



# Rating reliability and representation validity in scenic landscape assessments

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## Abstract

The US Supreme Court recently determined that experts from all fields of knowledge must demonstrate the reliability and validity of their testimony. While the broader implications of their finding have yet to manifest itself, it clearly has the potential to challenge all manner of professional practices. This paper explores the reliability of visual quality ratings of landscapes, and the validity of photographic representations used when making these ratings. A review of the literature finds that relatively few studies report reliability or validity coefficients. Those including such reports give reason for some concern. Data from several studies are re-analyzed to demonstrate how professionals should evaluate the reliability and validity of their visual landscape assessments. © 2001 Elsevier Science B.V. All rights reserved.

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## 1. Introduction

Visual landscape assessments involve the inventory and evaluation of diverse visible attributes of the landscape for purposes of planning, design and management. Such assessments may involve expert appraisals or public judgements, but they are always conducted by landscape professionals. As currently practiced, visual assessments are firmly grounded in a tradition of knowing that requires the collection of empirical (often quantitative) data for analysis through systematic means. That is, we believe the landscape has a physical reality independent of people that can be characterized through various measurements. The landscape also has a reality that depends on our individual perceptions. These perceptions can be characterized or measured by various means. While

beauty (and other perceptions) may be “in the eye of the beholder,” we believe that large groups of people share similar landscape perceptions, either because of biological heritage or common cultural and personal experiences. Attendant with this perspective of research or practice is the normative belief that to be good our work must be both reliable and valid.

This paper reviews two issues of particular importance to scenic landscape assessments: (1) the degree of similarity among evaluators, which is a test of reliability, and (2) the equivalence of judgements made from photographs and in the field, which is a test of validity. The rest of the introduction describes why reliability and validity are a concern for visual landscape assessment. In the following sections, the literature supporting the common practice in landscape assessments is reviewed for each of these concerns. Data are presented that cast doubt on common practices, and a more responsible approach is proposed.

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### 1.1. Reliability and validity as professional responsibilities

What is it that distinguishes a visual landscape assessment prepared by an expert compared to an ordinary citizen? Landscape architects form the primary professional group conducting visual landscape assessments in the United States. The American Society of Landscape Architects' Code and Guidelines for Professional Conduct requires that its members "not mislead ... clients," and "undertake to perform professional services only when they ... are qualified" (ASLA, 1998: 6). However, this says little about what standards to expect from visual landscape assessment experts. Recent rulings from the US Supreme Court are much less ambiguous about what it means to be an expert.

Since 1923 the standard under which US Courts permitted expert testimony was whether he or she was "generally accepted" by the relevant scientific community (Marshall, 1993). In *Daubert* (1993), the US Supreme Court asserted a new standard for determining what qualifies an expert to provide factual testimony. Before accepting testimony on facts or data, the trial judge must ensure that the "expert's testimony both rests on a reliable foundation and is relevant to the task at hand." The judge must further determine that the testimony will be relevant "by demanding a valid scientific connection to the pertinent inquiry as a precondition to admissibility." The focus in *Daubert* was on scientific findings. The court offered four possible considerations for determining the admissibility of scientific testimony: (1) whether the theory or technique is falsifiable and has been tested, (2) whether it has been subjected to peer review and published, (3) what is its known or potential error rate and what are the standards to control it, and (4) widespread acceptance by the relevant scientific community. In *Kumho* (1999) the Court reaffirmed their ruling and extended it "not only to 'scientific' testimony, but to all expert testimony." The facts of this case concerned whether a tire failed from a manufacturing defect or other cause. Of particular importance to us is that "the specific issue before the court was not the reasonableness *in general* of a tire expert's use of a visual and tactile inspection" to obtain data, but the "particular method of analyzing the data thereby obtained, to draw a conclusion regarding the parti-

cular matter to which the expert testimony was directly relevant." They further clarify that "the relevant issue was whether the expert could reliably determine the cause of *this* tire's separation." In *Kumho*, the expert "failed to satisfy either *Daubert's* factors or *any other* set of reasonable reliability criteria."

