in a horizontal configuration using a 2-bundle of 2933 kcmil AAAC for each pole. The structures will have 2 ground wires in a horizontal configuration. One will be 19#10 Alumoweld; the other will be an OPGW with sag coefficients similar to 19#10 Alumoweld.
 - a. The 3720/3731 line crosses the parcel LL 12519, State of New Hampshire – Department of Resources of Economic Development, Nash Stream State Forest for approximately 4080'.
4. Energized conductors will have a maximum tension of 20,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).
5. The 3720/3731 line is a 320 kV direct current (DC) line. Per NESC 230 the required clearances are applicable for both alternating and direct currents. To convert 320 kV DC to a corresponding alternating current (AC) voltage (for purposes of calculating clearances) take $320 \text{ kV} \times 3^{0.5} / 2^{0.5} = 392 \text{ kV}$. The equivalent phase to ground is calculated by taking $392 \times 105\%$ (voltage adder) divided by $3^{0.5} = 237.6$
6. Northern Pass Transmission, LLC (NPT) has investigated a multitude of weather and loading conditions for its design. NPT used these design conditions and combinations thereof to determine the minimum clearance of all conductors to both ground and aerial obstacles, between the phase conductors and OPGW cable. NPT has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations. All NESC clearances have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met.
 - a. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the ground will always exceed the minimum required NESC distance.

- b. 130 degrees F – Maximum operating temperature (energized conductor) based on NPT transmission standards the maximum sag for this weather case controls.



0 2,500 5,000
 Feet

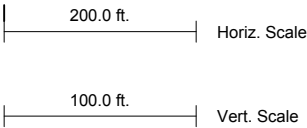
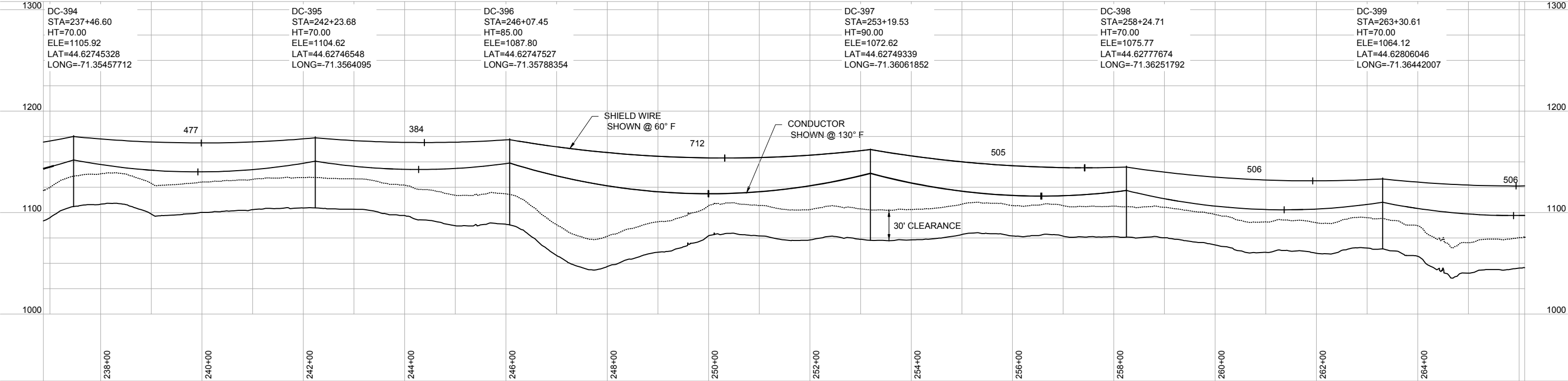
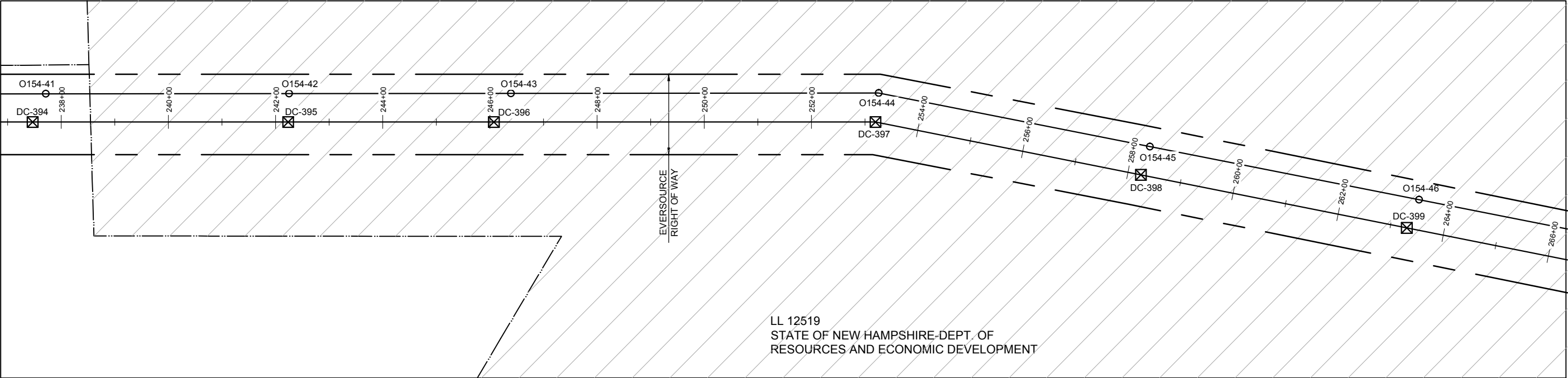
LEGEND

- Parcel Boundary
- Project ROW
- Town Boundary



Line List 12519
 State Land Crossing Permit
 Location Map

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PUBLIC LAND



PROPOSED MONOPOLE



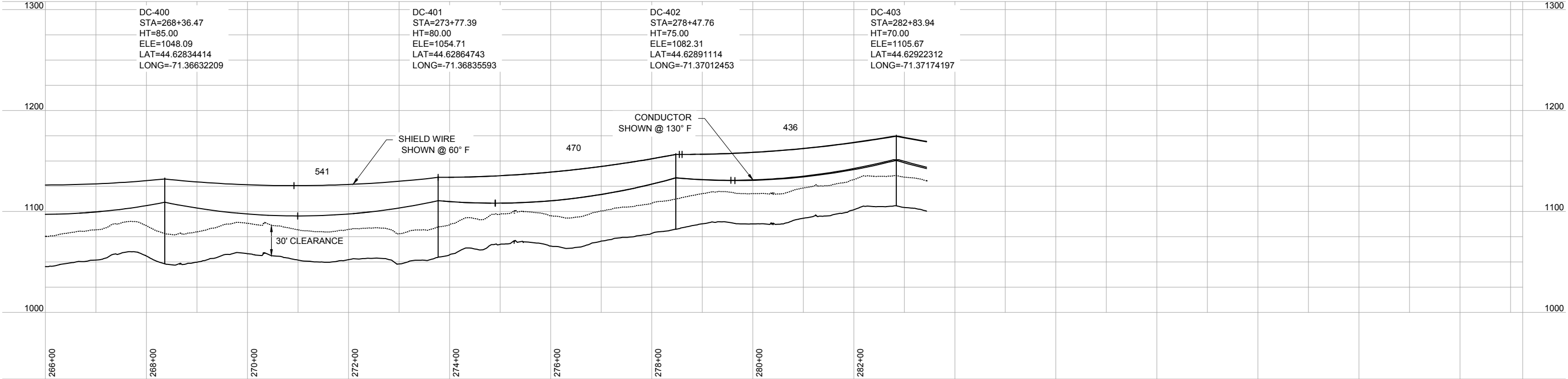
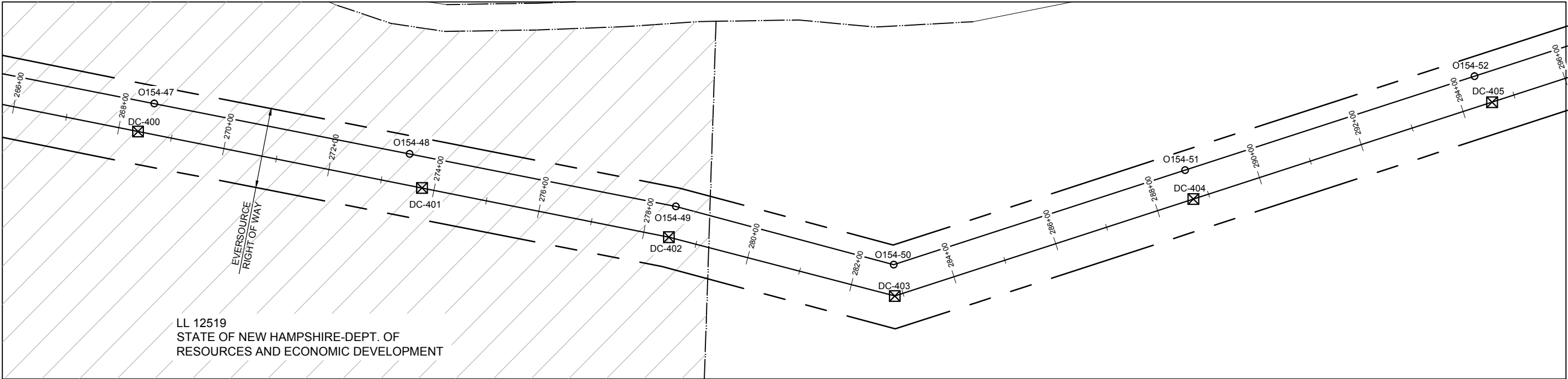
PROPOSED TRANS
STRUCTURE



**PRELIMINARY - NOT
FOR CONSTRUCTION**

REVISION HISTORY					
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		NORTHERN PASS LLC			
		TITLE N2 LL12519 3720/3731 STATE LAND CROSSING PERMIT SH. 1 OF 2			
BY	REV. NO.	DATE	SIZE	DWG. NO.	
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200.0 ft. Horiz. Scale

100.0 ft. Vert. Scale



PUBLIC LAND



PROPOSED MONOPOLE
PROPOSED TRANS
STRUCTURE

**PRELIMINARY - NOT
FOR CONSTRUCTION**

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		NORTHERN PASS LLC			
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BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 372099005.DWG	

APPENDIX 2
3720/3731 DC LINE
STRUCTURES DC-416 TO DC-419
STATE OF NEW HAMPSHIRE- DEPARTMENT OF RESOURCES AND ECONOMIC DEVELOPMENT
PERCY STATE FOREST
LL 12547
STARK, NH




1. This crossing is shown on attached drawing 372099006
 - a. This drawing shows a 30' terrain clearance line (offset from ground surface), which is greater than required minimum of 21.7'.
2. The location of the 3720/3731 line is shown on attached maps titled Line List 12547.
3. This portion of the 3720/3731 line will be on steel structures with foundations. For a portion of the crossing, the energized conductor (positive pole and negative pole for direct current) is in a horizontal configuration using a 2-bundle of 2933 kcmil AAAC for each pole. The structures will have 2 ground wires in a horizontal configuration. One will be 19#10 Alumoweld; the other will be an OPGW with sag coefficients similar to 19#10 Alumoweld. Another portion will be in a vertical configuration using a 2-bundle of 2933 kcmil AAAC for each pole. Structures in a vertical configuration will only have 1 ground wire, an OPGW with sag coefficients similar to 19#10 Alumoweld.
 - a. The 3720/3731 line crosses the parcel LL 12547 State of New Hampshire – Department of Resources of Economic Development, Percy State Forest for approximately 2000'.
4. Energized conductors will have a maximum tension of 20,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).
5. The 3720/3731 line is a 320 kV direct current (DC) line. Per NESC 230 the required clearances are applicable for both alternating and direct currents. To convert 320 kV DC to a corresponding alternating current (AC) voltage (for purposes of calculating clearances) take $320 \text{ kV} \times 3^{0.5} / 2^{0.5} = 392 \text{ kV}$. The equivalent phase to ground is calculated by taking $392 \times 105\%$ (voltage adder) divided by $3^{0.5} = 237.6$
6. Northern Pass Transmission, LLC (NPT) has investigated a multitude of weather and loading conditions for its design. NPT used these design conditions and combinations thereof to determine the minimum clearance of all conductors to both ground and aerial obstacles, between the phase conductors and OPGW cable. NPT has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations. All NESC clearances have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met.

- a. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the ground will always exceed the minimum required NESC distance.
- b. 130 degrees F – Maximum operating temperature (energized conductor) based on NPT transmission standards the maximum sag for this weather case controls.



0 400 800
Feet

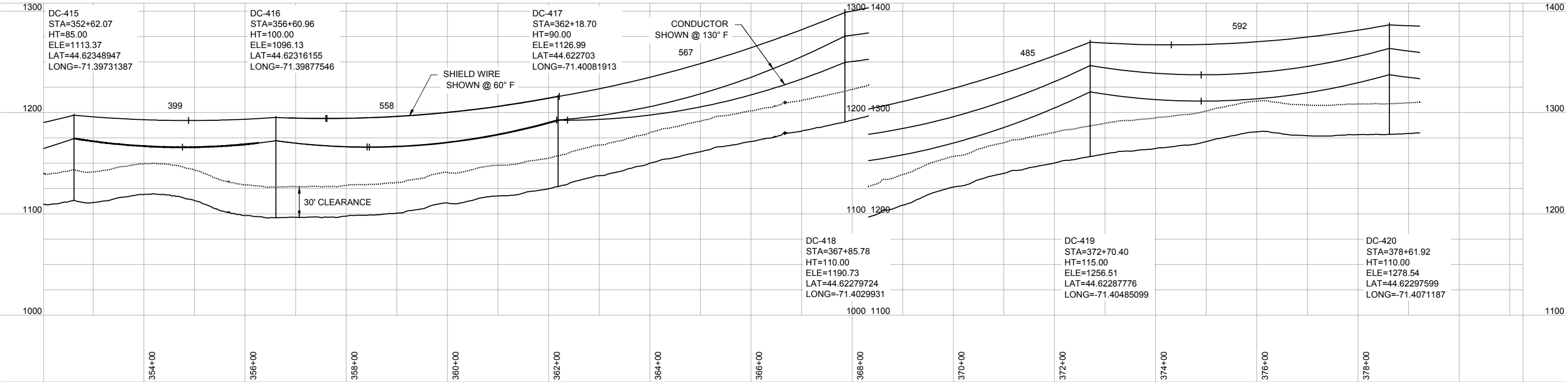
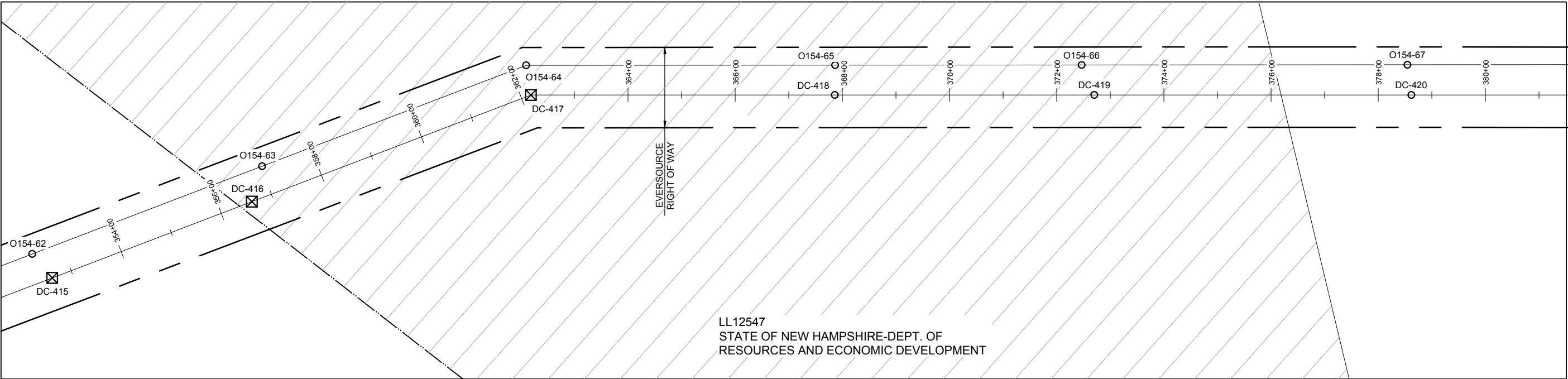
LEGEND

-  Parcel Boundary
-  Project ROW
-  Town Boundary



Line List 12547
State Land Crossing Permit
Location Map

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200.0 ft. Horiz. Scale

100.0 ft. Vert. Scale



PUBLIC LAND




PROPOSED MONOPOLE



PROPOSED TRANS
STRUCTURE



**PRELIMINARY - NOT
FOR CONSTRUCTION**

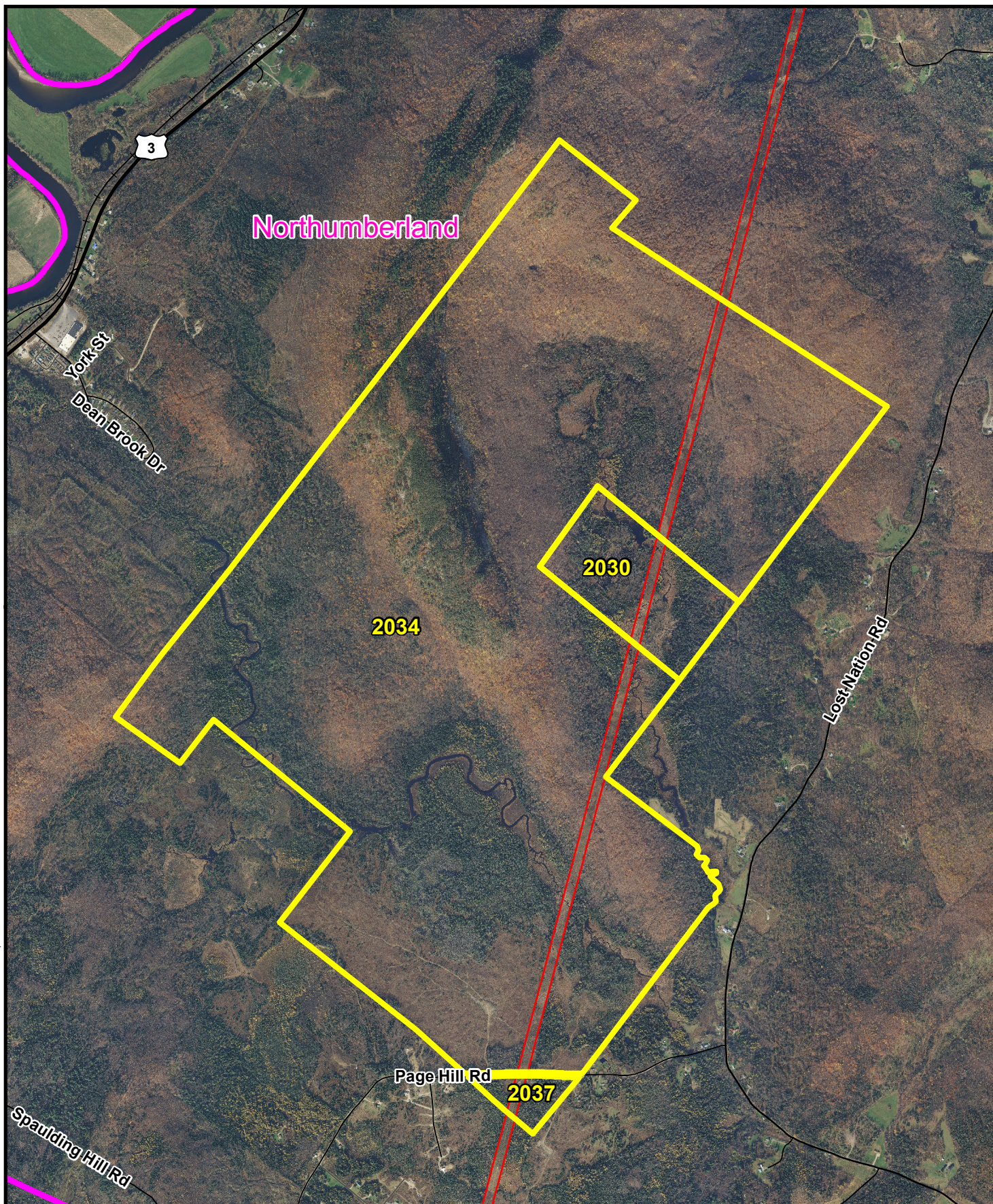
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 THE NORTHERN PASS		NORTHERN PASS LLC			
		TITLE N2 LL12547 3720/3731 STATE LAND CROSSING PERMIT			
BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 372099006.DWG	

APPENDIX 3
3720/3731 DC LINE
STRUCTURES DC-486 TO DC-506
STATE OF NEW HAMPSHIRE- DEPARTMENT OF RESOURCES AND ECONOMIC DEVELOPMENT
CAPE HORN STATE FOREST
LL 2030, 2034, 2037
NORTHUMBERLAND, NH

1. This crossing is shown on attached drawing 372099001
 - a. This drawing shows a 30' terrain clearance line (offset from ground surface), which is greater than required minimum of 21.7'.
2. The location of the 3720/3731 line is shown on attached maps titled Line List 2030, Line List 2034, Line List 2037.
3. This portion of the 3720/3731 line will be on steel structures with foundations. The energized conductor (positive pole and negative pole for direct current) is in a horizontal configuration using a 2-bundle of 2933 kcmil AAAC for each pole. The structures will have 2 ground wires in a horizontal configuration. One will be 19#10 Alumoweld; the other will be an OPGW with sag coefficients similar to 19#10 Alumoweld.
 - a. The 3720/3731 line crosses the parcel LL 2030, State of New Hampshire – Department of Resources of Economic Development, Cape Horn State Forest for approximately 1,670'
 - b. The 3720/3731 line crosses the parcel LL 2034, State of New Hampshire – Department of Resources of Economic Development, Cape Horn State Forest for approximately 10,830'
 - c. The 3720/3731 line crosses the parcel LL 2037, State of New Hampshire – Department of Resources of Economic Development, Cape Horn State Forest for approximately 620'
4. Energized conductors will have a maximum tension of 20,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).
5. The 3720/3731 line is a 320 kV direct current (DC) line. Per NESC 230 the required clearances are applicable for both alternating and direct currents. To convert 320 kV DC to a corresponding alternating current (AC) voltage (for purposes of calculating clearances) take $320 \text{ kV} \times 3^{0.5} / 2^{0.5} = 392 \text{ kV}$. The equivalent phase to ground is calculated by taking $392 \times 105\%$ (voltage adder) divided by $3^{0.5} = 237.6$.
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and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations. All NESC clearances have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met.

- a. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the ground will always exceed the minimum required NESC distance.
- b. 130 degrees F – Maximum operating temperature (energized conductor) based on NPT transmission standards the maximum sag for this weather case controls.



0 1,000 2,000



Scale in Feet

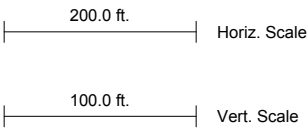
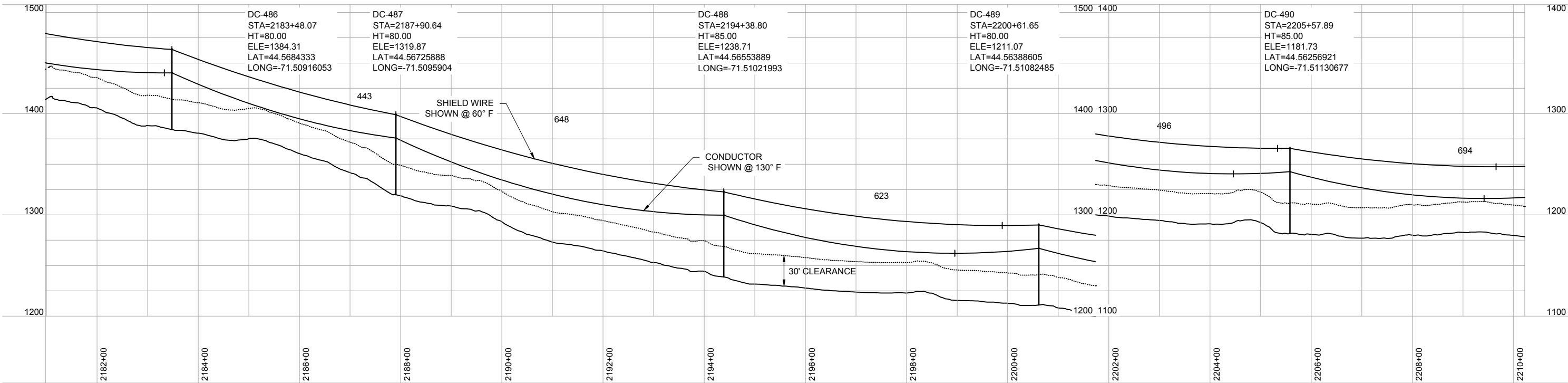
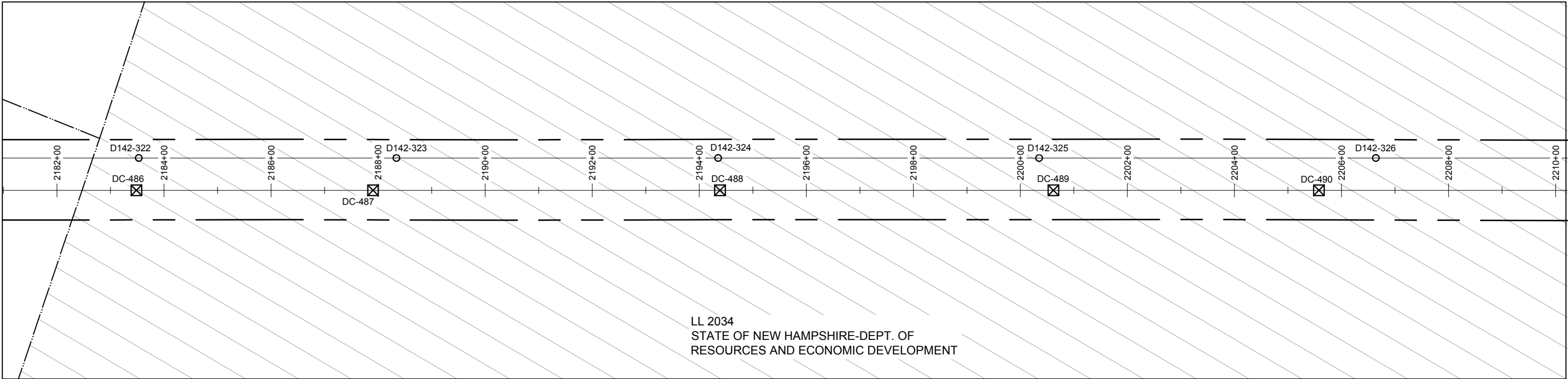
LEGEND

- Parcel Boundary
- Project ROW
- Town Boundary



Line List 2030, 2034, & 2037
State Land Crossing Permit
Location Map

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PUBLIC LAND




PROPOSED MONOPOLE



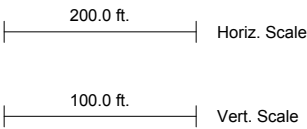
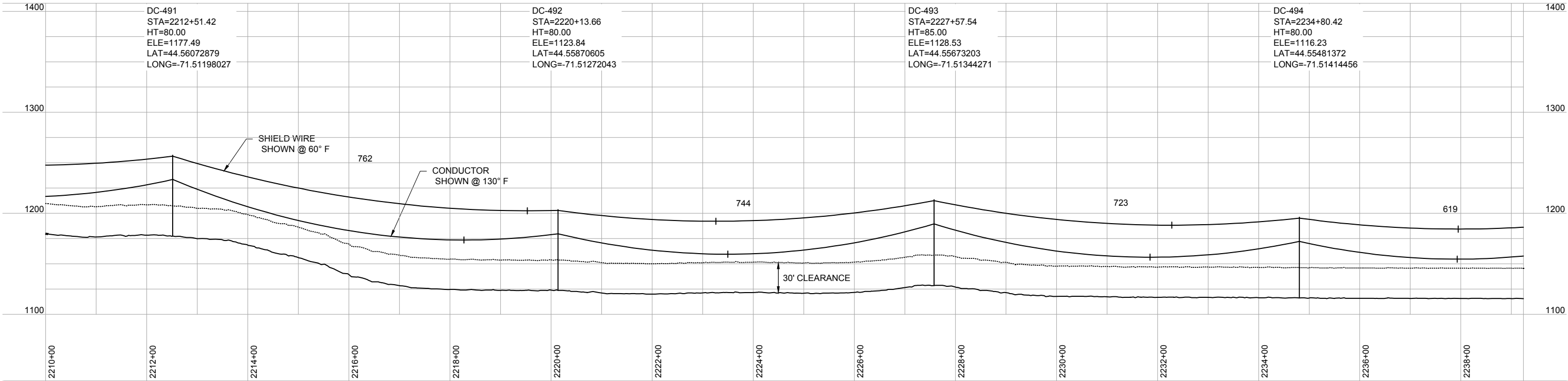
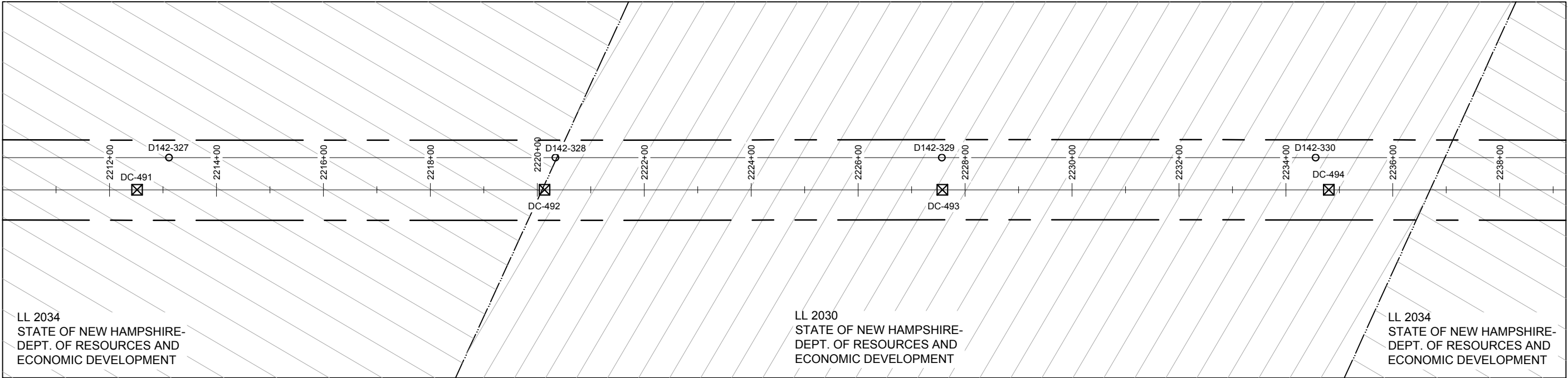
PROPOSED TRANS
STRUCTURE



**PRELIMINARY - NOT
FOR CONSTRUCTION**

REVISION HISTORY					
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 THE NORTHERN PASS		NORTHERN PASS LLC			
		TITLE N2 LL2030, LL2034, LL2037 3720/3731 STATE LAND CROSSING PERMIT SH. 1 OF 5			
BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 372099001.DWG	

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PUBLIC LAND



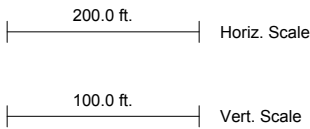
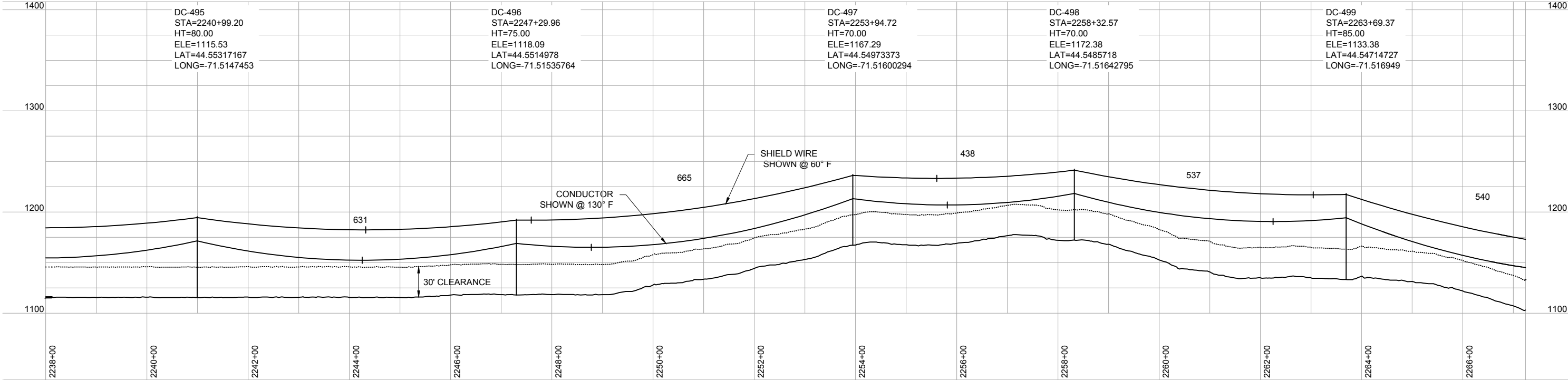
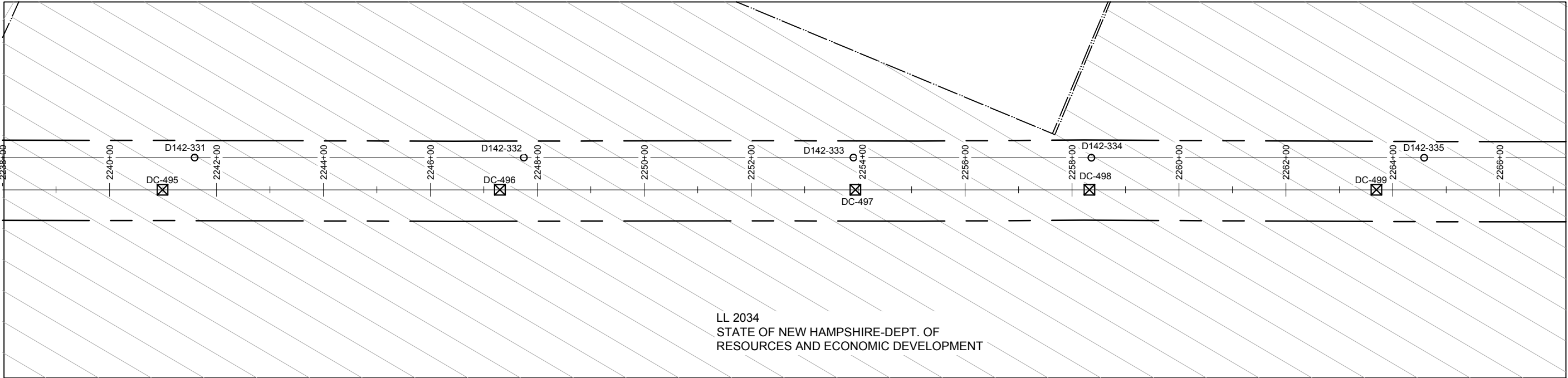
PROPOSED MONOPOLE
PROPOSED TRANS
STRUCTURE



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FOR CONSTRUCTION**

REVISION HISTORY					
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BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 372099001.DWG	

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PUBLIC LAND



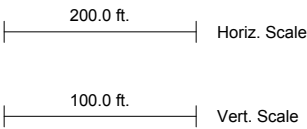
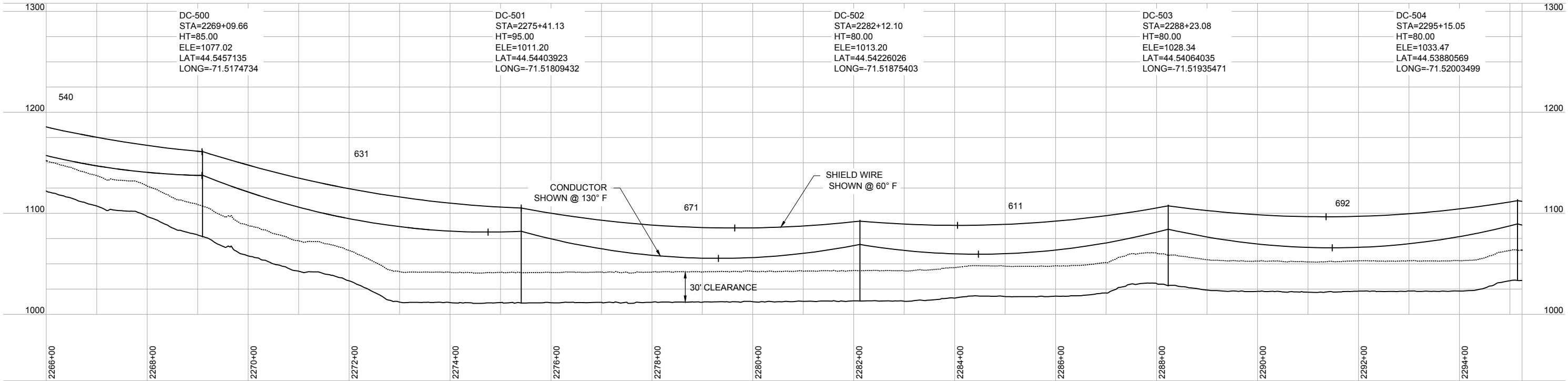
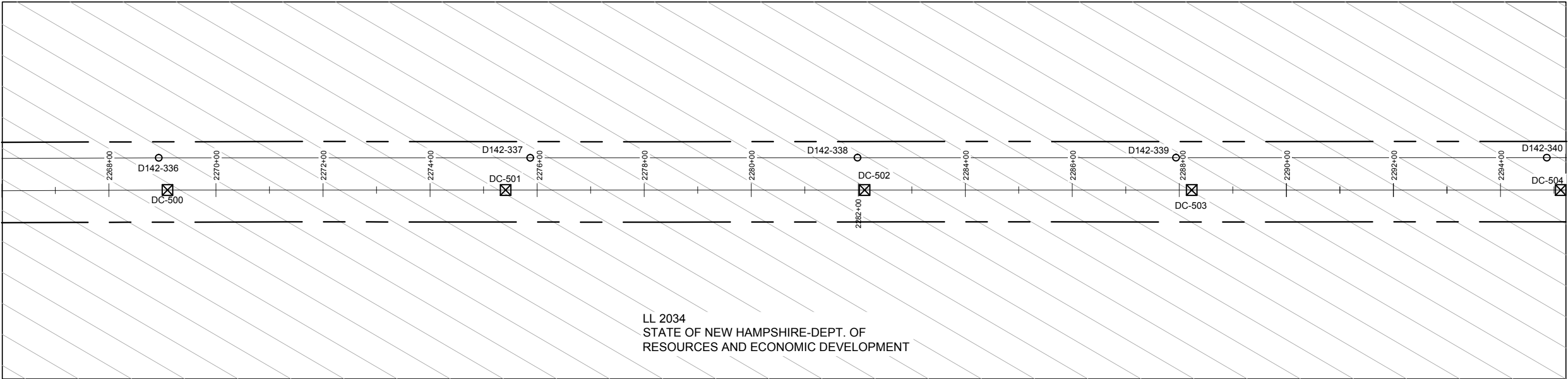
PROPOSED MONOPOLE
PROPOSED TRANS
STRUCTURE



**PRELIMINARY - NOT
FOR CONSTRUCTION**

REVISION HISTORY					
-	-	-	-	-	-
A	4/30/15	ISSUED FOR REVIEW		KRR	DAB
 THE NORTHERN PASS		NORTHERN PASS LLC			
		TITLE N2 LL2030, LL2034, LL2037 3720/3731 STATE LAND CROSSING PERMIT SH. 3 OF 5			
BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 372099001.DWG	

08/27/2015 7:26am - mspeich - N:\NUSCO\58479 - NPT\Overhead\Cadd\01-Record Worksheets\02 Permits\Public Lands Crossings\DXF Exports\372099001.dwg




PUBLIC LAND



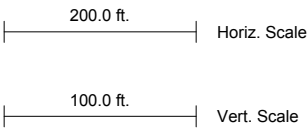
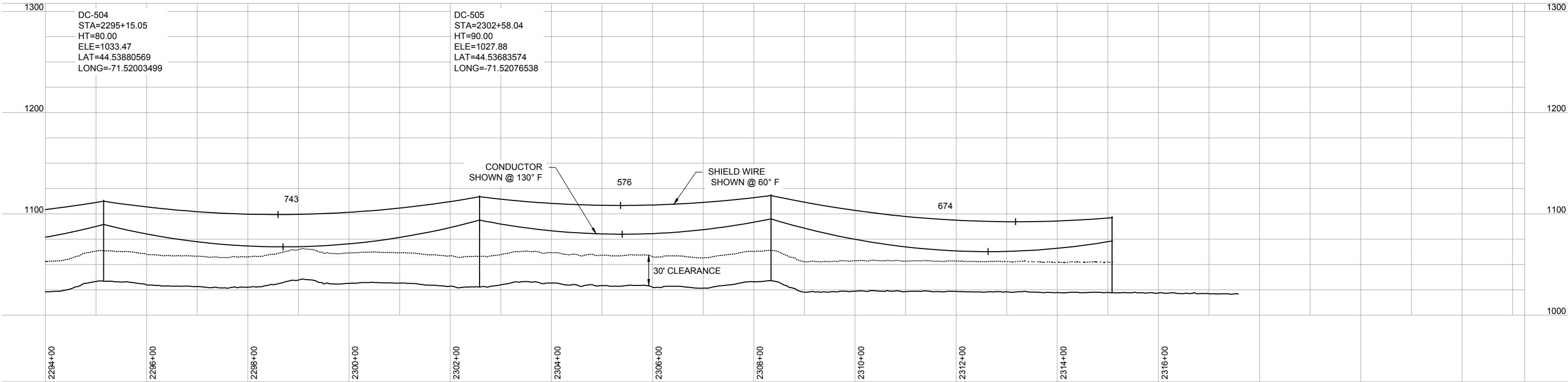
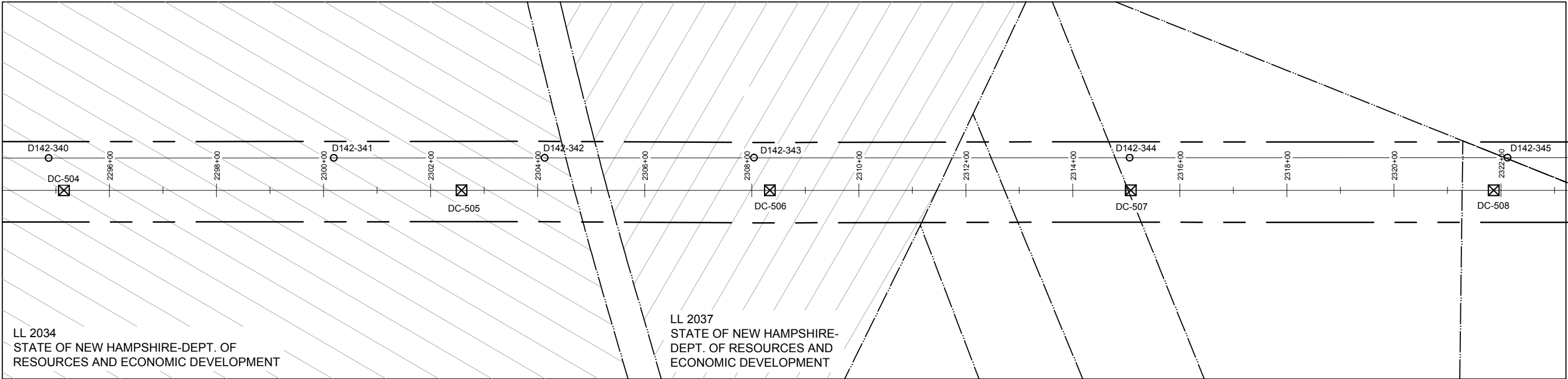
PROPOSED MONOPOLE
PROPOSED TRANS
STRUCTURE



**PRELIMINARY - NOT
FOR CONSTRUCTION**

REVISION HISTORY					
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 THE NORTHERN PASS		NORTHERN PASS LLC			
		TITLE N2 LL2030, LL2034, LL2037 3720/3731 STATE LAND CROSSING PERMIT SH. 4 OF 5			
BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO.	372099001.DWG