A central feature of environmental decision-making in the United States, as well as elsewhere, is its adversarial nature. These US Supreme Court rulings shed significant light on what all experts must do to establish the reliability and relevance of both their data and methods of analysis. It is the experts' responsibility to establish the reliability and validity of their methods generally, and as applied to specific studies. We believe that few involved with visual landscape assessment are prepared to do this. The following review of the literature establishes that there is cause for concern. Procedures to evaluate the reliability of landscape ratings and the validity of landscape representations are presented here in the hope that they will be widely employed by those preparing visual landscape assessments.

### 1.2. Visual landscape assessments in practice

We believe that few of those conducting visual landscape assessments are prepared to meet the Supreme Court's criteria for expertise. Most assessments rely on one of the established procedures (Countryside Commission, 1993; Smardon et al., 1988; USDA, 1995, 1974; USDI, 1980; USDOT, 1981). However, they are frequently adapted for local circumstances, or in other ways "improved." The assessment begins with a desk study to become oriented to the area, determine its boundaries, and prepare the fieldwork. Typically only one professional conducts the field evaluation at any particular site. This may include completing systematic evaluation sheets or simply taking field notes. Photographs are normally taken to document the area, but often without any explicit approach to selection beyond a desire to be "representative" (Hull and Revell, 1989). Upon returning to the office, the field data are organized. If the study is associated with an impact assessment, then visual simulations may be prepared. If the project is politically charged, a group of evaluators may rate slides or photographs of the site with and without the proposed project. However, evaluations are always the

result of an individual's experience, not a group's experience. The professional analyzes these data and prepares a report that includes only mean ratings.

Issues concerning the reliability and validity of the photographic representations and the evaluations are not considered. If a reviewer raises these issues, the response will be that research by Daniel and Boster (1976), Shafer and Richards (1974) and Zube and colleagues (1974), has shown that photographs can be used with confidence in visual assessments. As for the procedures used, the reply will be that they are "widely accepted" and the evaluations were made by a qualified professional. It is unlikely that they are prepared to demonstrate how the work of Daniel, Shafer or Zube relates to their specific project. Nor could they refer to work demonstrating the reliability of the evaluation methods they use, particularly as applied to their specific project.

### *1.3. Units of analysis*

We found reason to be concerned after conducting the literature reviews summarized below. When reporting the reliability of landscape ratings, authors almost always report the reliability of the group's mean rating and not the reliability of individual ratings. Similarly, when evaluating the validity of photographic landscape representations, authors almost always report the correlation of mean ratings for a group of representations compared to ratings of the actual settings they represent. The validity of individual representations are rarely considered. We believe this practice is in error because it fails to represent the way landscapes are experienced by the public or evaluated by landscape professionals. This error is known by social scientists as the "ecological fallacy."

Robinson (1950) first demonstrated the error of using a group measurement to substitute for individual measurements. He defines an analysis of individuals as being when "the statistical object or thing described is indivisible." An ecological analysis occurs when the "statistical object is a group" of individuals. Robinson provides dramatic examples of where grouped data are erroneously used to describe individual attributes. Since landscape ratings are an individual activity in practice, then an analysis of the reliability of ratings must begin with individual rather than group data. Similarly, we normally evaluate individual sites or

views. Therefore, the validity of representations must also be evaluated at the site level, and not for an aggregation of sites.

However, we acknowledge that there may be times when it is appropriate to consider the reliability of a group's mean rating or the validity of a group of representations. There is a recent exchange in the literature about the appropriate unit of analysis for environmental assessments involving human behavior or perceptions (Levine, 1994, 1996; Richards, 1990, 1996; Richards et al., 1991). While the unit of analysis may not be an open and closed decision, we believe that most landscape assessments are conducted by an individual of a specific site or sites. Evaluations of landscape assessment reliability and validity must reflect this practice. As described above, the Federal courts also expect experts to demonstrate the reliability and validity of their specific judgements, as well as the reliability and validity of their general procedures and practices.

## **2. Evaluating the reliability of ratings**

Reliability refers to the dependability or consistency of something that is done repeatedly. Measurements, such as those made with rating scales, are reliable when they are similar, even though made by different people, or at different times. The average correlation among separate measurements is the normally accepted test of their reliability. Among psychometricians, reliability coefficients of 0.70 or 0.80 are normally expected from sound research. In applied settings, where the measurements are the basis of important decisions, reliabilities of 0.90 and above are expected (Nunnally, 1978).

Since professional or public landscape ratings may have important consequences, it is surprising that relatively little attention is paid by most researchers and practitioners to the reliability of landscape assessment methods — and there is a lot on which to focus. For instance, how many photos are needed to reliably represent different landscapes (Daniel et al., 1977; Hoffman, 1997)? When a long series of landscape scenes are being evaluated, are the same standards being reliably applied throughout the sequence (Palmer, 1998)? Are landscape evaluations stable after a year or two (Hull and Buhyoff, 1984); how about after

10 years (Palmer, 1997)? While these and other questions of reliability are all important, this paper focuses on the reliability of raters.

### 2.1. Calculating reliability coefficients

There are diverse ways to estimate the reliability or agreement of a rater's judgements (Ebel, 1951; Jones et al., 1983; Tinsley and Weiss, 1975). The two most common approaches to describe reliability are the average interrater correlation and the intraclass correlation. The average interrater correlation is the mean of the pairwise product moment (e.g. Pearson) correlations between all the members of a group. Estimates of the reliability for any size group are made by adjusting the average interrater correlation using the Spearman–Brown formula (Nunnally, 1978). Its advantage is simplicity of calculation. Most statistical software programs require only one instruction to calculate all of these correlations and a spreadsheet can be used to find their average. Its disadvantage is that ratings with parallel profiles have a high correlation, even though their systematic differences may be significant. The loss of between-rater variation gives a more optimistic estimate of reliability, which also may be significant.

The intraclass correlation is calculated from specific mean square components of an analysis of variance (ANOVA). There are many possible ways to calculate the intraclass correlation. Specifying the appropriate ANOVA model and properly calculating the intraclass correlation requires a level of statistical sophistication not often found among landscape assessors (Shrout and Fleiss, 1979). However, there are situations where the intraclass correlation can be calculated, and the interrater correlation cannot. In addition, the intraclass correlation can easily account for between-rater variation, which may result in lower reliability. This approach is advised by most authors (Ebel, 1951; Jones et al., 1983; Tinsley and Weiss, 1975).

### 2.2. Literature review

The general practice for reporting reliability of scenic landscape assessments is to focus on the correlation between the mean ratings of two or more groups, or the reliability of a group's mean rating (Palmer, 2000). Table 1 summarizes the reliability of

scenic preference ratings as reported in 13 studies involving a total of more than 1000 people. A cursory review of these values gives one an overall feeling of confidence in landscape ratings.

### 2.3. Reliability of individual ratings

All the rating reliabilities in Table 1 are for group means, or represent the mean correlation among groups. "However, if the raters ordinarily work individually, . . . then the reliability of individual ratings is the appropriate measure" (Ebel, 1951). In most cases, landscape ratings are actually made by individuals, and evaluating only mean group ratings is an example of the "ecological fallacy."

The few studies that report the reliability of individuals are instructive. For instance, Patsfall et al. (1984) calculated an individual reliability of 0.23 for preference ratings, down from a reliability of 0.92 for the group of 41 raters. Feimer et al. (1979) called for more studies of individual reliability of landscape ratings. Their group of 22 students had an individual reliability of 0.02 for scenic beauty judgements, while 22 landscape professionals with the Bureau of Land Management (BLM) had an individual reliability of only 0.14. Results such as these leave one with much less confidence in individual ratings.