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PUBLIC LAND



PROPOSED MONOPOLE
PROPOSED TRANS
STRUCTURE



**PRELIMINARY - NOT
FOR CONSTRUCTION**

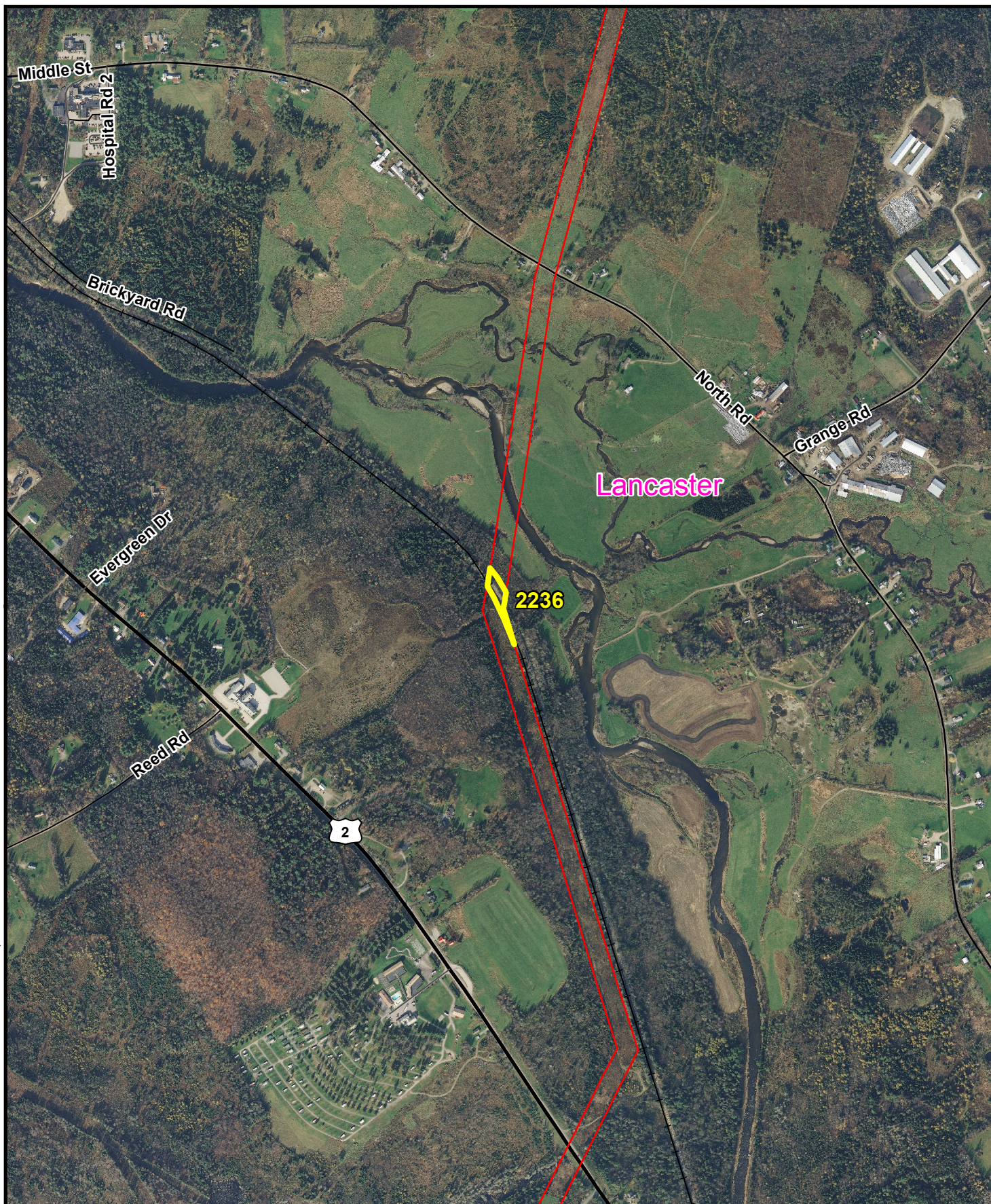
REVISION HISTORY					
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		NORTHERN PASS LLC			
		TITLE N2 LL2030, LL2034, LL2037 3720/3731 STATE LAND CROSSING PERMIT SH. 5 OF 5			
BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 372099001.DWG	

APPENDIX 4
3720/3731 DC LINE
STRUCTURES DC-539 TO DC-540
STATE OF NEW HAMPSHIRE – BUREAU OF RAIL & TRANSIT
GROVETON BRANCH
LL 2236
LANCASTER, NH

1. This crossing is shown on attached drawing 372099601
2. The location of the 3720/3731 line is shown on attached maps titled Line List 2236
3. The 3720/3731 line will be on steel structures with foundations at this crossing. The energized conductor (positive pole and negative pole for direct current) is in a vertical configuration using a 2-bundle of 2933 kcmil AAAC for each pole. The structure will have 1 ground wire. It will be OPGW with sag coefficients similar to 19#10 Alumoweld.
 - a. DC-539 & DC-540 will be structures with V-string insulators. The energized conductors are separated approximately 28 feet horizontally and 0 feet vertically in a horizontal configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 12 inches below the top of the structure. The ground/OPGW wires are separated horizontally approximately 11 feet. The ground/OPGW and energized conductor are separated vertically by approximately 23.5 feet.
4. Energized conductors will have a maximum tension of 20,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).
5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met.
6. The 3720/3731 line is a 320 kV direct current (DC) line. Per NESC 230 the required clearances are applicable for both alternating and direct currents. To convert 320 kV DC to a corresponding alternating current (AC) voltage (for purposes of calculating clearances) take $320 \text{ kV} \times 3^{0.5} / 2^{0.5} = 392 \text{ kV}$. The equivalent phase to ground is calculated by taking $392 \times 105\%$ (voltage adder) divided by $3^{0.5} = 237.6$.
 - a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to tracks of railroads is 26.5'. NESC Rule 232.C.1.a states that an additional clearance of 7.19 feet or $[(237.6 \text{ kV} - 22 \text{ kV}) \times 0.4] / 12$ is needed for 392 kV, which brings the total required minimum clearance to 33.7 feet.
 - b. For overhead ground wires, the minimum required clearance to tracks of railroad is 23.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.

- c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:
 - i. 8.67 feet is required between 320 kV DC energized conductor and ground wire
 - ii. 16.59 feet is required between 320 kV DC energized conductors
 - d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support
 - i. 9.88 feet is required between 320 kV DC energized conductors and ground wire
 - ii. 15.82 feet is required between 320 kV DC energized conductors
 - iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.
 - e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
 - i. 8.96 feet is required between 320 kV DC energized conductors and ground wire
 - ii. 16.88 feet is required between 320 kV DC energized conductors
 - f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
 - i. 8.3 feet are required between 320 kV DC energized conductors and ground wire
 - ii. 16.21 feet are required between 320 kV DC energized conductors
 - g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.
7. Northern Pass Transmission, LLC (NPT) has investigated a multitude of weather and loading conditions for its design. NPT used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. NPT has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.
- a. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the railroad track will always exceed the minimum required NESC distance.
 - b. 130 degrees F – Maximum operating temperature (energized conductor) based on NPT transmission standards, the maximum sag for this weather case results in a clearance to railroad track of 44 feet, this exceeds the minimum required clearance of 33.7 feet.
 - c. Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would

have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with $\frac{1}{2}$ " of radial ice. Under these conditions the clearance would be 22.5 feet vertically and 8.5 feet horizontally from the ground wires to the closest energized conductor.



0 500 1,000
 Feet

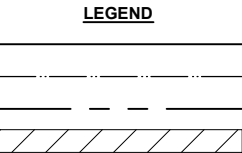
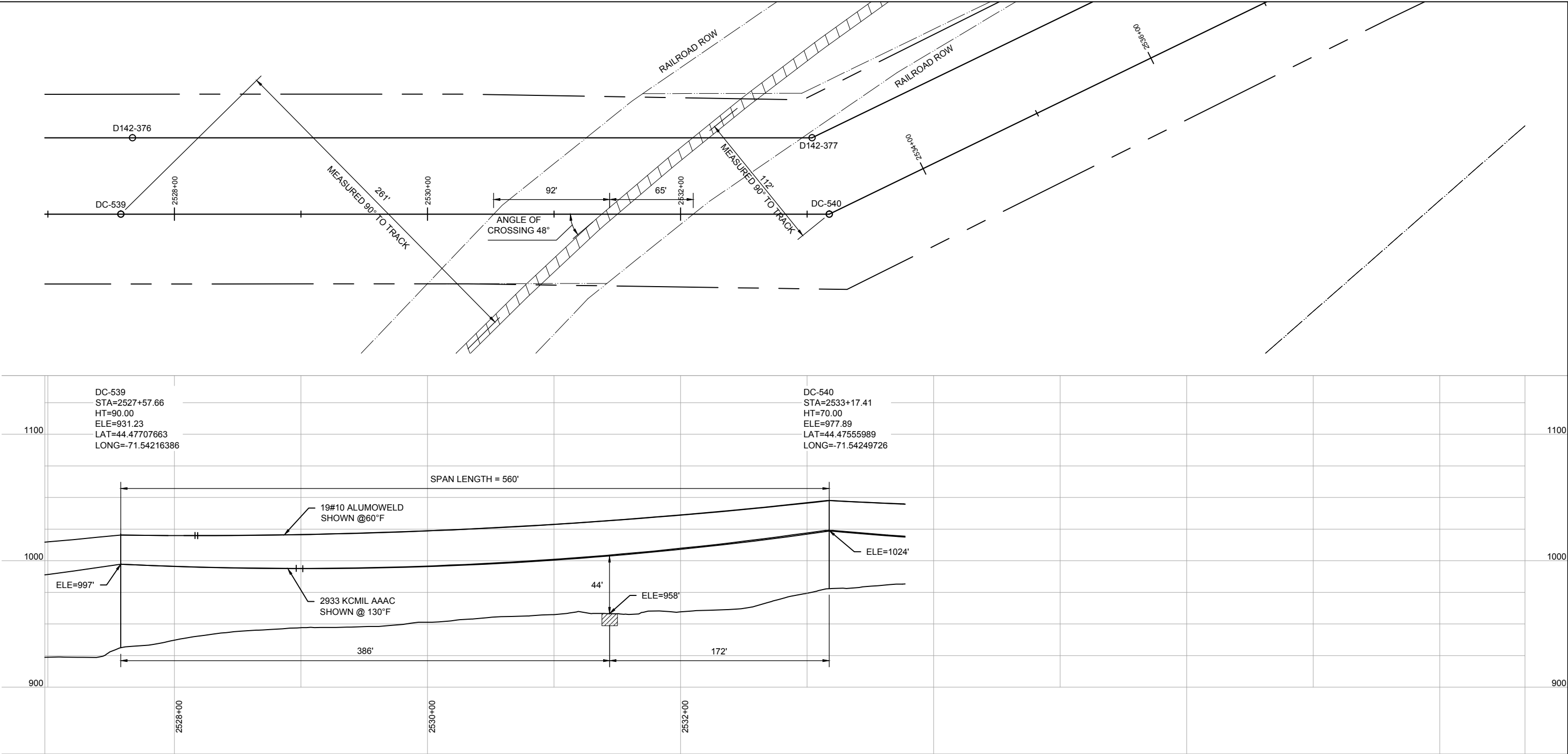
LEGEND

- Parcel Boundary
- Project ROW
- Town Boundary



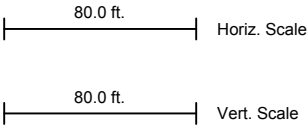
Line List 2236
 State Land Crossing Permit
 Location Map

09/08/2015 4:09pm - mspeich - N:\NUSCO\58479 - NPT\Overhead\Cadd\01-Record Worksheets\02 Permits\RR Crossing Permits\372099601.dwg



TRANSMISSION CENTERLINE
PARCEL BOUNDARY
EVERSOURCE ROW
RAILROAD BED


○ PROPOSED MONOPOLE
☒ PROPOSED TRANS STRUCTURE
○ EXISTING H-FRAME



PRELIMINARY - NOT FOR CONSTRUCTION

NOTES:

1. DESIGN CONFORMS TO ALL CODE REQUIREMENTS (NATIONAL ELECTRIC SAFETY CODE). SAG CONDITION DISPLAYED IN EXHIBIT IS THE CONTROLLING SAG CONDITION.

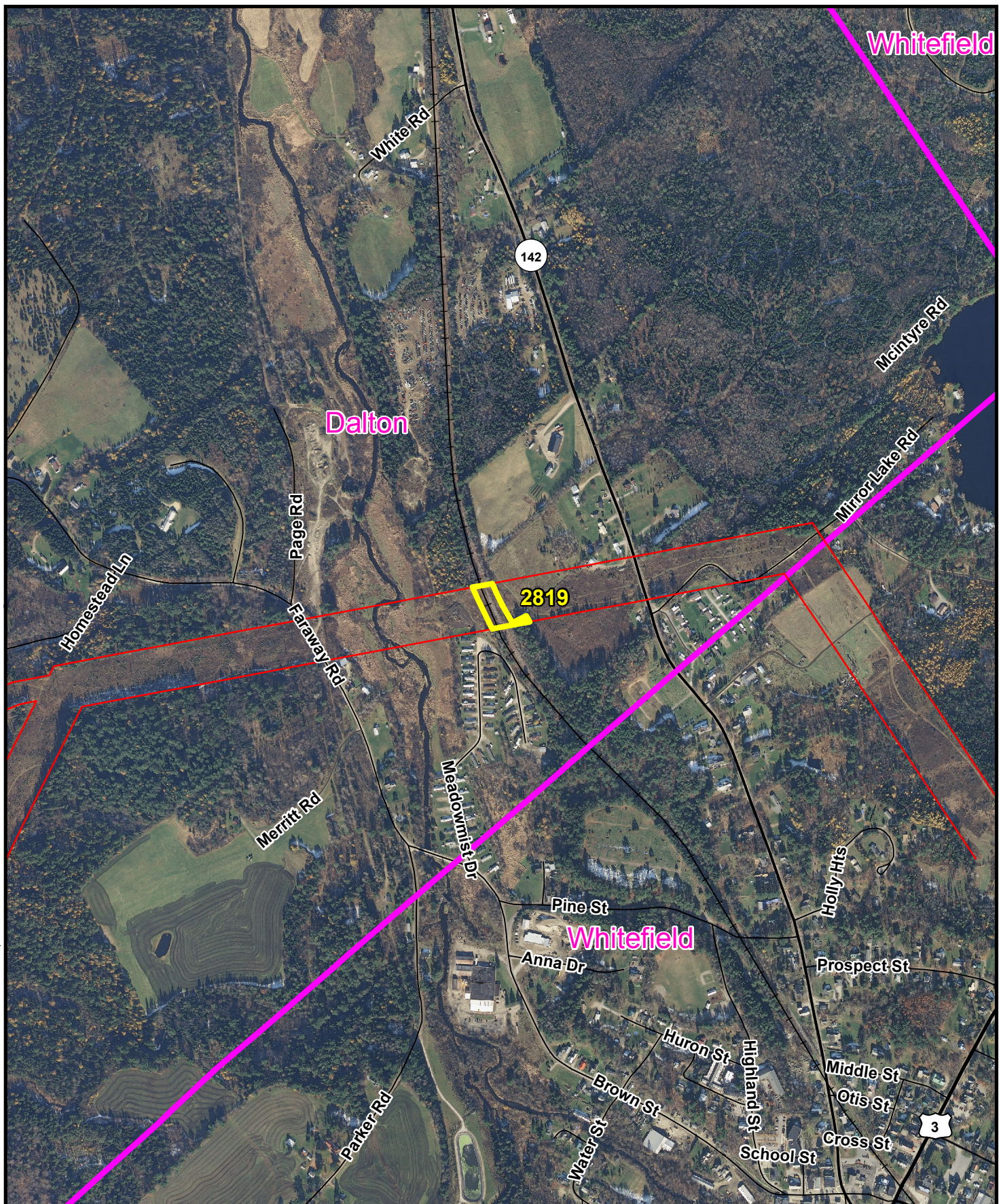
REVISION HISTORY					
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 THE NORTHERN PASS		NORTHERN PASS LLC			
		TITLE N2 LL2236 3720/3731 RAILROAD CROSSING PERMIT			
BY MSP	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 372099601.DWG	

APPENDIX 5
3720/3731 DC LINE
STRUCTURES DC-620 TO DC-621
STATE OF NEW HAMPSHIRE – BUREAU OF RAIL & TRANSIT
GROVETON BRANCH
LL 2819
DALTON, NH

1. This crossing is shown on attached drawing 372099602
2. The location of the 3720/3731 line is shown on attached map titled Line List 2819
3. The 3720/3731 line will be on steel structures with foundations at this crossing. The energized conductor (positive pole and negative pole for direct current) is in a horizontal configuration using a 2-bundle of 2933 kcmil AAAC for each pole. The structures will have 2 ground wires in a horizontal configuration. One will be 19#10 Alumoweld; the other will be an OPGW with sag coefficients similar to 19#10 Alumoweld.
 - a. DC-620 will be a structure with V-string insulators. The energized conductors are separated approximately 28 feet horizontally and 0 feet vertically in a horizontal configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 12 inches below the top of the structure. The ground/OPGW wires are separated horizontally approximately 11 feet. The ground/OPGW and energized conductor are separated vertically by approximately 23.5 feet.
 - b. DC-621 will be a structure with strain insulators. The energized conductors are separated approximately 36 feet horizontally and 0 feet vertically in a horizontal configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 12 inches below the top of the structure. The ground/OPGW wires are separated horizontally approximately 9.5 feet. The ground/OPGW and energized conductor are separated vertically by approximately 23.5 feet.
4. Energized conductors will have a maximum tension of 20,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).
5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met.
6. The 3720/3731 line is a 320 kV direct current (DC) line. Per NESC 230 the required clearances are applicable for both alternating and direct currents. To convert 320 kV DC to a corresponding alternating current (AC) voltage (for purposes of calculating clearances) take $320 \text{ kV} \times 3^{0.5} / 2^{0.5} = 392 \text{ kV}$. The equivalent phase to ground is calculated by taking $392 \times 105\%$ (voltage adder) divided by $3^{0.5} = 237.6$.

- a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to tracks of railroads is 26.5'. NESC Rule 232.C.1.a states that an additional clearance of 7.19 feet or $[(237.6 \text{ kV} - 22 \text{ kV}) \times 0.4] / 12$ is needed for 392 kV, which brings the total required minimum clearance to 33.7 feet.
 - b. For overhead ground wires, the minimum required clearance to tracks of railroad is 23.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.
 - c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:
 - i. 8.67 feet is required between 320 kV DC energized conductor and ground wire
 - ii. 16.59 feet is required between 320 kV DC energized conductors
 - d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support
 - i. 9.88 feet is required between 320 kV DC energized conductors and ground wire
 - ii. 15.82 feet is required between 320 kV DC energized conductors
 - iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.
 - e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
 - i. 8.96 feet is required between 320 kV DC energized conductors and ground wire
 - ii. 16.88 feet is required between 320 kV DC energized conductors
 - f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
 - i. 8.3 feet are required between 320 kV DC energized conductors and ground wire
 - ii. 16.21 feet are required between 320 kV DC energized conductors
 - g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.
7. Northern Pass Transmission, LLC (NPT) has investigated a multitude of weather and loading conditions for its design. NPT used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. NPT has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.
- a. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the railroad track will always exceed the minimum required NESC distance.

- b. 130 degrees F – Maximum operating temperature (energized conductor) based on NPT transmission standards, the maximum sag for this weather case results in a clearance to railroad track of 57 feet, this exceeds the minimum required clearance of 33.7 feet.
- c. Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 22.3 feet vertically and 9.5 feet horizontally from the ground wires to the closest energized conductor.



0 400 800
 Feet

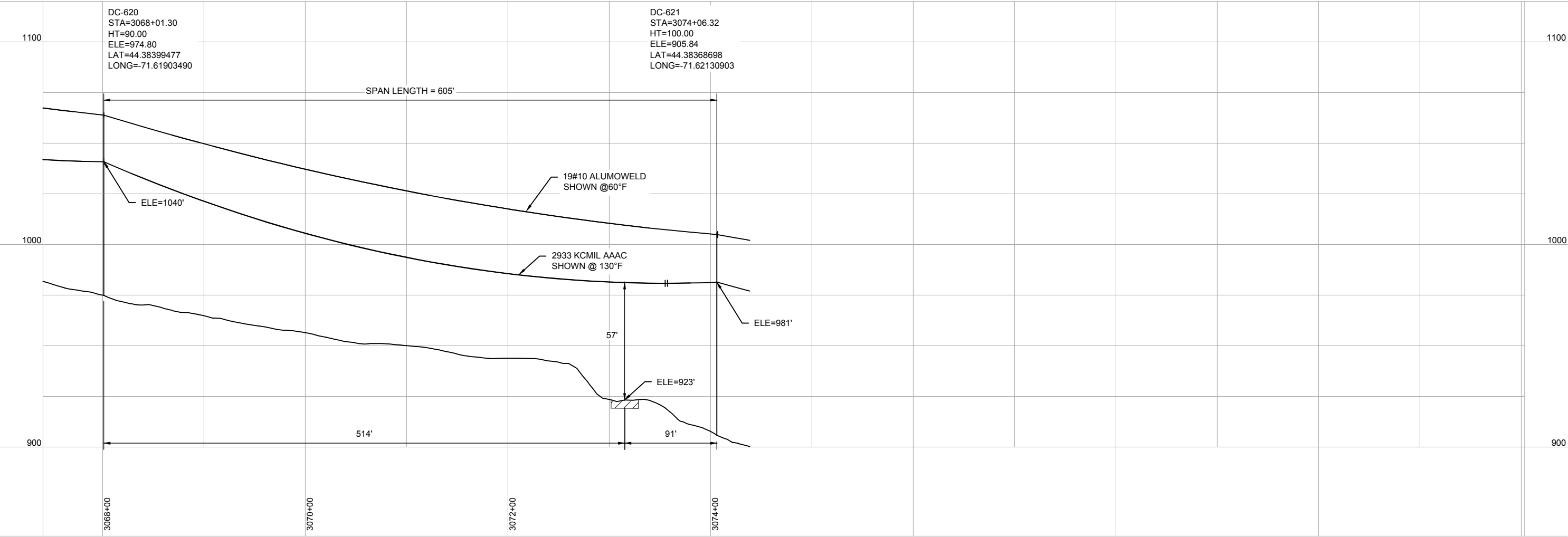
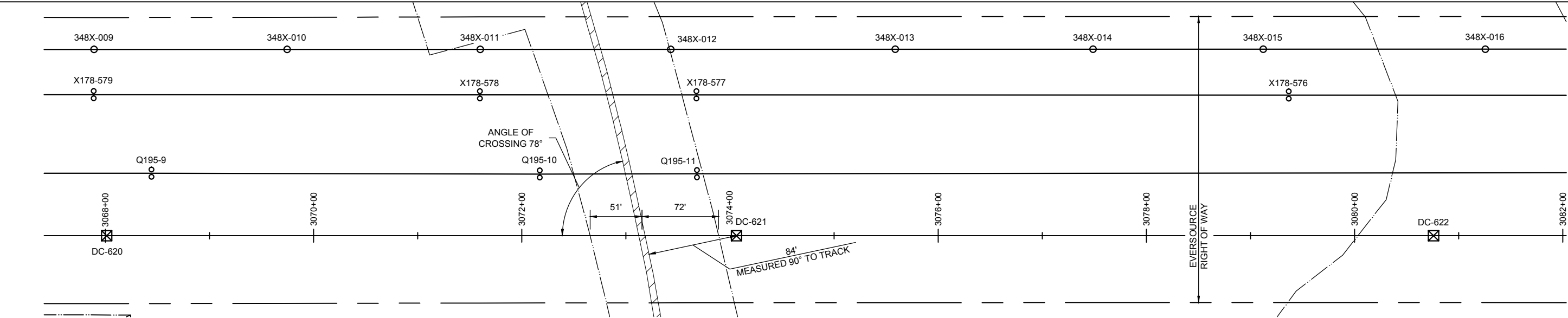
LEGEND

- Parcel Boundary
- Project ROW
- Town Boundary



Line List 2819
 State Land Crossing Permit
 Location Map

05/07/2015 11:03am - mspepich - N:\NUSCO\58479 - NPT\Overhead\Cadd\01-Record Worksheets\02 Permits\RR Crossing Permits\372099602.dwg



NOTES:
1. DESIGN CONFORMS TO ALL CODE REQUIREMENTS (NATIONAL ELECTRIC SAFETY CODE). SAG CONDITION DISPLAYED IN EXHIBIT IS THE CONTROLLING SAG CONDITION.