The difference between individual and group reliability coefficients is further illustrated for three studies in Table 2. In 1986, Palmer and Smardon (1989) surveyed a random sample of residents and attendees at a public workshop to study the human-use values of wetlands in Juneau, Alaska. The survey included 16 photographs representing the range of local wetland types and conditions. The second study in Table 2 began as part of a community effort to develop a comprehensive plan for Dennis, Massachusetts. In 1976, a random sample of registered voters evaluated 56 photographs representing the town (Palmer, 1983). These ratings are compared to those from employees of the US Army Corps of Engineers which were gathered in preparation for a training course in landscape aesthetics (Palmer, 1985). The third study evaluated simulations of different harvesting intensities, patterns, and patch sizes of clearcuts in the White Mountain National Forest, in New Hampshire (Palmer, 1998). Respondents included a random sample of regional residents, opinion leaders in the management

Table 1  
Studies reporting the reliability of mean group scenic preference ratings<sup>a</sup>

Ref.	Correlation	Number of raters	Region	Settings			Reliability coefficient			Sampling method
				Forested	Open countryside	Urban/suburban	Intraclass correlation	Pearson correlation	Other	
Brown and Daniel, 1987	0.85–0.93	20–27	SW	•			•			S
Daniel et al., 1989	0.92–0.98	38–101	SW	•			•			U
Gobster and Chenoweth, 1989	0.91–0.96	44	NE	•	•		•			S
Herzog and Bosley, 1992	0.95	104		•	•				•	S
Herzog, 1985	0.95	85		•	•				•	S
Herzog, 1987	0.97	274	SW	•	•				•	S
Herzog, 1989	0.98	76	NE			•			•	S
Hetherington et al., 1993	0.95	16	SW				•			S
Parsons and Daniel, 1988	0.91	27–36	SW				•			S
Patsfall et al., 1984	0.92	41	SE	•			•			S
Ribe, 1994	>0.90	16–40	NE	•				•		C
Rudis et al., 1988	0.85–0.92	35	SW	•			•			S
Schroeder, 1986	0.66–0.91	13–28	NE			•		•		C

<sup>a</sup> Notes: sampling method for respondents: available students (S), civic groups (C), random (R), or users (U). Region of study: US northeast (NE), northwest (NW), southeast (SE), southwest (SW), Australia (Au), or Europe (E).

Table 2  
Reliability coefficients for scenic preference ratings from three studies<sup>a</sup>

Location	Respondents	<i>n</i>	Interrater	Intraclass(1)	Intraclass( <i>n</i> )
Juneau, AK	Residents	406	0.307	0.309	0.995
	Public meeting attendees	41	0.355	0.243	0.928
Dennis, MA	Registered voter	68	0.603	0.607	0.991
	Environ. professionals	118	0.672	0.633	0.995
White Mountains, NH	Residents	73	0.512	0.247	0.960
	Opinion leaders	97	0.532	0.345	0.979
	USFS employees	205	0.619	0.447	0.994

<sup>a</sup> Notes: the number of photographs evaluated in Juneau was 16, in Dennis it was 56, and in the White Mountains it was 64.

of the area's forests, and environmental professionals stationed on National Forests in the northeastern quarter of the US.

In several instances, the interrater and intraclass reliability coefficients for individuals give essential the same results. In those cases where the intraclass(1) correlations are significantly lower, it reflects the substantial variation among the raters within the group. In all cases, the intraclass(*n*) correlation measuring the reliability of the group's mean rating is much higher than the reliability coefficients for individuals. While these group mean ratings can be used with confidence, the use of only one or two individual's ratings should be viewed with suspicion.

### 3. Evaluating the validity of representations

Validity refers to the degree that something is as it purports to be. The validity of measurement scales and indices has long concerned social scientists. Almost 40 years ago, Ebel (1961) questioned whether this obsession is well placed. "So long as what a test is suppose to measure is conceived to be an ideal quantity, unmeasurable directly and hence undefinable operationally, it is small wonder that we have trouble validating our tests" (Ebel, 1961: 643). He suggests that we settle for reliable and useful measurement.

However, the validity of using photographs in visual landscape assessments is testable by comparing them to the settings they are intended to represent. Sheppard (1982: 14–15) identifies two basic types of validity: accuracy and realism. Accuracy refers to "replicating the physical and visual qualities," such as color,

position, scale, shape, and texture. All of these characteristics have a physical reality that can serve as the evaluation criterion. Verifying accuracy is particularly critical for the simulations of proposed conditions used in visual impact assessment (Sheppard, 1989).