LEGEND

- TRANSMISSION CENTERLINE
- PARCEL BOUNDARY
- EVERSOURCE ROW
- RAILROAD BED

- PROPOSED MONOPOLE
- PROPOSED TRANS STRUCTURE
- EXISTING H-FRAME

100.0 ft. Horiz. Scale

50.0 ft. Vert. Scale

North Arrow

PRELIMINARY - NOT FOR CONSTRUCTION

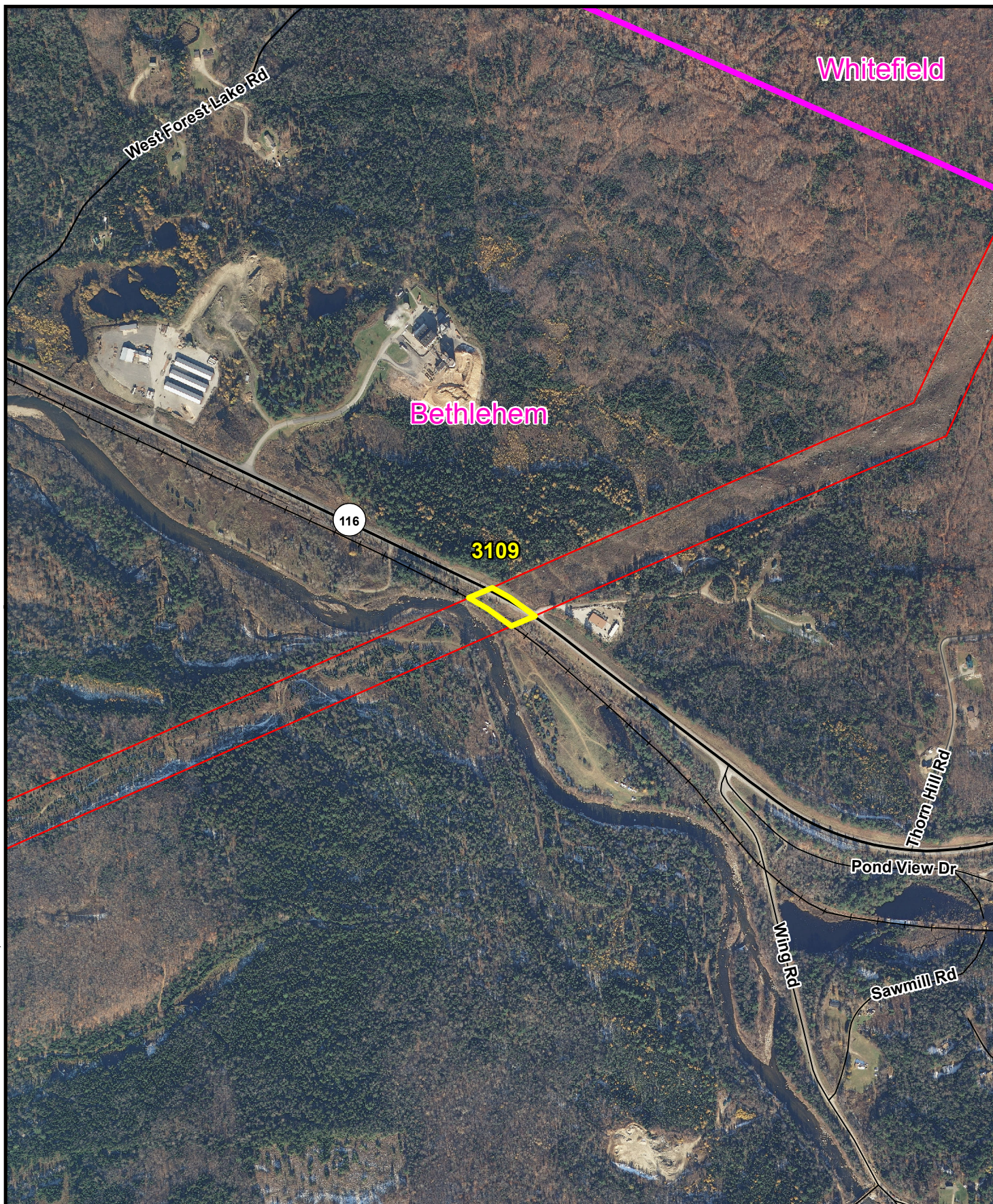
REVISION HISTORY					
-	-	-	-	-	-
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		NORTHERN PASS LLC			
		C1 LL2819 3720/3731 RAILROAD CROSSING PERMIT			
BY DJL	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 372099602.DWG	

APPENDIX 6
3720/3731 LINE
STRUCTURES DC-662 TO DC-663
STATE OF NEW HAMPSHIRE – DEPARTMENT OF TRANSPORTATION
GROVETON BRANCH
LL 3109
BETHLEHEM, NH

1. This crossing is shown on attached drawing 372099603
2. The location of the 3720/3731 line is shown on attached map titled Line List 3109
3. The 3720/3731 line will be on steel structures with foundations at this crossing. The energized conductor (positive pole and negative pole for direct current) is in a horizontal configuration using a 2-bundle of 2933 kcmil AAAC for each pole. The structures will have 2 ground wires in a horizontal configuration. One will be 19#10 Alumoweld; the other will be an OPGW with sag coefficients similar to 19#10 Alumoweld.
 - a. DC-662 & DC-663 will be structures with V-string insulators. The energized conductors are separated approximately 28 feet horizontally and 0 feet vertically in a horizontal configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 12 inches below the top of the structure. The ground/OPGW wires are separated horizontally approximately 11 feet. The ground/OPGW and energized conductor are separated vertically by approximately 23.5 feet.
4. Energized conductors will have a maximum tension of 20,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).
5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met.
6. The 3720/3731 line is a 320 kV direct current (DC) line. Per NESC 230 the required clearances are applicable for both alternating and direct currents. To convert 320 kV DC to a corresponding alternating current (AC) voltage (for purposes of calculating clearances) take $320 \text{ kV} \times 3^{0.5} / 2^{0.5} = 392 \text{ kV}$. The equivalent phase to ground is calculated by taking $392 \times 105\%$ (voltage adder) divided by $3^{0.5} = 237.6$.
 - a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to tracks of railroads is 26.5'. NESC Rule 232.C.1.a states that an additional clearance of 7.19 feet or $[(237.6 \text{ kV} - 22 \text{ kV}) \times 0.4] / 12$ is needed for 392 kV, which brings the total required minimum clearance to 33.7 feet.
 - b. For overhead ground wires, the minimum required clearance to tracks of railroad is 23.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.




- c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:
 - i. 8.67 feet is required between 320 kV DC energized conductor and ground wire
 - ii. 16.59 feet is required between 320 kV DC energized conductors
 - d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support
 - i. 9.88 feet is required between 320 kV DC energized conductors and ground wire
 - ii. 15.82 feet is required between 320 kV DC energized conductors
 - iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.
 - e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
 - i. 8.96 feet is required between 320 kV DC energized conductors and ground wire
 - ii. 16.88 feet is required between 320 kV DC energized conductors
 - f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
 - i. 8.3 feet are required between 320 kV DC energized conductors and ground wire
 - ii. 16.21 feet are required between 320 kV DC energized conductors
 - g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.
7. Northern Pass Transmission, LLC (NPT) has investigated a multitude of weather and loading conditions for its design. NPT used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. NPT has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.
- a. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the railroad track will always exceed the minimum required NESC distance.
 - b. 130 degrees F – Maximum operating temperature (energized conductor) based on NPT transmission standards, the maximum sag for this weather case results in a clearance to railroad track of 63 feet, this exceeds the minimum required clearance of 33.7 feet.
 - c. Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized

conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with $\frac{1}{2}$ " of radial ice. Under these conditions the clearance would be 22.0 feet vertically and 8.7 feet horizontally from the ground wires to the closest energized conductor.



0 400 800
Feet

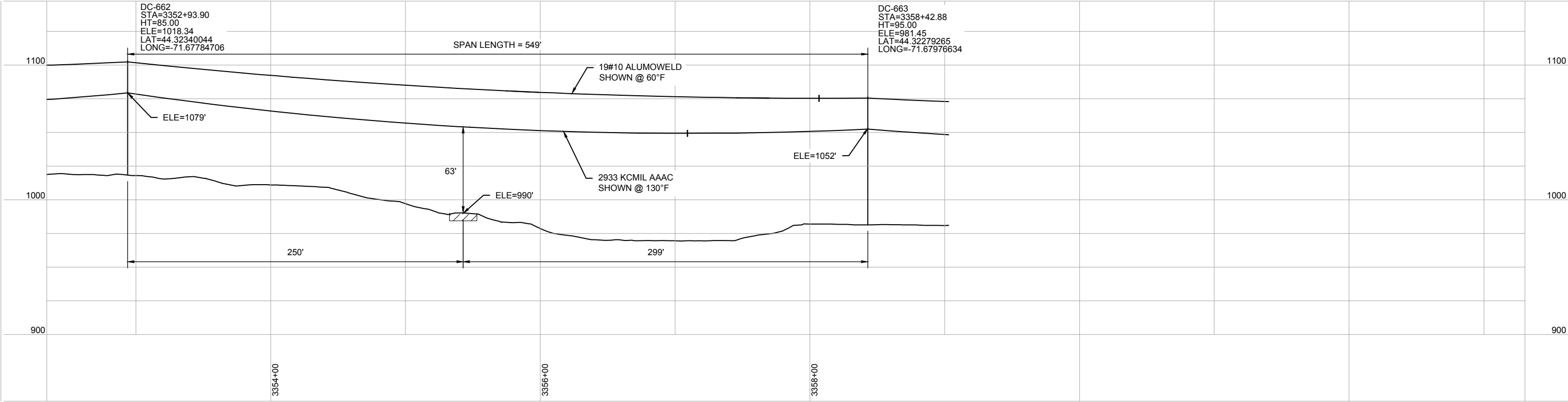
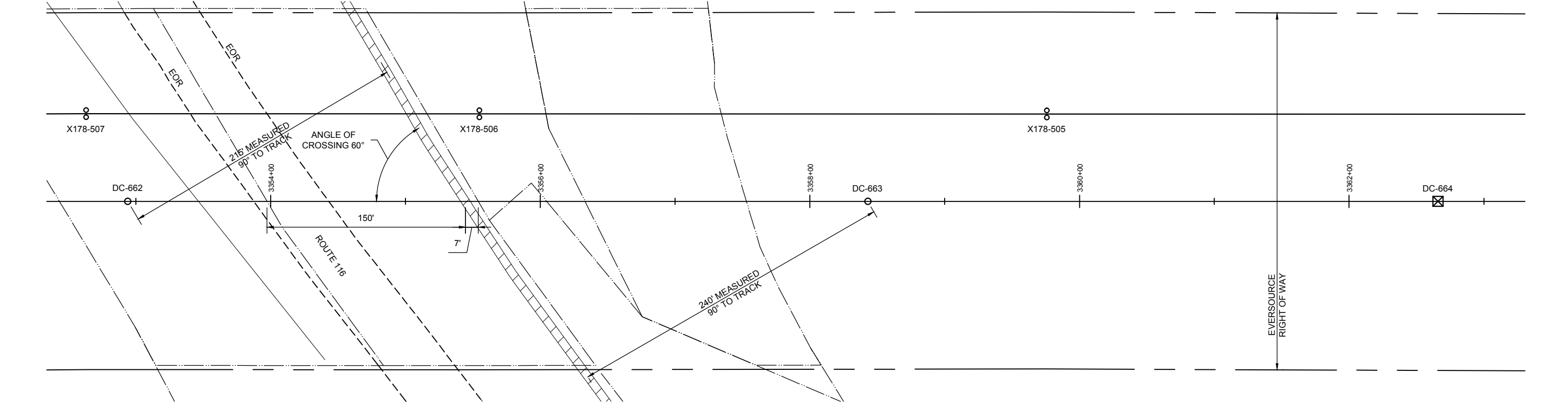
LEGEND

-  Parcel Boundary
-  Project ROW
-  Town Boundary

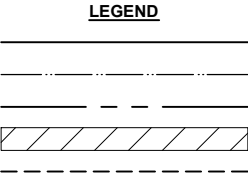


Line List 3109
State Land Crossing Permit
Location Map

09/25/2015 8:04am - mspeich - N:\NUSCO\58479 - NPT\Overhead\Cadd\01-Record Worksheets\02 Permits\PR Crossing Permits\372099603.dwg

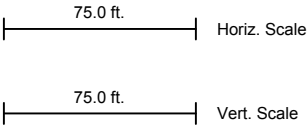


NOTES:
1. DESIGN CONFORMS TO ALL CODE REQUIREMENTS (NATIONAL ELECTRIC SAFETY CODE). SAG CONDITION DISPLAYED IN EXHIBIT IS THE CONTROLLING SAG CONDITION.




TRANSMISSION CENTERLINE
PARCEL BOUNDARY
EVERSOURCE ROW
RAILROAD BED
PAVED ROADS

PROPOSED TRANS
STRUCTURE
EXISTING H-FRAME
PROPOSED MONOPOLE



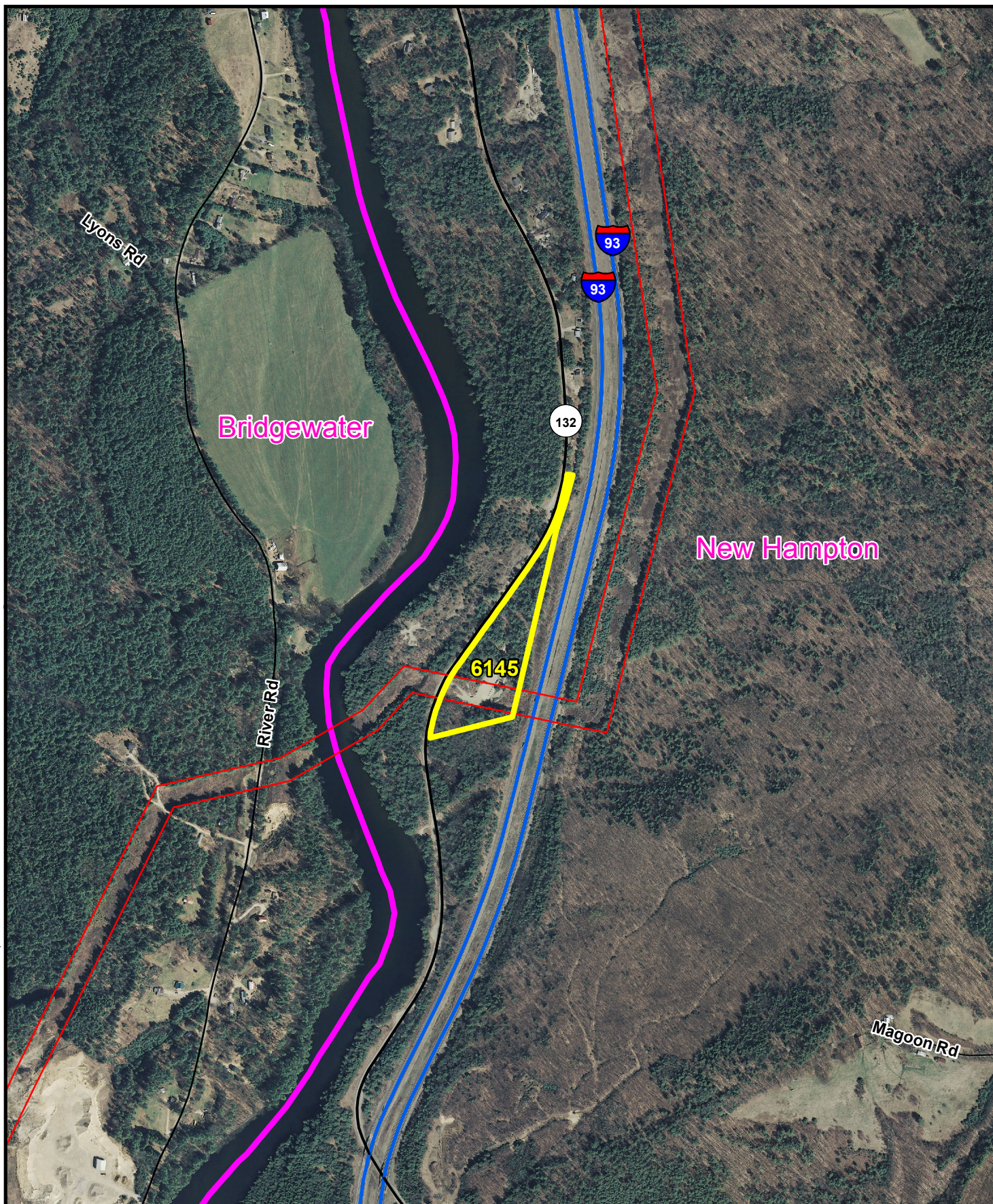
**PRELIMINARY - NOT
FOR CONSTRUCTION**

REVISION HISTORY					
-	-	-	-	-	-
A	4/30/15	ISSUED FOR REVIEW		DJL	DAB
		NORTHERN PASS LLC			
		C1 LL3109 3720/3731 RAILROAD CROSSING PERMIT			
BY DJL	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 372099603.DWG	

APPENDIX 7
3720/3731 LINE
STRUCTURES DC-1142 TO DC-1142
STATE OF NEW HAMPSHIRE- DEPARTMENT OF TRANSPORTATION
STATE POLICE FIRING RANGE
LL6145
NEW HAMPTON, NH

1. This crossing is shown on attached drawing 372099002
 - a. This drawing shows a 30' terrain clearance line (offset from ground surface), which is greater than required minimum of 21.7'.
2. The location of the 3720/3731 line is shown on attached maps titled Line List 6145.
3. This portion of the 3720/3731 line will be on steel structures with foundations. The energized conductor (positive pole and negative pole for direct current) is in a horizontal configuration using a 2-bundle of 2933 kcmil AAAC for each pole. The structures will have 2 ground wires in a horizontal configuration. One will be 19#10 Alumoweld; the other will be an OPGW with sag coefficients similar to 19#10 Alumoweld.
 - a. The 3720/3731 line crosses the parcel LL 6145, State of New Hampshire – Department of Transportation for approximately 450'.
4. Energized conductors will have a maximum tension of 20,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).
5. The 3720/3731 line is a 320 kV direct current (DC) line. Per NESC 230 the required clearances are applicable for both alternating and direct currents. To convert 320 kV DC to a corresponding alternating current (AC) voltage (for purposes of calculating clearances) take $320 \text{ kV} \times 3^{0.5} / 2^{0.5} = 392 \text{ kV}$. The equivalent phase to ground is calculated by taking $392 \times 105\%$ (voltage adder) divided by $3^{0.5} = 237.6$.
6. Northern Pass Transmission, LLC (NPT) has investigated a multitude of weather and loading conditions for its design. NPT used these design conditions and combinations thereof to determine the minimum clearance of all conductors to both ground and aerial obstacles, between the phase conductors and OPGW cable. NPT has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations. All NESC clearances have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met.
 - a. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the ground will always exceed the minimum required NESC distance.




- b. 130 degrees F – Maximum operating temperature (energized conductor) based on NPT transmission standards the maximum sag for this weather case controls.