Realism refers to an observer's "response equivalence" when viewing the real setting or a photographic representation. This may be a difficult determination because it relies on indirect measures of the observer's experience of the type questioned above by Ebel (1961). Even with the difficulties associated with its measurement, the response equivalence is a fundamental requirement for many landscape assessments and is the focus of this section.

#### 3.1. Calculating validity coefficients

The first issue in testing the response equivalence between photographic representations and the actual setting they represent is how to capture meaningful responses. The normal practice is a pairwise comparison of ratings completed on site and while viewing the representation. It is assumed in this paper that rating scales are a valid way to measure visual experience, though this is a topic that warrants further investigation.

There are two approaches to calculating validity coefficients. The most common is to demonstrate a similar response pattern by calculating a correlation coefficient, normally the Pearson's product-moment correlation coefficient. However, correlation only measures a similar pattern of response. A high correlation is possible even though the actual values may systematically differ by a significant amount.

Student's *t*-test or analysis of variance is used to identify whether a significant difference exists between particular field and photograph ratings. We were not able to find any statement of expected validity standards, but believe that Nunnally's (1978) requirement of a minimum correlation of 0.70 and a preferred correlation of 0.90 are desirable targets. There should not be a significant difference between the field and photograph ratings. However, as a practical matter, significant *t*-tests may occur simply by increasing the number of respondents. It may be appropriate to consider a measure of agreement, rather than difference (Tinsley and Weiss, 1975).

### 3.2. Literature review

Stamps (1990) identified over 1300 citations that appeared to use photographs to evaluate environmental preference. His purpose was to use the statistical principles of meta-analysis to calculate the combined size-effect over all the studies (Rosenthal, 1991). However, he found only 44 studies that could possibly be used in a meta-analysis, and only 11 published articles that met the meta-analysis requirements of reporting the correlation between preferences based on photographs and the actual scenes from at least 4 sites. In other words, just a few percent of the studies Stamps identified attempted to validate the use of photographic representations.

Stamps' meta-analysis has been extended here to include a total of 19 studies that explicitly tested the validity of single photographs or slides to represent the landscape for visual preference evaluation. The findings of these studies, which are briefly characterized in Table 3, are reported in more detail by Hoffman and Palmer (1994). Collectively, these 470 sites produce an overall size effect (i.e. the weighted average correlation) of 0.80, which appears to support the reasonableness of using photographic representations for scenic landscape evaluation.

However, there are problems with this approach. The first is known as the "file drawer problem," an effect with which most researchers are familiar (Iyengar and Greenhouse, 1988). Publishable research generally requires positive results, while negative results are simply stored away in the file drawer. However, there are a few cases that indicate photographic representations may not always be valid. For instance, after

evaluating the validity at eight sites in their study of the Connecticut River Valley, Zube et al. (1974: 49) conclude that: "All of the analyses suggest that panoramic and wide-angle color photography *may be* valid landscape simulation media" (emphasis added). Yet two pages later they devote a full page to discussing the significant differences found at two of the eight sites between the field and photograph ratings using 18 landscape description scales and the presence of 51 landscape features.

Brown and coworkers (1988) evaluated the validity of photographic representations at 11 campgrounds. While they found there was a 0.76 correlation between the mean direct field and mean photograph ratings, these means were also significantly different from each other ( $t = 6.8$ ,  $p < 0.0001$ ). They conclude by stating that, "our results suggest that the campers, who had demonstrated in photo-based evaluations that they were discriminating judges of forest conditions, still generally liked where they were more than any photographically represented alternative. Which evaluation, then, is to be believed? Should society disregard the preferences of public panels that provided their reasoned discrimination among a set of options if, in the act of participation, campers report a strong preference for things as they are?"

In perhaps the most disquieting study of all, Danford and Willems (1975) used 16 semantic differential scales to evaluate the setting of the Bates College of Law at the University of Houston. A group of students were taken on a tour of the College with 62 "standard stops." Another group viewed slides of the 62 standard stops. The results indicated a high agreement between the ratings given during both experiences of the site. However, another group without any previous experience with the site were asked "to complete the response instrument based solely upon personal expectations concerning (a) what one would *expect* a law school to *look* like and (b) how one would *expect* a law school to make one feel." This group's evaluation of the site was indistinguishable from the other two groups! The authors conclude by warning that "using comparisons of subjective ratings to show convergent validity between simulations and real, intact environments is not enough." Clearly more attention needs to be given to questions of representational validity.

Table 3  
Studies testing the validity of photographic media compared to field evaluations of scenic preference<sup>a</sup>

Ref.	Correlation	Number of sites	Region	Settings			Media				Experimental design		
				Forested	Open countryside	Urban/suburban	Black and white	Color	Prints	Slides	Different field/photo subjects	Same field/photo subjects	Sampling method
Brown et al., 1988	0.76	11	SW	•				•	•			•	U
Brush, 1979	0.67	10	NE	•				•	•		•		S/U
Clamp, 1975	0.80	170	E	•	•	•		•	•			•	R
Coughlin and Goldstein, 1970	0.64	92	NE	•	•	•				•	•		S
Daniel and Boster, 1976	0.97	6	SW	•				•		•	•		S/C
Daniel and Boster, 1976	0.98	6	SW	•				•		•	•		S/C
Dearinger, 1979	0.79	34	SE	•	•			•		•	•		S/E
Dunn, 1974	0.64	6	E						•		•		–
Hull and Stewart, 1992	0.91	12	SE	•	•			•	•			•	U
Kane, 1981	0.96	10	Au	•	•	•		•		•	•		–
Kellomaki and Savolainen, 1984	0.83	34	E	•			•		•		•	•	S/R
Kroh and Gimblett, 1992	0.38	16	NE	•	•			•		•		•	S
Rabinowitz and Coughlin, 1971	0.89	14	NE	•	•	•		•		•	•	•	R
Seaton and Collins, 1972	0.93	4	NW			•		•	•		•		U
Seaton and Collins, 1972	–0.27	4	NW			•	•		•		•		U
Shafer and Richards, 1974	0.71	8	NE	•	•	•		•	•	•	•		S
Shelby and Harris, 1985	0.76	20	NW	•				•	•		•		U
Stewart et al., 1984	0.67	5	SW		•	•		•		•		•	U
Zube et al., 1974	0.76	8	NE		•	•		•	•			•	S/R

<sup>a</sup> Notes: sampling method for respondents: available students (S), experts (E), civic groups (C), random (R), or users (U). Region of study: US northeast (NE), northwest (NW), southeast (SE), southwest (SW), Australia (Au), or Europe (E).



### 3.3. Validity of individual photographic representations

All of the studies in Table 3 validating photographic representations are for groups of scenes. Therefore, these studies all fall prey to the “ecological fallacy” by failing to recognize that each photo represents a specific view at a specific site, not the landscape generally. The remainder of this section will present results that illustrate this issue.

The materials and data to investigate photo validity are drawn from three studies summarised in Table 4 that were conducted in northeastern hardwood forests to better understand major forest management issues. The visual affect of harvesting alternatives were simulated in this study from two vista sites in the White Mountain National Forest: Sugarloaf and Welsh Ledge (Palmer et al., 1995). In all there were 30 simulations representing different sized clearcuts, patterns and intensities. Also included among these simulations were the photograph of the original view taken the previous year and a completely revegetated simulation. A total of 26 different hikers at each site, used a 10-point bi-polar scale to rate the scenic value of all 32 scenes. The interviews were conducted in the field at the view point. The hikers also rated the

actual view and were asked to locate the scene that most resembled the view from among the 32 photographs.

Cuyler Hill State Forest in Central New York is a demonstration site for uneven-age single-tree selection silviculture (Hoffman and Palmer, 1994). The area was marked according to research guidelines and harvested by a commercial logger in late-August 1993. The last previous harvest was in mid-1970. Two existing data collection points with similar appearance were selected in the treatment area and a third point from a neighboring unharvested stand with similar forest structure was selected as a control site. All three sites were photographed in mid-July 1993. The two treatment sites were rephotographed a week after the harvest. The slash was lopped to the ground at one of these sites, and rephotographed. This resulted in the sites representing three different field conditions: uncut, slash, and lopped. Two non-overlapping views were photographed using color 35 mm film at all three sites in their uncut condition, at two sites in their slash condition, and one with the slash lopped. All three sites were visited by 12 landscape architecture students during September 1993. A total of 24 bi-polar scales were used to describe various visible forest characteristics, including overall scenic