0 400 800

Scale in Feet

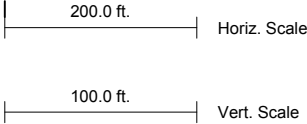
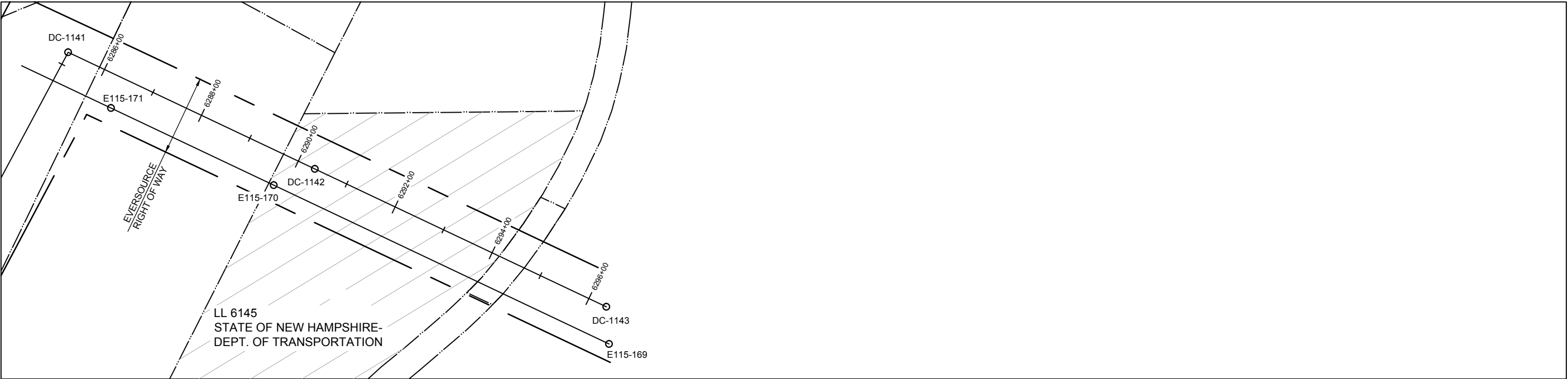
LEGEND

-  Parcel Boundary
-  Project ROW
-  Town Boundary



Line List 6145
State Land Crossing Permit
Location Map

09/25/2015 8:01am - mspeich - N:\NUSCO\58479 - NPT\Overhead\Cadd\01-Record Worksheets\02 Permits\Public Lands Crossings\DXF Exports\372099002.dwg



PUBLIC LAND




PROPOSED MONOPOLE



PROPOSED TRANS
STRUCTURE



**PRELIMINARY - NOT
FOR CONSTRUCTION**

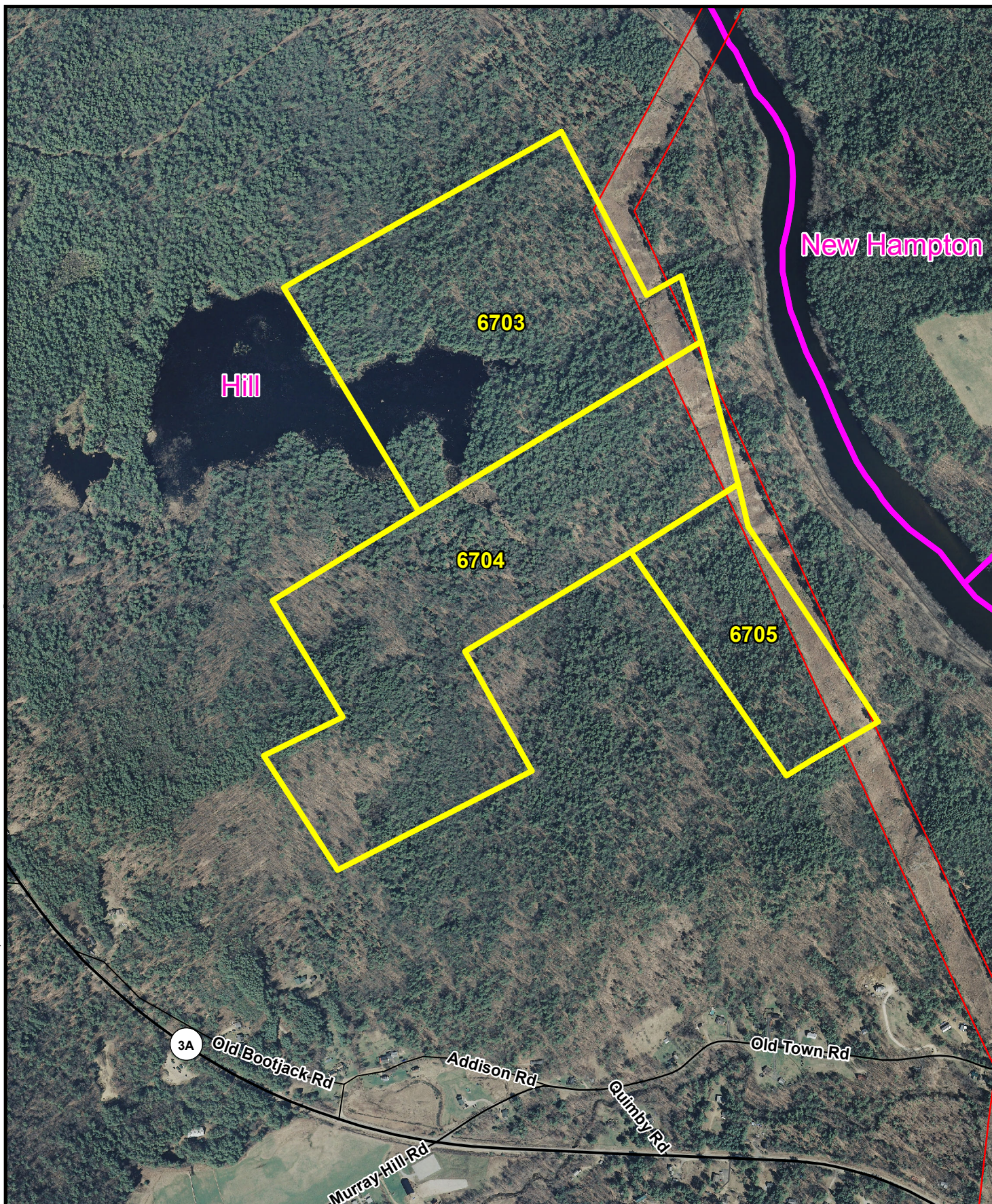
REVISION HISTORY					
-	-	-	-	-	-
A	4/30/15	ISSUED FOR REVIEW		KRR	DAB
		NORTHERN PASS LLC			
		C2 LL6145 3720/3731 STATE LAND CROSSING PERMIT			
BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 372099002.DWG	

APPENDIX 8
3720/3731 DC LINE
STRUCTURES DC-1209 TO DC-1213
STATE OF NEW HAMPSHIRE- DEPARTMENT OF RESOURCES AND ECONOMIC DEVELOPMENT
WILLIAM H. THOMAS STATE FOREST
LL6703, 6704, 6705
HILL, NH

1. This crossing is shown on attached drawing 372099003
 - a. This drawing shows a 30' terrain clearance line (offset from ground surface), which is greater than required minimum of 21.7'.
2. The location of the 3720/3731 line is shown on attached maps titled Line List 6703, Line List 6704, Line List 6705.
3. This portion of the 3720/3731 line will be on steel structures with foundations. The energized conductor (positive pole and negative pole for direct current) is in a horizontal configuration using a 2-bundle of 2933 kcmil AAAC for each pole. The structures will have 2 ground wires in a horizontal configuration. One will be 19#10 Alumoweld; the other will be an OPGW with sag coefficients similar to 19#10 Alumoweld.
 - a. The 3720/3731 line crosses the parcel LL 6703, State of New Hampshire – Department of Resources of Economic Development, William H. Thomas State Forest for approximately 420'
 - b. The 3720/3731 line crosses the parcel LL 6704, State of New Hampshire – Department of Resources of Economic Development, William H. Thomas State Forest for approximately 720'
 - c. The 3720/3731 line crosses the parcel LL 6705, State of New Hampshire – Department of Resources of Economic Development, William H. Thomas State Forest for approximately 880'
4. Energized conductors will have a maximum tension of 20,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).
5. The 3720/3731 line is a 320 kV direct current (DC) line. Per NESC 230 the required clearances are applicable for both alternating and direct currents. To convert 320 kV DC to a corresponding alternating current (AC) voltage (for purposes of calculating clearances) take $320 \text{ kV} \times 3^{0.5} / 2^{0.5} = 392 \text{ kV}$. The equivalent phase to ground is calculated by taking $392 \times 105\%$ (voltage adder) divided by $3^{0.5} = 237.6$.
6. Northern Pass Transmission, LLC (NPT) has investigated a multitude of weather and loading conditions for its design. NPT used these design conditions and combinations thereof to determine the minimum clearance of all conductors to both ground and aerial obstacles,

between the phase conductors and OPGW cable. NPT has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations. All NESC clearances have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met.

- a. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the ground will always exceed the minimum required NESC distance.
- b. 130 degrees F – Maximum operating temperature (energized conductor) based on NPT transmission standards the maximum sag for this weather case controls.






0 400 800



Scale in Feet

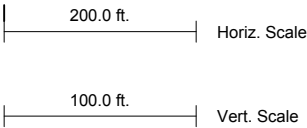
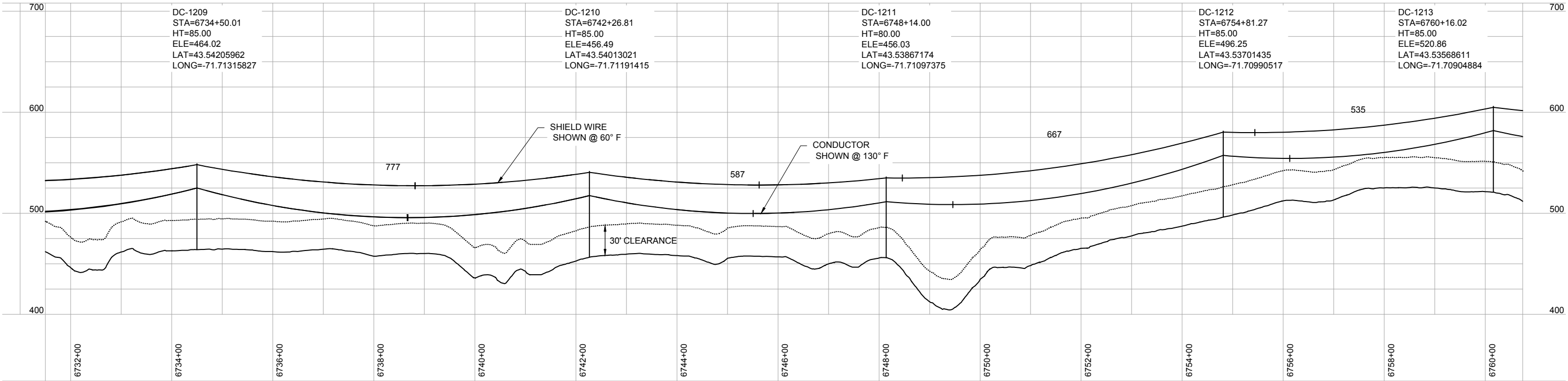
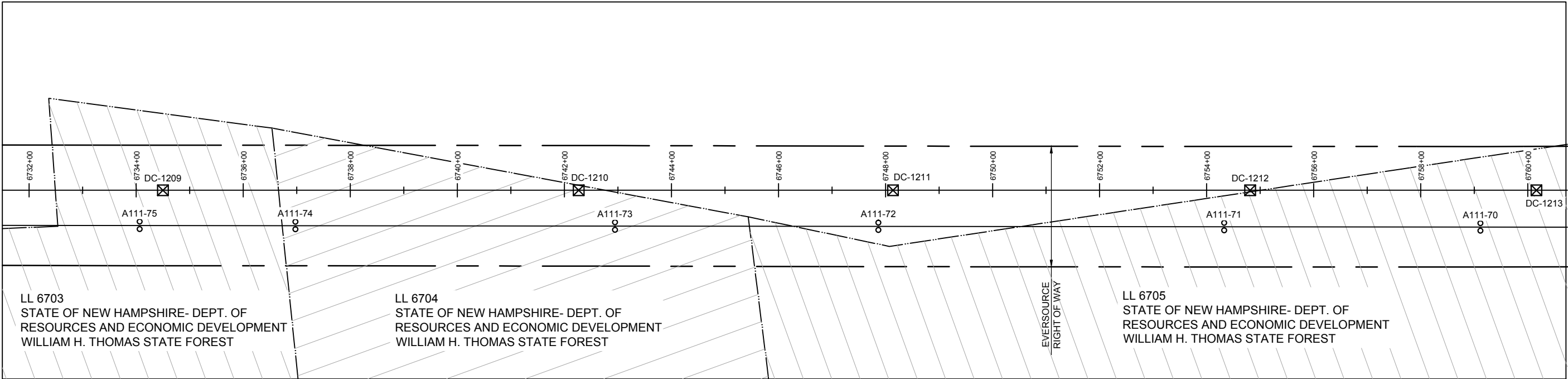
LEGEND

-  Parcel Boundary
-  Project ROW
-  Town Boundary



Line List 6703, 6704, & 6705
State Land Crossing Permit
Location Map


08/27/2015 7:29am - mspeich - N:\NUSCO\58479 - NPT\Overhead\Cadd\01-Record Worksheets\02 Permits\Public Land Crossings\DXF Exports\372099003.dwg



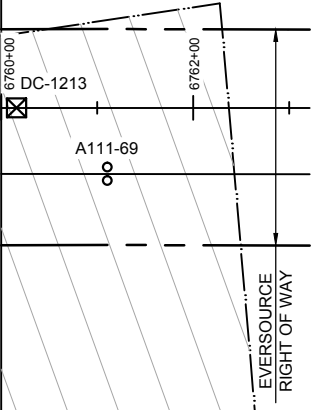
- PROPOSED MONOPOLE
- ⊠ PROPOSED TRANS STRUCTURE
- EXISTING H-FRAME



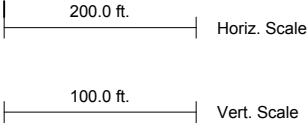
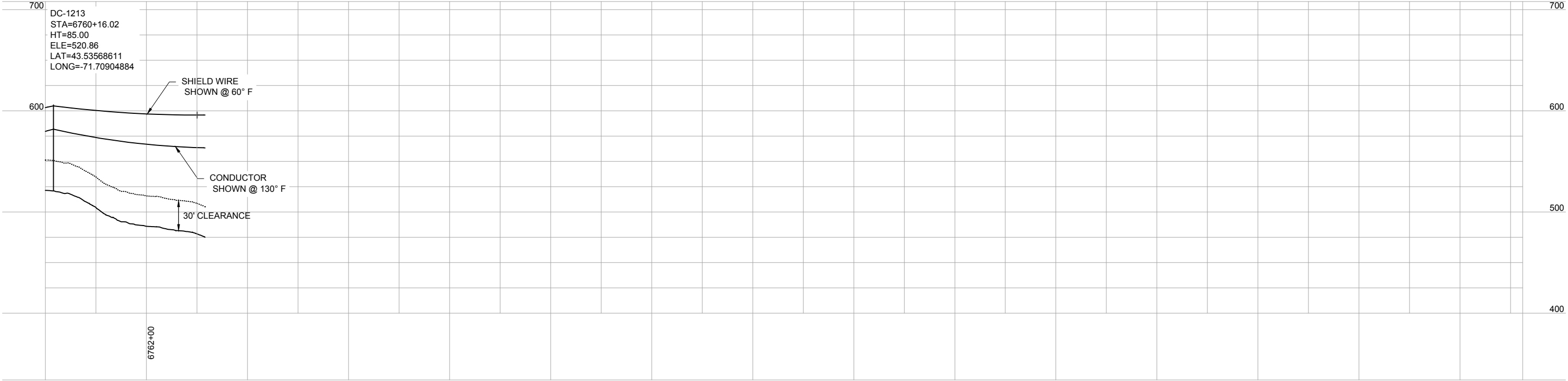
**PRELIMINARY - NOT
FOR CONSTRUCTION**

REVISION HISTORY					
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 THE NORTHERN PASS		NORTHERN PASS LLC			
		TITLE C2 LL6703, LL6704, L6705 3720/3731 STATE LAND CROSSING PERMIT SH. 1 OF 2			
BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 372099003.DWG	

08/27/2015 7:29am - mspeich - N:\NUSCO\58479 - NPT\Overhead\Cadd\01-Record Worksheets\02 Permits\Public Lands Crossings\DXF Exports\372099003.dwg



LL 6705
STATE OF NEW HAMPSHIRE- DEPT. OF
RESOURCES AND ECONOMIC DEVELOPMENT
WILLIAM H. THOMAS STATE FOREST




PUBLIC LAND



PROPOSED MONOPOLE
PROPOSED TRANS
STRUCTURE
EXISTING H-FRAME

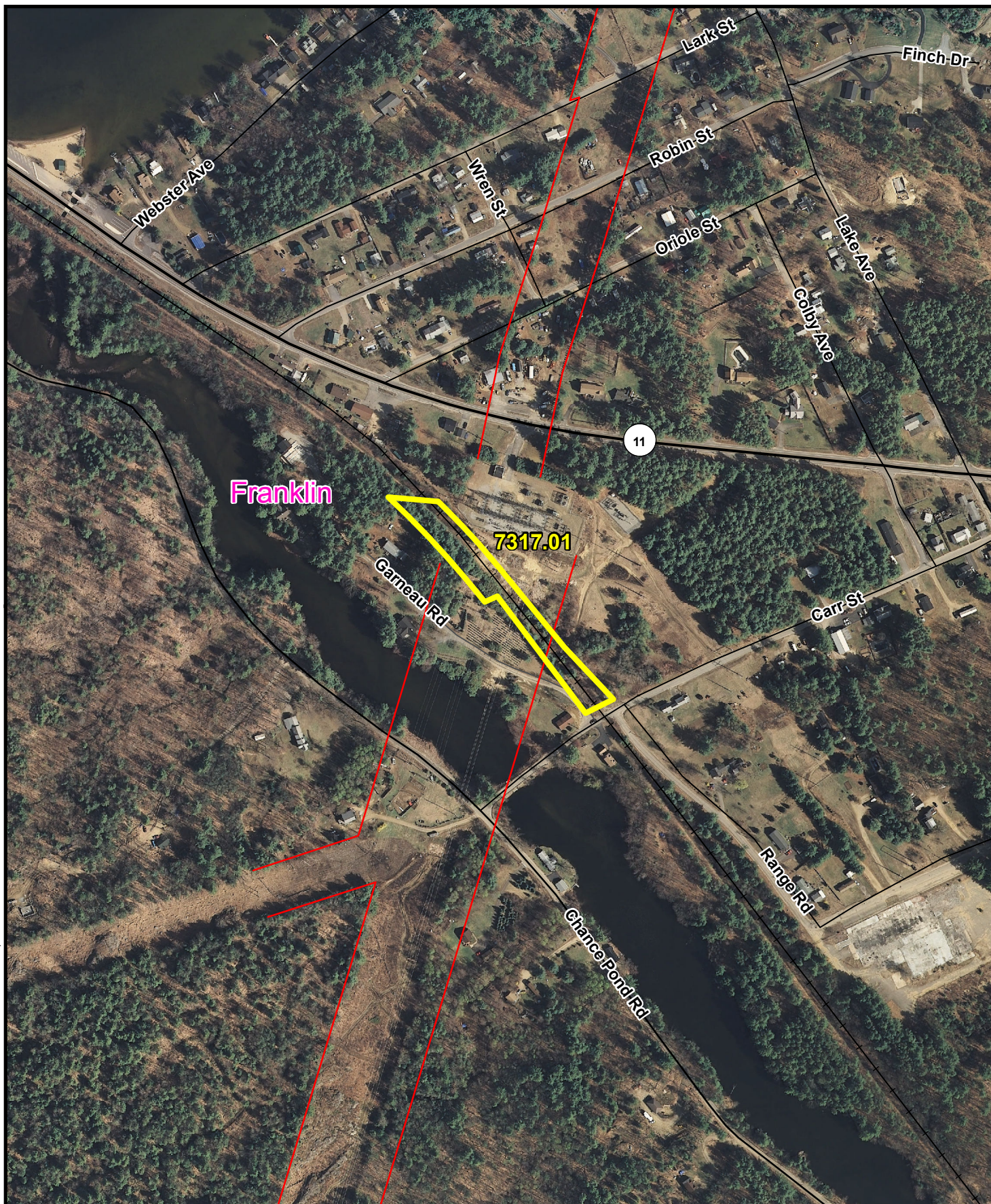
PRELIMINARY - NOT
FOR CONSTRUCTION

REVISION HISTORY					
-	-	-	-	-	-
A	4/30/15	ISSUED FOR REVIEW		KRR	DAB
 THE NORTHERN PASS		NORTHERN PASS LLC			
		TITLE C2 LL6703, LL6704, L6705 3720/3731 STATE LAND CROSSING PERMIT SH. 2 OF 2			
BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 372099003.DWG	

APPENDIX 9
3720/3731 DC LINE
STRUCTURES DC-1270 TO DC-1270
STATE OF NEW HAMPSHIRE- BUREAU OF RAIL AND TRANSIT
RAIL TRAIL
LL7317.01
FRANKLIN, NH

1. This crossing is shown on attached drawing 372099004
 - a. This drawing shows a 30' terrain clearance line (offset from ground surface), which is greater than required minimum of 21.7'.
2. The location of the 3720/3731 line is shown on attached maps titled Line List 7317.01
3. This portion of the 3720/3731 line will be on steel structures with foundations. The energized conductor (positive pole and negative pole for direct current) is in a horizontal configuration using a 2-bundle of 2933 kcmil AAAC for each pole. The structures will have 2 ground wires in a horizontal configuration. One will be 19#10 Alumoweld; the other will be an OPGW with sag coefficients similar to 19#10 Alumoweld.
 - a. The 3720/3731 line crosses the parcel LL 7317.01, State of New Hampshire – Bureau of Rail and Transit for approximately 130'
4. Energized conductors will have a maximum tension of 20,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).
5. The 3720/3731 line is a 320 kV direct current (DC) line. Per NESC 230 the required clearances are applicable for both alternating and direct currents. To convert 320 kV DC to a corresponding alternating current (AC) voltage (for purposes of calculating clearances) take $320 \text{ kV} \times 3^{0.5} / 2^{0.5} = 392 \text{ kV}$. The equivalent phase to ground is calculated by taking $392 \times 105\%$ (voltage adder) divided by $3^{0.5} = 237.6$.
6. Northern Pass Transmission, LLC (NPT) has investigated a multitude of weather and loading conditions for its design. NPT used these design conditions and combinations thereof to determine the minimum clearance of all conductors to both ground and aerial obstacles, between the phase conductors and OPGW cable. NPT has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations. All NESC clearances have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met.
 - a. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the ground will always exceed the minimum required NESC distance.

- b. 130 degrees F – Maximum operating temperature (energized conductor) based on NPT transmission standards the maximum sag for this weather case controls.