Table 4

The validity of photographs to represent the scenic preference of views in three studies<sup>a</sup>

White Mountains, NF: view point <sup>b</sup>	Mean rating		Statistics	
	Field	Photo	<i>t</i>	<i>r</i>
Sugarloaf	6.23	3.54	4.53***	0.26
Welsh Ledge	7.08	5.71	2.70*	0.24
Cuyler Hill SF: treatment <sup>c</sup>				
Uncut	3.25	3.17	0.24	0.25
Cut w/slash	3.83	4.88	−1.71	0.05
Cut and lopped	3.67	3.21	2.03	0.81
Allegany NF: density, treatment <sup>c</sup>				
10 deer/m <sup>2</sup> , uncut	2.13	1.96	1.16	0.78
10 deer/m <sup>2</sup> , thinned	2.72	2.56	0.46	0.10
10 deer/m <sup>2</sup> , clearcut	3.96	3.58	0.89	0.20
64 deer/m <sup>2</sup> , uncut	2.65	2.00	3.16**	0.50
64 deer/m <sup>2</sup> , thinned	2.66	2.11	1.97	0.36
64 deer/m <sup>2</sup> , clearcut	4.59	4.59	0.00	0.38
Uncontrolled, Sfailed clearcut	2.95	3.05	−0.37	0.79

<sup>a</sup> Significance levels are \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

<sup>b</sup> Rating scale of 1: low scenic value to 10: high scenic value.

<sup>c</sup> Rating scale of 1: beautiful to 7: ugly.

beauty. All participants rated the 3 field sites and 12 photographic slides.

Regeneration failure after harvesting in the Allegheny National Forest of western Pennsylvania has become a serious problem due to excessive browsing by the deer population (Hoffman and Palmer, 1994). Fenced plots at Fool's Creek have been established to study the effects of deer density on forest vegetation. There were two controlled densities of 10 and 64 deer per square mile. Within each density, there is an area that has been uncut, thinned to 60% stocking, and clearcut in 1968. A third unfenced site was clearcut and remained open to the natural density of >100 deer per square mile. During the second week of September 1994, a color 35 mm slide was taken at each site to represent each management condition, for a total of seven slides. On 16 October 1994, a group of 27 students and their professors on a biology field trip evaluated all the slides and sites. They used 24 bi-polar scales to describe the forest's visible characteristics, including an overall rating of scenic beauty.

The results from these three studies give reason for concern about the uncritical use of photographic representations, at least for studies of the scenic quality in the northeastern hardwood forest. There are significant differences and very low correlations between the field and photograph ratings in the White Mountain National Forest study. The respondents were interviewed at the sites where the photos were taken, a viewpoint with a breathtaking panoramic view. These hikers understood the scene they were looking at. Over 80% at each site recognized the clearcut patches in the on-site view, and over one third were able to pick the photograph of the site's actual condition from among the 32 very similar photographs. However, their comments made it clear that they were not able to objectively ignore the dramatic context of the panorama when they were directed to evaluate that portion of the on-site view represented in the photographs. In this case, the simulations were accepted as useful representations for the limited purpose of comparing generic alternative harvesting scenarios. However, they would not be appropriate for assessing the visual impacts of harvesting alternatives from these particular sites.

At the Cuyler Hill State Forest, the mean rating of the two slides was compared to the scenic quality rating completed while in the forest stand. There are

no significant differences between the field and photo ratings. However, two of the three sites have unacceptably low correlations between the field and photo ratings.

The results from the Allegheny National Forest deer study show the scenic ratings for one of the seven photos is significantly different from the corresponding field ratings. While the correlations between the field and photo scenic ratings are acceptable at two sites, and marginal at a third, they are unacceptable at the remaining four sites. Once again, the results suggest caution in the use of photographic representations.