0 200 400

Scale in Feet

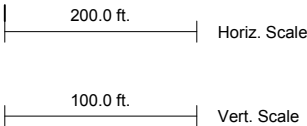
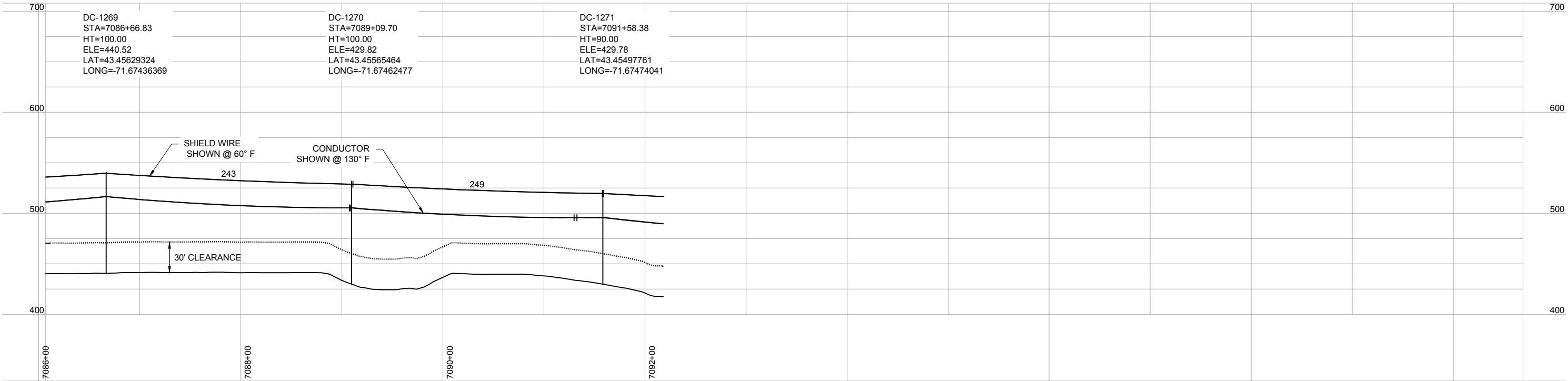
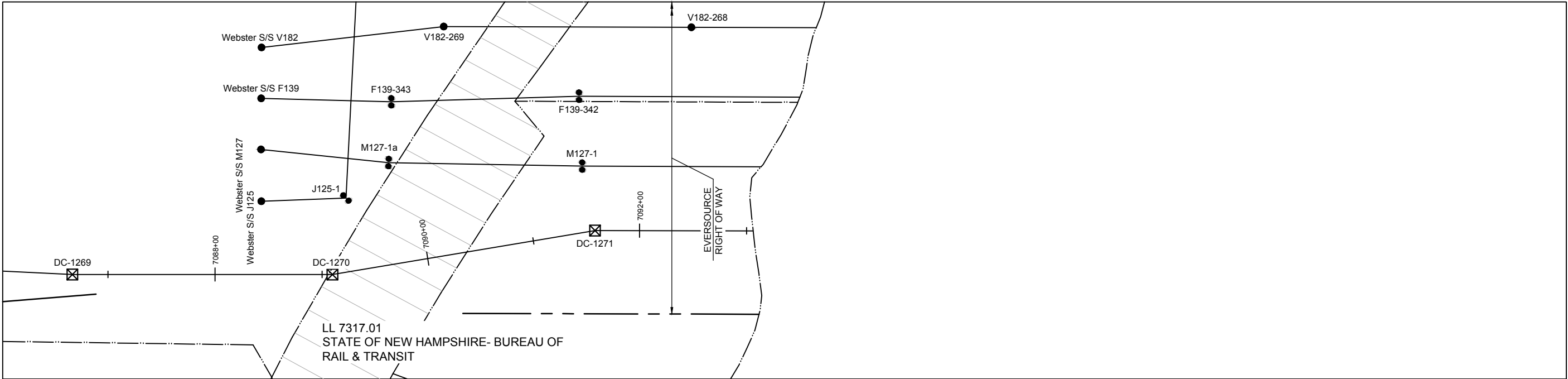
LEGEND

- Parcel Boundary
- Project ROW
- Town Boundary



Line List 7317.01
 State Land Crossing Permit
 Location Map


08/27/2015 7:30am - mspeich - N:\NUSCO\58479 - NPT\Overhead\Cadd\01-Record Worksheets\02 Permits\Public Lands Crossings\DXF Exports\372099004.dwg



- PROPOSED MONOPOLE
- ⊠ PROPOSED TRANS STRUCTURE
- PROPOSED H-FRAME
- EXISTING MONOPOLE



**PRELIMINARY - NOT
FOR CONSTRUCTION**

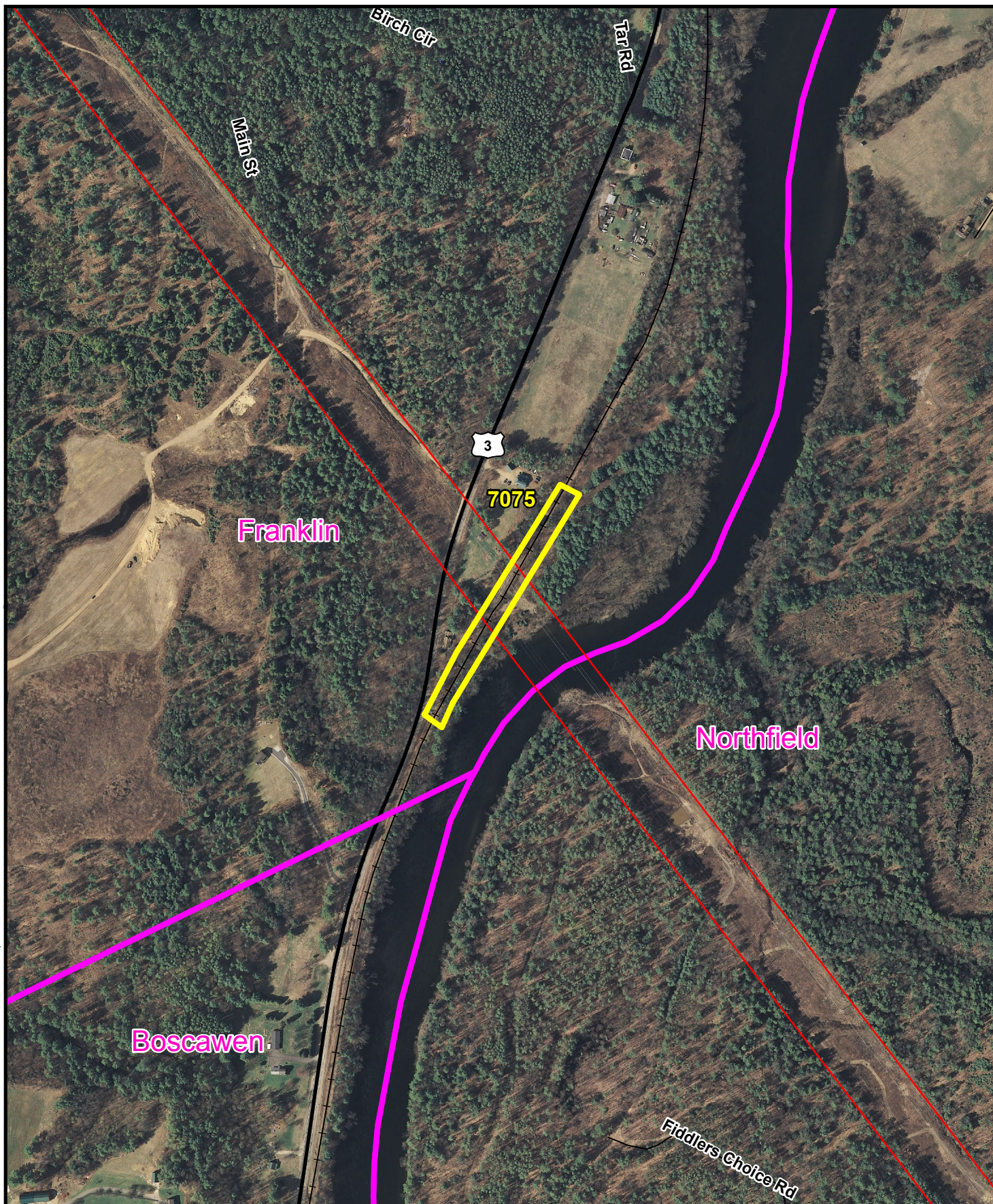
REVISION HISTORY					
-	-	-	-	-	-
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 THE NORTHERN PASS		NORTHERN PASS LLC			
		TITLE C2 7317.01 3720/3731 STATE LAND CROSSING PERMIT			
BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 372099004.DWG	

APPENDIX 10
3132 AC LINE
STRUCTURES 3132-4 TO 3132-5
STATE OF NEW HAMPSHIRE – DEPARTMENT OF TRANSPORTATION
CONCORD-LINCOLN LINE
LL 7075
FRANKLIN, NH

1. This crossing is shown on attached drawing 313243601
2. The location of the 3132 line is shown on attached map titled Line List 7075
3. The 3132 line will be on steel structures at this crossing. The energized conductor is in a horizontal configuration using a 2-bundle of 1590 kcmil ACSR. The structures will have 2 ground wires in a horizontal configuration. One will be 19#10 Alumoweld; the other will be an OPGW with sag coefficients similar to 19#10 Alumoweld.
 - a. 3132-4 & 3132-5 will be structures with suspension insulators. The energized conductors are separated approximately 26 feet horizontally and 0 feet vertically in a horizontal configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW wires are separated horizontally approximately 16 feet. The ground/OPGW and energized conductor are separated vertically by approximately 25 feet.
4. Energized conductors will have a maximum tension of 11,400 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).
5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met.
6. The 3132 line is a 345 kV alternating current (AC) line.
 - a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to tracks of railroads is 26.5'. NESC Rule 232.C.1.a states that an additional clearance of 6.24 feet or $[(209.1 \text{ kV} - 22 \text{ kV}) \times 0.4]/12$ is needed, which brings the total required minimum clearance to 32.7 feet.
 - b. For overhead ground wires, the minimum required clearance to tracks of railroad is 23.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.
 - c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:

- i. 7.72 feet is required between 345 kV AC energized conductor and ground wire
 - ii. 12.83 feet is required between 345 kV AC energized conductors
 - d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support
 - i. 9.17 feet is required between 345 kV AC energized conductors and ground wire
 - ii. 13.00 feet is required between 345 kV AC energized conductors
 - iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.
 - e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
 - i. 8.01 feet is required between 345 kV AC energized conductors and ground wire
 - ii. 13.12 feet is required between 345 kV AC energized conductors
 - f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
 - i. 7.34 feet are required between 345 kV AC energized conductors and ground wire
 - ii. 14.31 feet are required between 345 kV AC energized conductors
 - g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.
7. Northern Pass Transmission, LLC (NPT) has investigated a multitude of weather and loading conditions for its design. NPT used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. NPT has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.
- a. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the railroad track will always exceed the minimum required NESC distance.
 - b. 285 degrees F – Maximum operating temperature (energized conductor) based on NPT transmission standards, the maximum sag for this weather case results in a clearance to railroad track of 57 feet, this exceeds the minimum required clearance of 32.7 feet.
 - c. Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 24.6

feet vertically and 13.3 feet horizontally from the ground wires to the closest energized conductor.






0 250 500



Scale in Feet

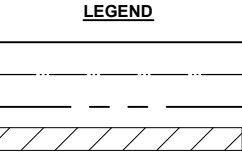
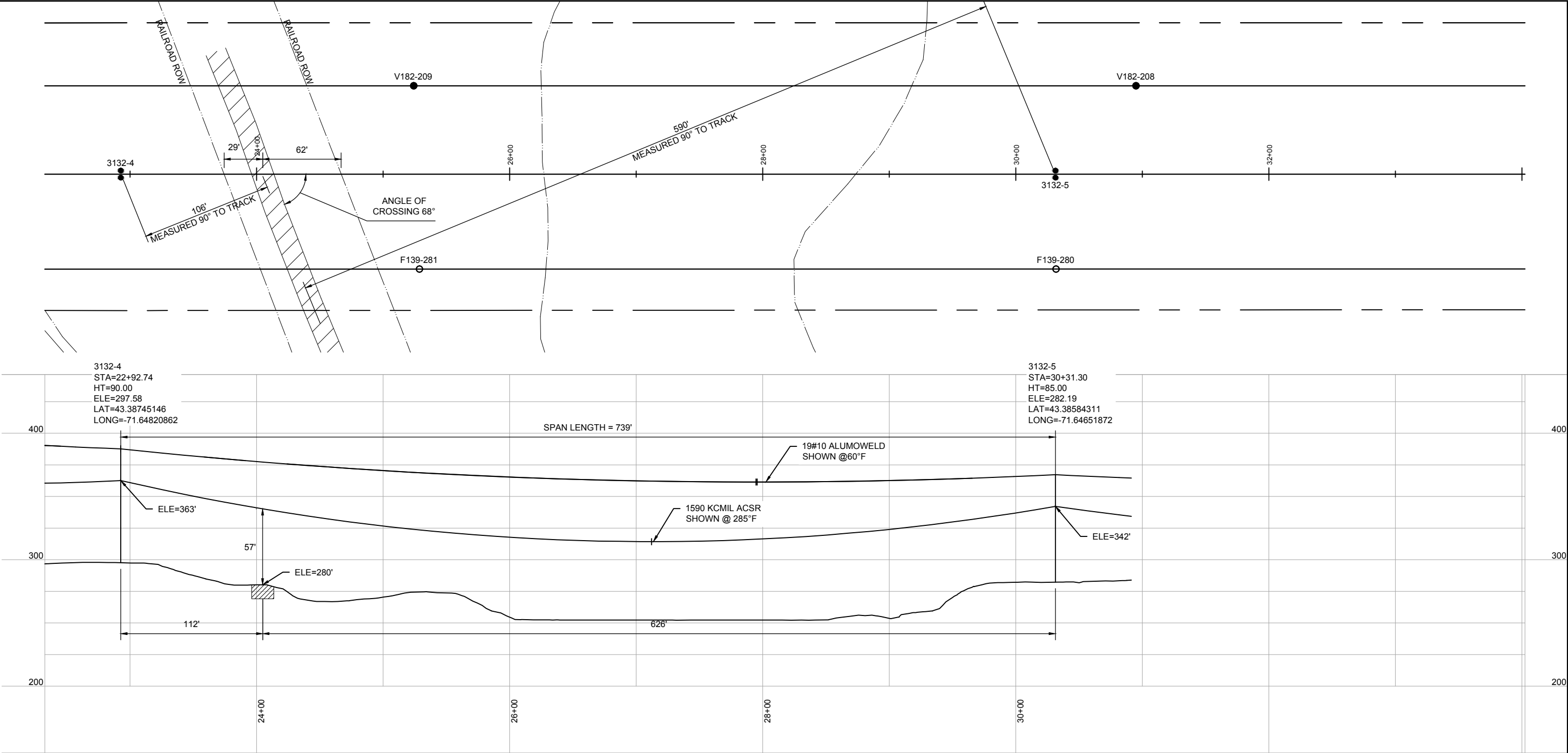
LEGEND

-  Parcel Boundary
-  Project ROW
-  Town Boundary



Line List 7075
State Land Crossing Permit
Location Map

05/07/2015 9:43am - mspepich - N:\NUSCO\58479 - NPT\Overhead\Cadd\01-Record Worksheets\02 Permits\RR Crossing Permits\313243601.dwg



TRANSMISSION CENTERLINE
PARCEL BOUNDARY
EVERSOURCE ROW
RAILROAD BED


○ PROPOSED MONOPOLE
☒ PROPOSED TRANS STRUCTURE
● H-FRAME
● EXISTING MONOPOLE



80.0 ft. Horiz. Scale

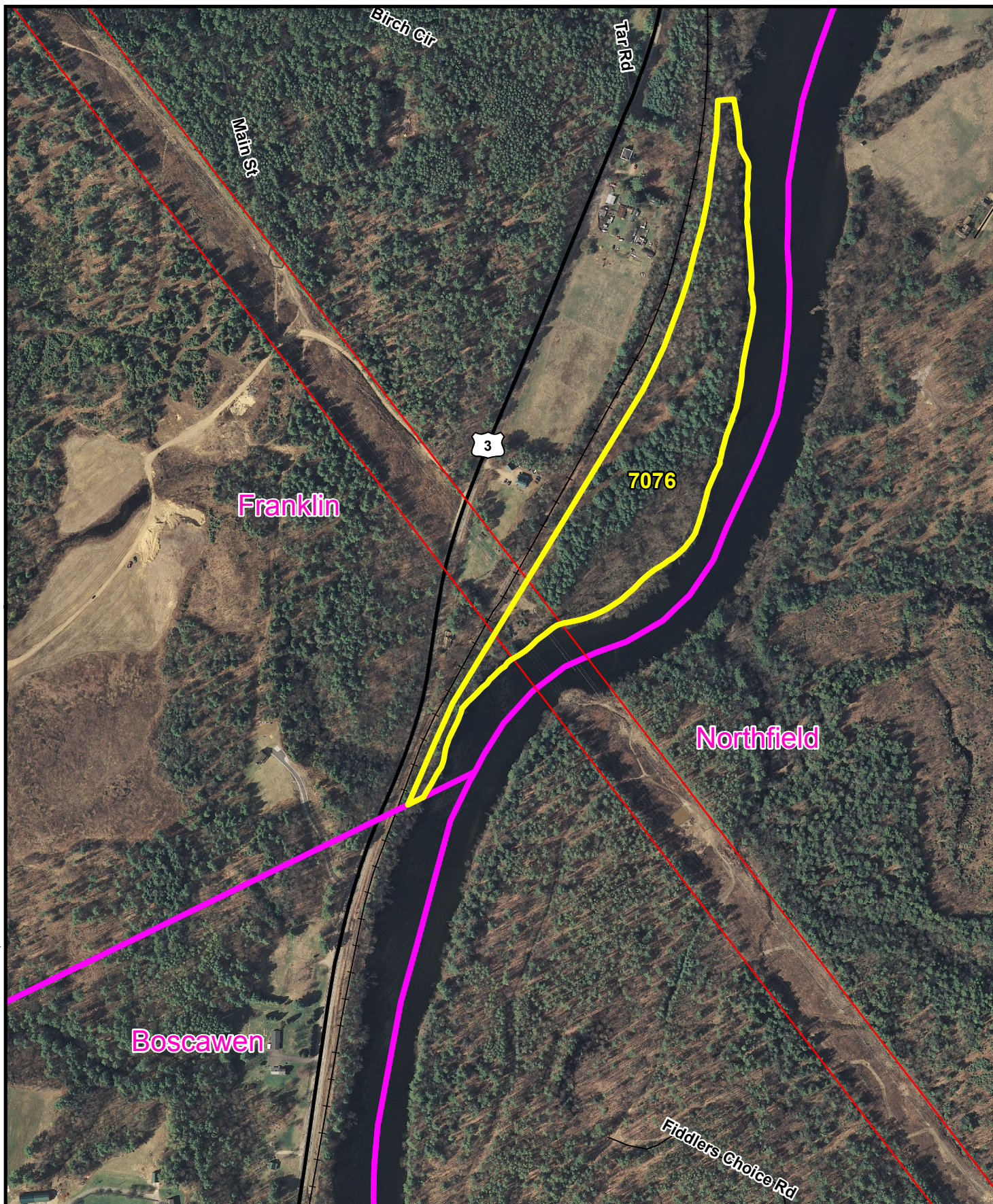
80.0 ft. Vert. Scale

**PRELIMINARY - NOT
FOR CONSTRUCTION**

NOTES:					
1. DESIGN CONFORMS TO ALL CODE REQUIREMENTS (NATIONAL ELECTRIC SAFETY CODE). SAG CONDITION DISPLAYED IN EXHIBIT IS THE CONTROLLING SAG CONDITION.					
REVISION HISTORY					
-	-	-	-	-	-
A	4/23/15	ISSUED FOR REVIEW		MSP	DAB
		NORTHERN PASS LLC			
		TITLE S1 LL7075 3132 RAILROAD CROSSING PERMIT			
BY MSP	REV. NO. A	DATE 4/23/15	SIZE B	DWG. NO. 313243601.DWG	

APPENDIX 11
3132 AC LINE
STRUCTURES 3132-4 TO 3132-5
STATE OF NEW HAMPSHIRE- DEPARTMENT OF TRANSPORTATION
VACANT LAND
LL 7076
FRANKLIN, NH

1. This crossing is shown on attached drawing 313299001
 - a. This drawing shows a 29' terrain clearance line (offset from ground surface), which is greater than required minimum of 20.8'.
2. The location of the 3132 line is shown on attached maps titled Line List 7076
3. This portion of the 3132 line will be on steel structures. The energized conductor is in a horizontal configuration using a 2-bundle of 1590 kcmil ACSR. The structures will have 2 ground wires in a horizontal configuration. One will be 19#10 Alumoweld; the other will be an OPGW with sag coefficients similar to 19#10 Alumoweld.
 - a. The 3132 line crosses the parcel LL 7076 State of New Hampshire – Department of Transportation for approximately 160'.
4. Energized conductors will have a maximum tension of 11,400 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).
5. The 3132 line is a 345 kV alternating current (AC) line.
6. Northern Pass Transmission, LLC (NPT) has investigated a multitude of weather and loading conditions for its design. NPT used these design conditions and combinations thereof to determine the minimum clearance of all conductors to both ground and aerial obstacles, between the phase conductors and OPGW cable. NPT has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations. All NESC clearances have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met.
 - a. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the ground will always exceed the minimum required NESC distance.
 - b. 285 degrees F – Maximum operating temperature (energized conductor) based on NPT transmission standards the maximum sag for this weather case controls.



0 250 500



Scale in Feet

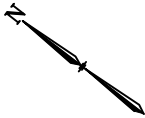
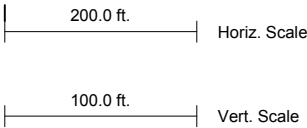
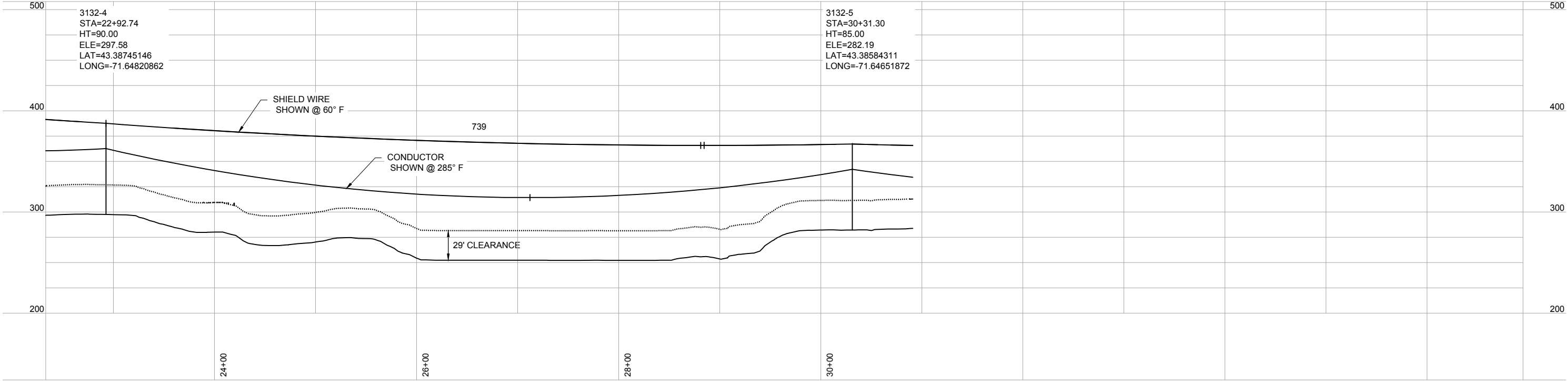
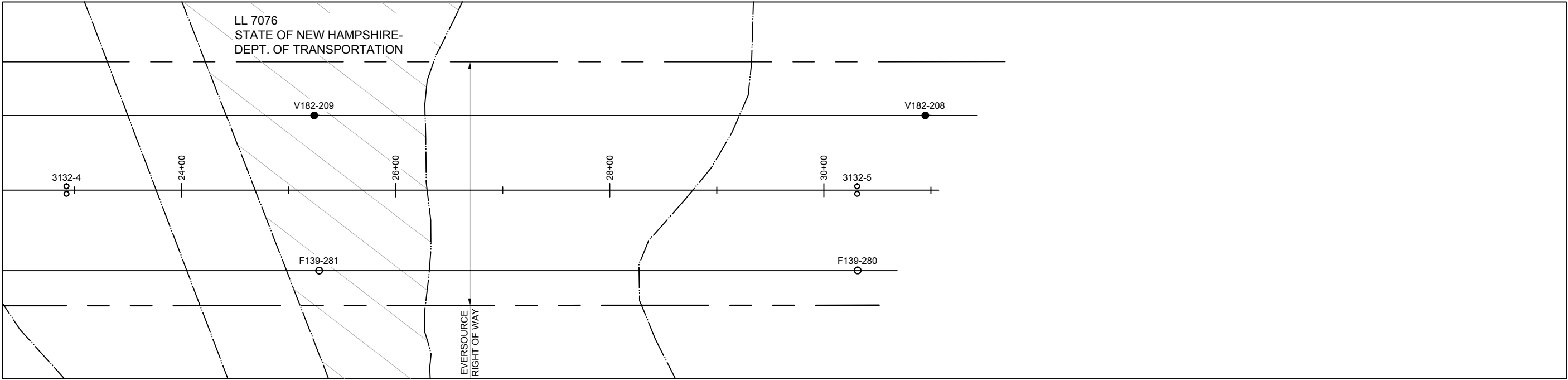
LEGEND

- Parcel Boundary
- Project ROW
- Town Boundary



Line List 7076
 State Land Crossing Permit
 Location Map

08/27/2015 7:22am - mspeich - N:\NUSCO\58479 - NPT\Overhead\Cadd\01-Record Worksheets\02 Permits\Public Lands Crossings\DXF Exports\313299001.dwg



PUBLIC LAND



PROPOSED MONOPOLE
EXISTING H-FRAME
EXISTING MONOPOLE

**PRELIMINARY - NOT
FOR CONSTRUCTION**

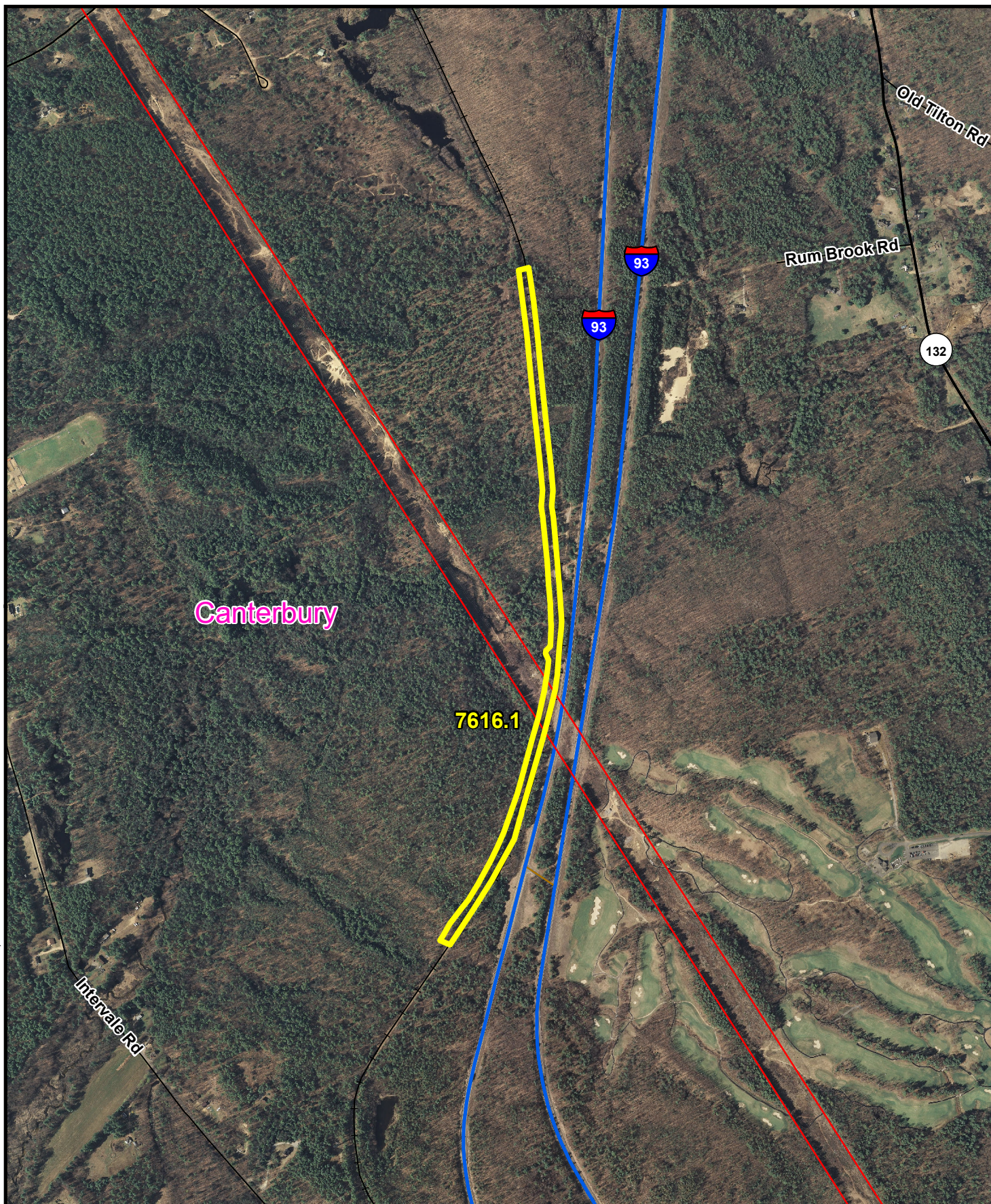
REVISION HISTORY					
-	-	-	-	-	-
A	4/30/15	ISSUED FOR REVIEW		KRR	DAB
		NORTHERN PASS LLC			
		TITLE S1 LL7076 3132 STATE LAND CROSSING PERMIT			
BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 313299001.DWG	

APPENDIX 12
3132 AC LINE
STRUCTURES 3132-32 TO 3132-33
STATE OF NEW HAMPSHIRE – DEPARTMENT OF TRANSPORTATION
CONCORD-LINCOLN LINE
LL 7616.1
CANTERBURY, NH

1. This crossing is shown on attached drawing 313243602
2. The location of the 3132 line is shown on attached map titled Line List 7616.1
3. The 3132 line will be on steel structures at this crossing. The energized conductor is in a horizontal configuration using a 2-bundle of 1590 kcmil ACSR. The structures will have 2 ground wires in a horizontal configuration. One will be 19#10 Alumoweld; the other will be an OPGW with sag coefficients similar to 19#10 Alumoweld.
 - a. 3132-32 & 3132-33 will be structures with suspension insulators. The energized conductors are separated approximately 26 feet horizontally and 0 feet vertically in a horizontal configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW wires are separated horizontally approximately 13 feet. The ground/OPGW and energized conductor are separated vertically by approximately 25 feet.
4. Energized conductors will have a maximum tension of 11,400 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).
5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met.
6. The 3132 line is a 345 kV alternating current (AC) line.
 - a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to tracks of railroads is 26.5'. NESC Rule 232.C.1.a states that an additional clearance of 6.24 feet or $[(209.1 \text{ kV} - 22 \text{ kV}) \times 0.4]/12$ is needed, which brings the total required minimum clearance to 32.7 feet.
 - b. For overhead ground wires, the minimum required clearance to tracks of railroad is 23.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.
 - c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:




- i. 7.72 feet is required between 345 kV AC energized conductor and ground wire
 - ii. 12.83 feet is required between 345 kV AC energized conductors
 - d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support
 - i. 9.17 feet is required between 345 kV AC energized conductors and ground wire
 - ii. 13.00 feet is required between 345 kV AC energized conductors
 - iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.
 - e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
 - i. 8.01 feet is required between 345 kV AC energized conductors and ground wire
 - ii. 13.12 feet is required between 345 kV AC energized conductors
 - f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
 - i. 7.34 feet are required between 345 kV AC energized conductors and ground wire
 - ii. 14.31 feet are required between 345 kV AC energized conductors
 - g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.
7. Northern Pass Transmission, LLC (NPT) has investigated a multitude of weather and loading conditions for its design. NPT used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. NPT has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.
- a. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the railroad track will always exceed the minimum required NESC distance.
 - b. 285 degrees F – Maximum operating temperature (energized conductor) based on NPT transmission standards, the maximum sag for this weather case results in a clearance to railroad track of 77 feet, this exceeds the minimum required clearance of 32.7 feet.
 - c. Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 24.5

feet vertically and 13.5 feet horizontally from the ground wires to the closest energized conductor.



0 500 1,000
Feet

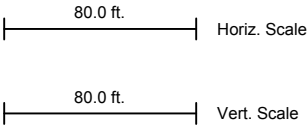
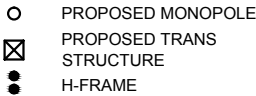
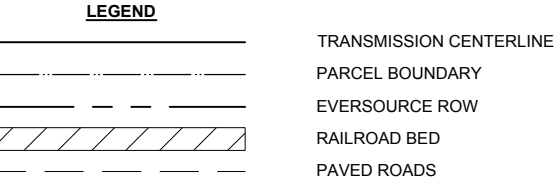
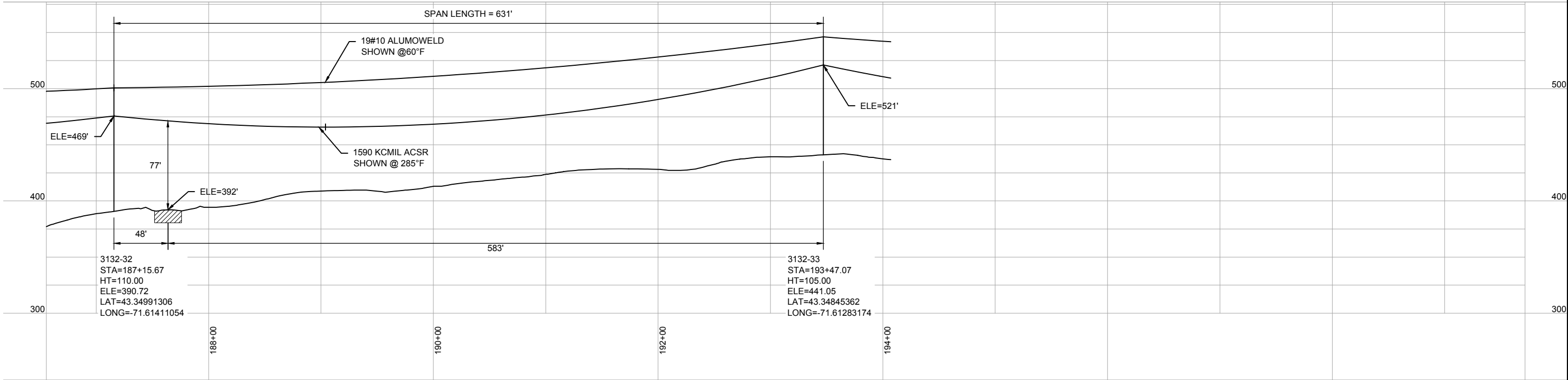
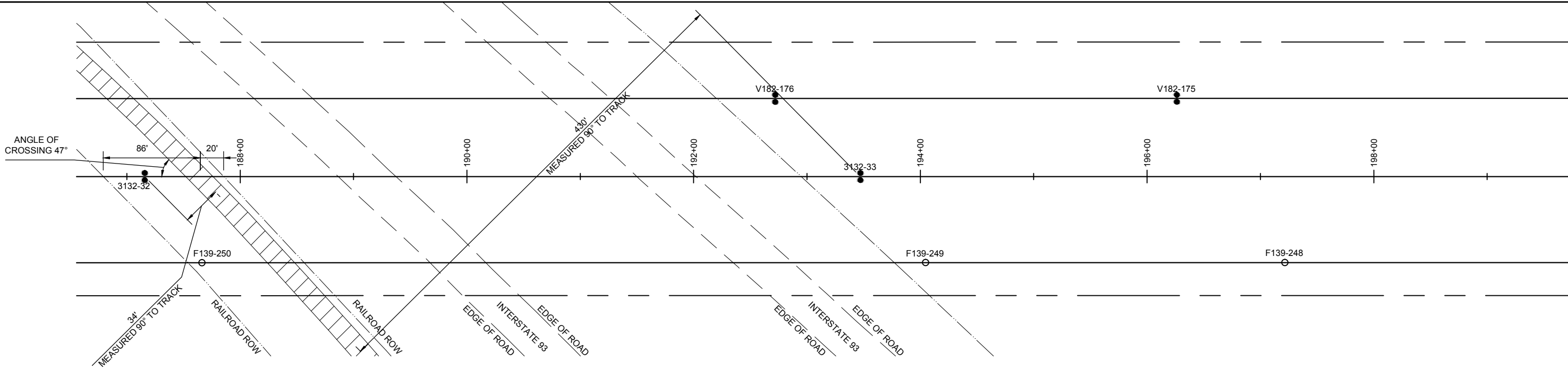
LEGEND

-  Parcel Boundary
-  Project ROW
-  Town Boundary



Line List 7616.1
State Land Crossing Permit
Location Map

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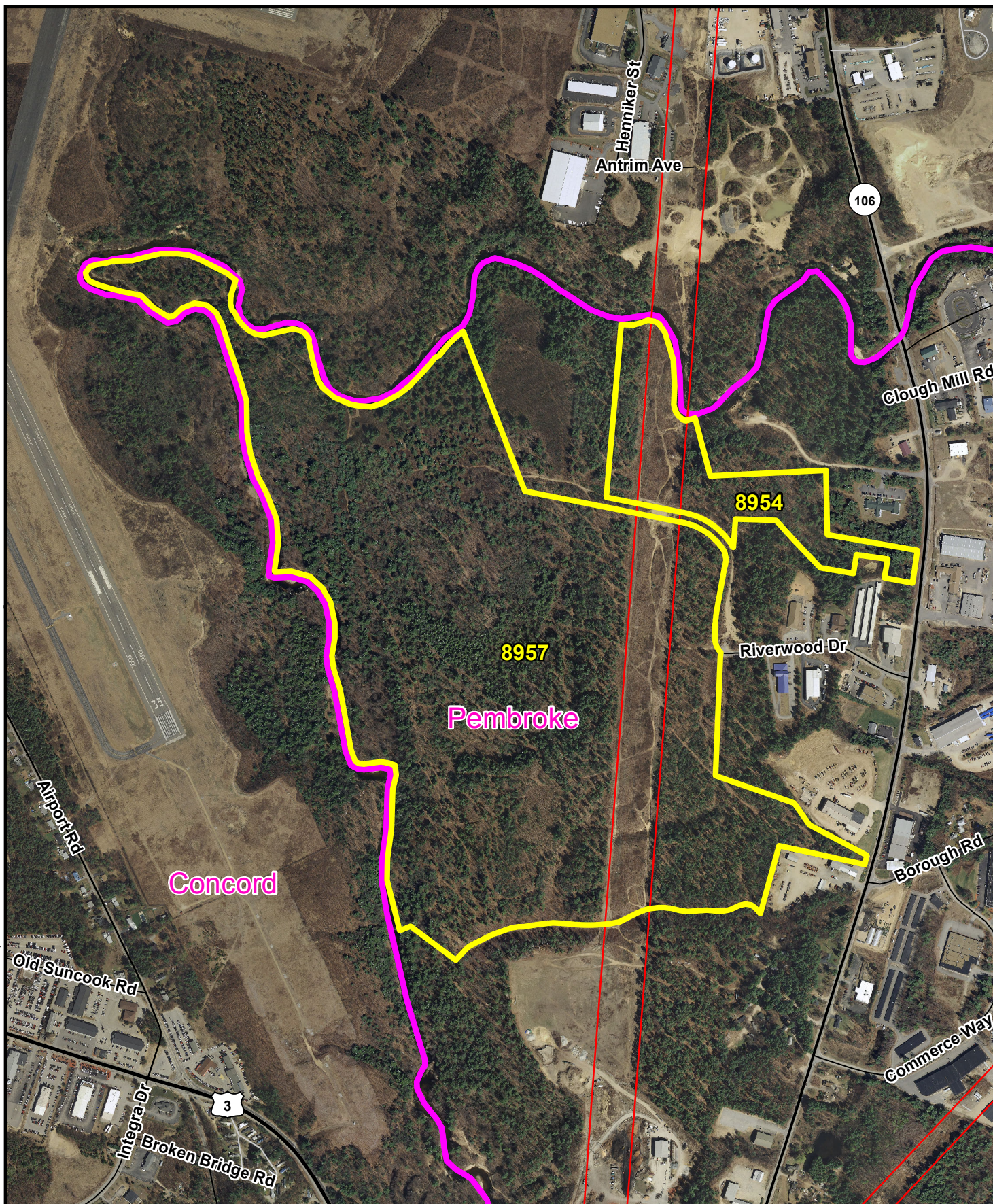


**PRELIMINARY - NOT
FOR CONSTRUCTION**

NOTES:					
1. DESIGN CONFORMS TO ALL CODE REQUIREMENTS (NATIONAL ELECTRIC SAFETY CODE). SAG CONDITION DISPLAYED IN EXHIBIT IS THE CONTROLLING SAG CONDITION.					
REVISION HISTORY					
-	-	-	-	-	-
A	4/23/15	ISSUED FOR REVIEW		MSP	DAB
		NORTHERN PASS LLC			
		TITLE N2 LL7616.1 3132 RAILROAD CROSSING PERMIT			
BY MSP	REV. NO. A	DATE 4/23/15	SIZE B	DWG. NO. 313243602.DWG	

APPENDIX 13
3132 AC LINE
STRUCTURES 3132-160 TO 3132-164
STATE OF NEW HAMPSHIRE- ADJUTANT GENERAL'S DEPARTMENT
LL 8954 & 8957
PEMBROKE, NH

1. This crossing is shown on attached drawing 313299002
 - a. This drawing shows a 29' terrain clearance line (offset from ground surface), which is greater than required minimum of 20.8'.
2. The location of the 3132 line is shown on attached maps titled Line List 8954 & Line List 8957.
3. This portion of the 3132 line will be on steel structures. The energized conductor is in a horizontal configuration using a 2-bundle of 1590 kcmil ACSR. The structures will have 2 ground wires in a horizontal configuration. One will be 19#10 Alumoweld; the other will be an OPGW with sag coefficients similar to 19#10 Alumoweld.
 - a. The 3132 line crosses the parcel LL 8954, State of New Hampshire – Adjutant General Department for approximately 1,000'
 - b. The 3132 line crosses the parcel LL 8957, State of New Hampshire – Adjutant General Department for approximately 2,450'
4. Energized conductors will have a maximum tension of 11,400 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).
5. The 3132 line is a 345 kV alternating current (AC) line.
6. Northern Pass Transmission, LLC (NPT) has investigated a multitude of weather and loading conditions for its design. NPT used these design conditions and combinations thereof to determine the minimum clearance of all conductors to both ground and aerial obstacles, between the phase conductors and OPGW cable. NPT has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations. All NESC clearances have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met.
 - a. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the ground will always exceed the minimum required NESC distance.
 - b. 285 degrees F – Maximum operating temperature (energized conductor) based on NPT transmission standards the maximum sag for this weather case controls.



0 400 800

Scale in Feet

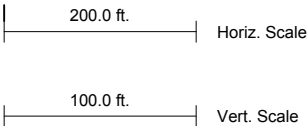
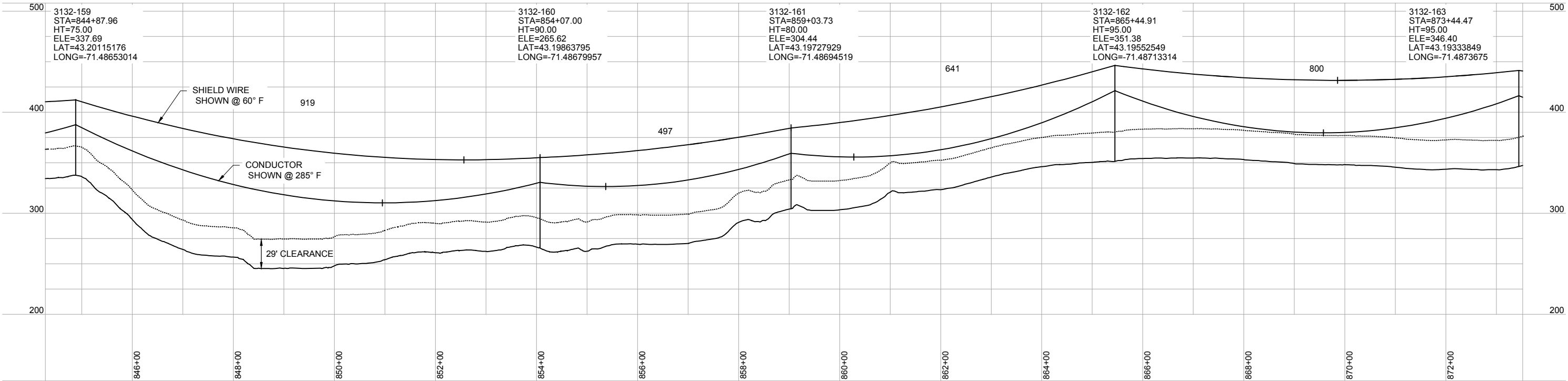
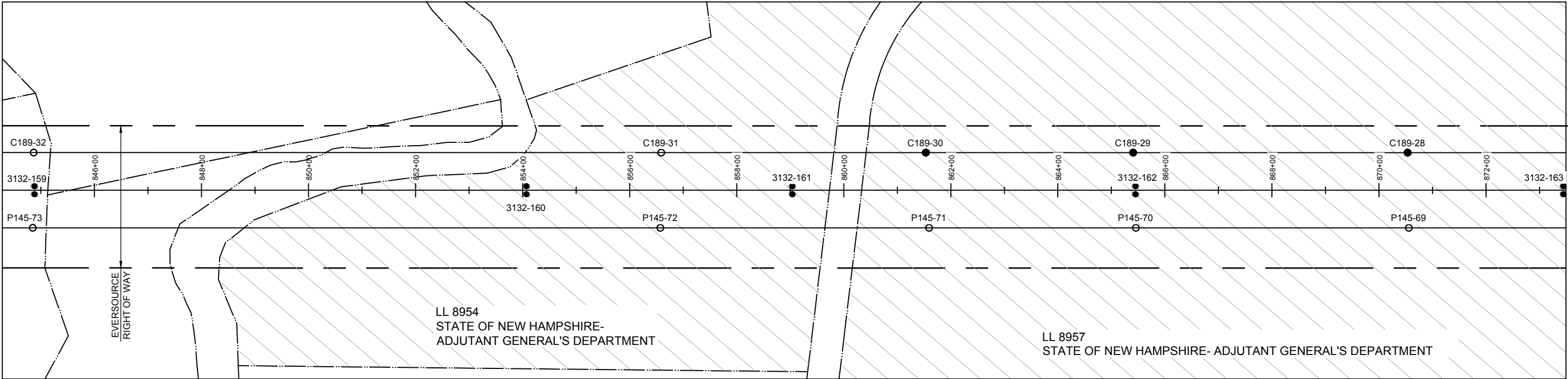
LEGEND

- Parcel Boundary
- Project ROW
- Town Boundary



Line List 8954 & 8957
 State Land Crossing Permit
 Location Map


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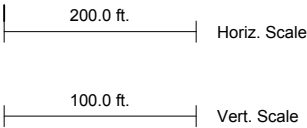
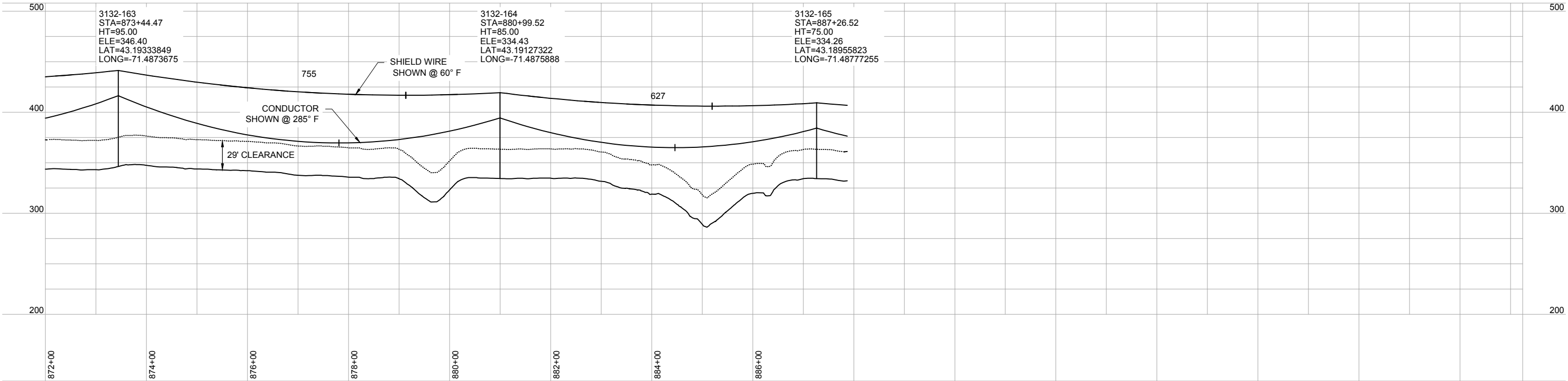
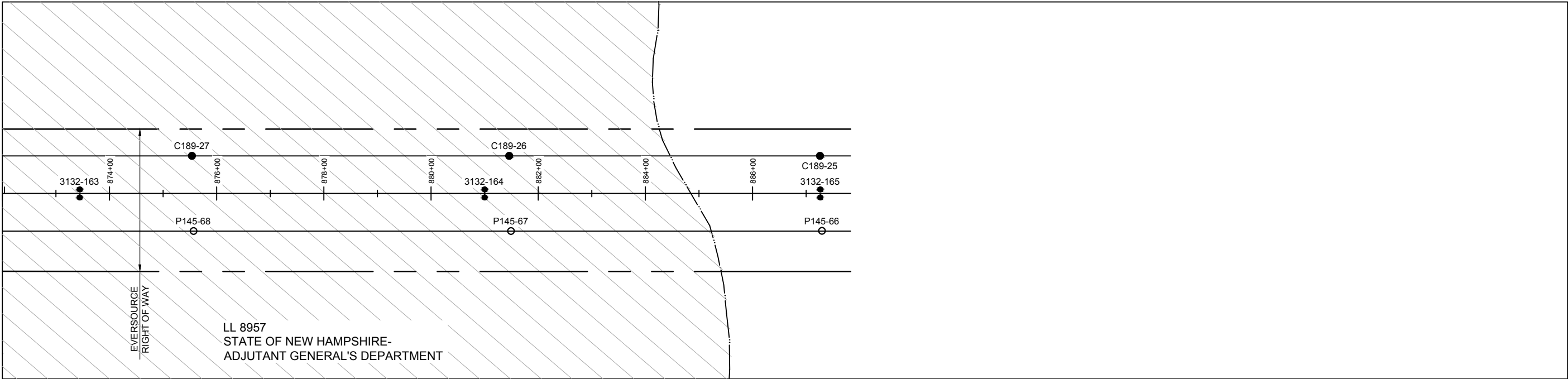
- PROPOSED MONOPOLE
- ⊠ PROPOSED TRANS STRUCTURE
- PROPOSED H-FRAME
- EXISTING MONOPOLE



**PRELIMINARY - NOT
FOR CONSTRUCTION**

REVISION HISTORY					
-	-	-	-	-	-
A	4/30/15	ISSUED FOR REVIEW		KRR	DAB
 THE NORTHERN PASS		NORTHERN PASS LLC			
		TITLE S1 LL8954, LL8957 3132 STATE LAND CROSSING PERMIT SH. 1 OF 2			
BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 313299002.DWG	

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PUBLIC LAND



PROPOSED MONOPOLE
PROPOSED TRANS
STRUCTURE
PROPOSED H-FRAME
EXISTING MONOPOLE

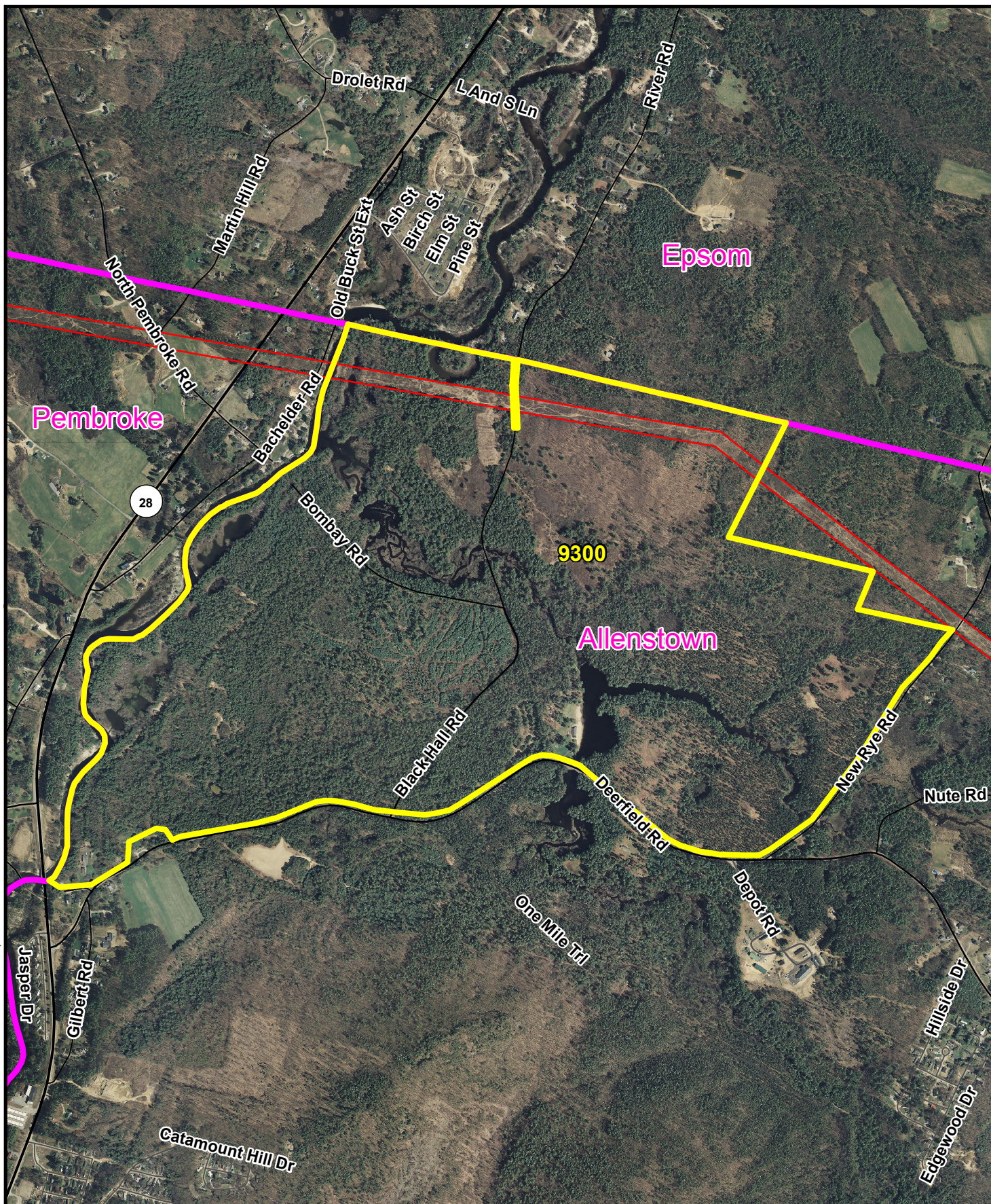


**PRELIMINARY - NOT
FOR CONSTRUCTION**

REVISION HISTORY					
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A	4/30/15	ISSUED FOR REVIEW		KRR	DAB
		NORTHERN PASS LLC			
		TITLE S1 LL8954, LL8957 3132 STATE LAND CROSSING PERMIT SH. 2 OF 2			
BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 313299002.DWG	

APPENDIX 14
3132 AC LINE
STRUCTURES 3132-219 TO 3132-227
STATE OF NEW HAMPSHIRE- DEPARTMENT OF RESOURCES AND ECONOMIC DEVELOPMENT
BEAR BROOK STATE PARK
LL 9300
ALLENSTOWN, NH

1. This crossing is shown on attached drawing 313299003
 - a. This drawing shows a 29' terrain clearance line (offset from ground surface), which is greater than required minimum of 20.8'.
2. The location of the 3132 line is shown on attached maps titled Line List 9300.
3. This portion of the 3132 line will be on steel structures. The energized conductor is in a vertical configuration using a 2-bundle of 1590 kcmil ACSR. The structures will have 1 ground wire; it will be an OPGW with sag coefficients similar to 19#10 Alumoweld.
 - a. The 3132 line crosses the parcel LL 9300 State of New Hampshire – Department of Resources of Economic Development, Bear Brook State Park for approximately 4500'.
4. Energized conductors will have a maximum tension of 11,400 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).
5. The 3132 line is a 345 kV alternating current (AC) line.
6. Northern Pass Transmission, LLC (NPT) has investigated a multitude of weather and loading conditions for its design. NPT used these design conditions and combinations thereof to determine the minimum clearance of all conductors to both ground and aerial obstacles, between the phase conductors and OPGW cable. NPT has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations. All NESC clearances have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met.
 - a. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the ground will always exceed the minimum required NESC distance.
 - b. 285 degrees F – Maximum operating temperature (energized conductor) based on NPT transmission standards the maximum sag for this weather case controls.



0 0.125 0.25
 Miles

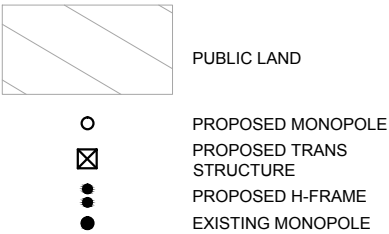
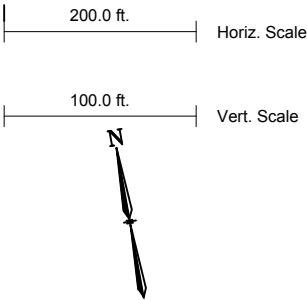
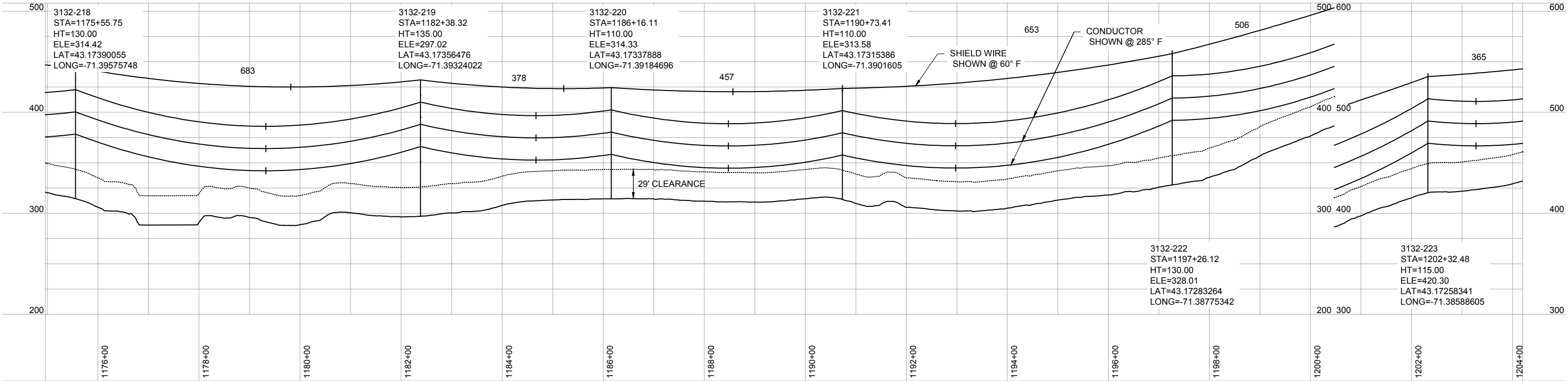
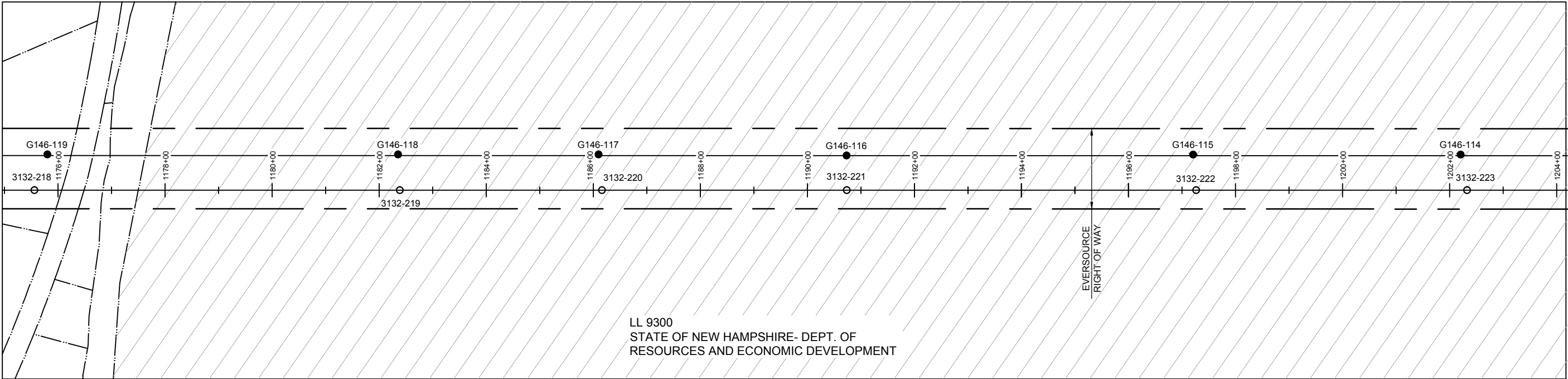
LEGEND

- Parcel Boundary
- Project ROW
- Town Boundary




Line List 9300
 State Land Crossing Permit
 Location Map

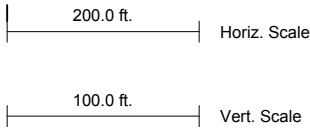
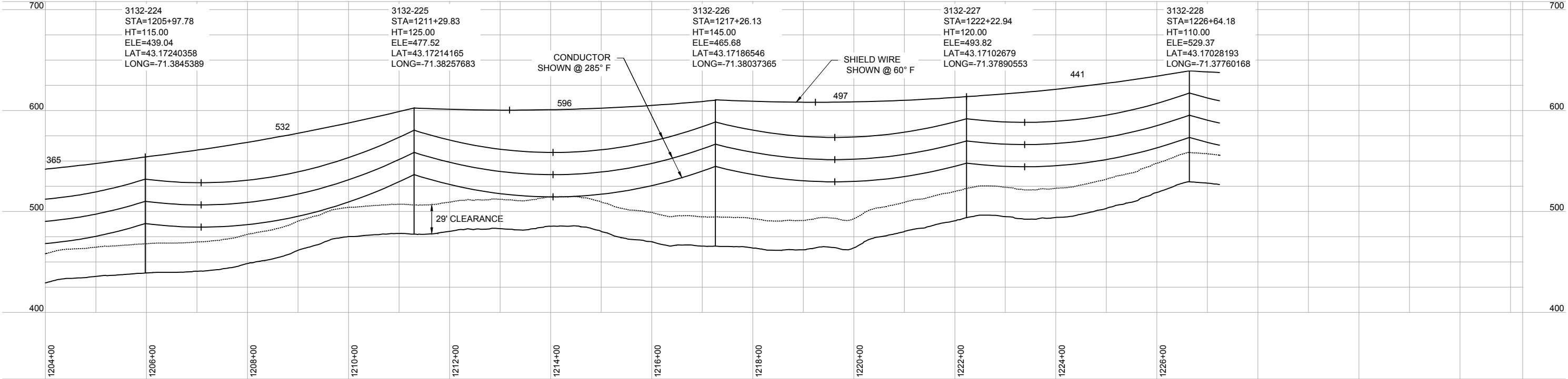
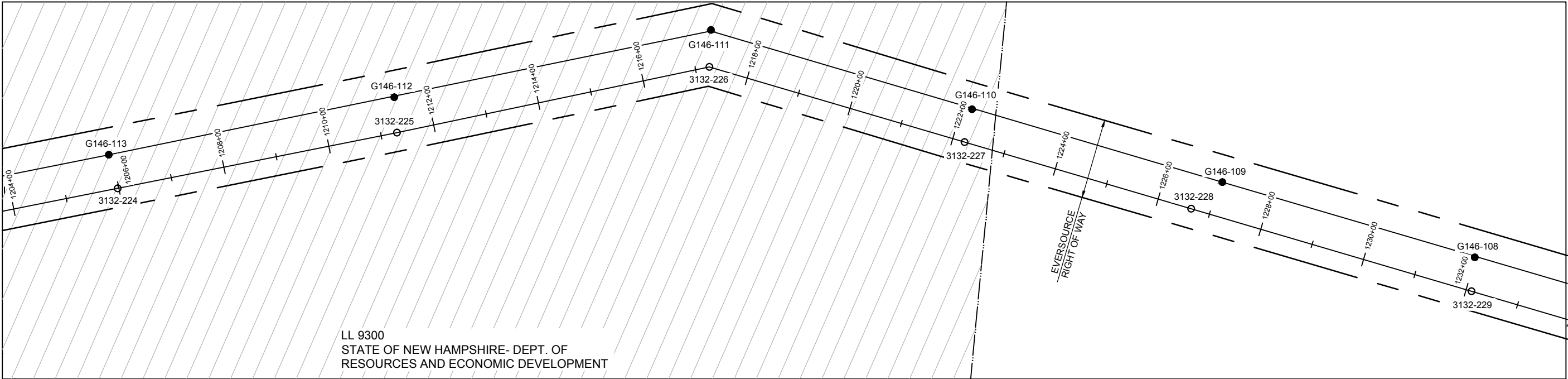
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**PRELIMINARY - NOT
FOR CONSTRUCTION**

REVISION HISTORY					
-	-	-	-	-	-
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 THE NORTHERN PASS		NORTHERN PASS LLC			
		TITLE S1 LL9300 3132 STATE LAND CROSSING PERMIT SH. 1 OF 2			
BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 313299003.DWG	


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PUBLIC LAND

- PROPOSED MONOPOLE
- ⊠ PROPOSED TRANS STRUCTURE
- PROPOSED H-FRAME
- EXISTING MONOPOLE

**PRELIMINARY - NOT
FOR CONSTRUCTION**

REVISION HISTORY					
-	-	-	-	-	-
A	4/30/15	ISSUED FOR REVIEW		KRR	DAB
 THE NORTHERN PASS		NORTHERN PASS LLC			
		TITLE S1 LL9300 3132 STATE LAND CROSSING PERMIT SH. 2 OF 2			
BY KRR	REV. NO. A	DATE 4/30/15	SIZE B	DWG. NO. 313299003.DWG	