### 3.4. Single representations

Another potential problem with using photographic representations is that they record a limited field of view. While an observer may experience the visual condition within an angle of 120° or more through slight movements of the eyes or head, the standard 35 mm wide angle lens covers approximately 60°. All of the results reported in Table 3 are for single frame photographic representations. It is very unusual to find a study that uses more than one photograph to represent the visual conditions from a particular viewpoint.

The results in Table 5 compare scenic beauty ratings by 12 landscape architecture students of two photographs taken at each of six conditions in Cuyler Hill State Forest. All the images are taken within what foresters consider homogenous conditions, leading one to expect no visual differences between them.

Table 5

A comparison of scenic preference ratings for two photographs taken from the same viewpoint at Cuyler Hill<sup>a</sup>

Site	Treatment	Mean rating		Statistics	
		Slide A	Slide B	<i>t</i>	<i>r</i>
X	Uncut	2.90	2.60	1.10	0.69
Y	Uncut	2.35	3.30	0.21	0.54
Y	Cut with slash	4.45	3.25	2.76*	0.52
Z	Uncut	2.95	2.65	1.28	0.41
Z	Lopped slash	3.05	3.50	−0.78	0.67
Z	Cut with slash	4.25	2.30	2.30*	0.21
Overall		3.33	2.93	3.11**	0.55

<sup>a</sup> Significance levels are \*:  $p < 0.05$ , \*\*:  $p < 0.01$ , \*\*\*:  $p < 0.001$ .

The correlations among the six matched pairs range from poor to mediocre. The ratings are significantly different for the two viewpoints with significant amounts of slash and tree tops left from the recent single tree selection harvest, as well as for the group as a whole. The mean rating for the two photographs at each site is used in the field-photo validity test.

#### 4. Conclusions

Over the past 30 years, researchers have developed confidence in the reliability of rating scales to evaluate landscape qualities, and the validity of photographs to represent those qualities. While most studies have been limited to the assessment of scenic preferences, this confidence has been extended to all visible landscape qualities. It seems that there is cause for concern if those professionals conducting landscape assessments embrace this confidence.

The wholesale extension of high reliability for mean group scenic preference ratings to the judgements of one or perhaps a few professional landscape assessors is demonstrated in this paper to be unfounded. This is particularly true for visible landscape qualities other than scenic preference, which have not been as extensively studied.

Similarly, past demonstrations of the validity of photographic representations have been averaged over a group of views, rather than for individual views. This paper calls attention to several instances where specific photographs poorly represented the scenic quality of the actual view. In some instances, this may be because no single photograph can represent the diversity readily seen from a particular viewpoint. Further, the extension of results based on scenic preference to other visible qualities is also unfounded.

We would offer some recommendations to professionals preparing landscape assessments, in the light of the US Supreme Court's recent findings about the need of an expert to demonstrate the reliability and validity of their methods and data both generally and specifically.

1. *Establish the reliability of professional ratings.* This may be accomplished by having several professionals evaluate each view and then calcu-

lating the reliability coefficient. It is also desirable to establish the relationship of professional ratings to a criterion group, such as a random sample of the public.

2. *Establish the validity of each landscape representation.* This may be accomplished by comparing the ratings of the representations and actual field conditions from several individuals. In situations where the visual condition may be quite diverse, use panoramic images or more than one photograph from each viewpoint.
3. *Establish a record of preparing valid visual simulations.* It is, of course, not possible to establish the validity of a simulation before it is built, but it is possible to validate the existing condition's representation. Professionals who frequently create visual simulations should establish a record of their validity by comparing ratings of them to ratings of the project as built.

If professionals conducting landscape assessments follow this advice, then they should be able to meet any challenges to the reliability or validity of their work.

#### Acknowledgements

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**STATE OF NEW HAMPSHIRE**  
**SITE EVALUATION COMMITTEE**

**SEC DOCKET NO. 2015-06**

**JOINT APPLICATION OF NORTHERN PASS TRANSMISSION LLC &  
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE  
D/B/A EVERSOURCE ENERGY  
FOR A CERTIFICATE OF SITE AND FACILITY**

**APPLICANTS' RESPONSES TO COUNSEL FOR THE PUBLIC'S  
EXPERT ASSISTED DATA REQUESTS AND INTERROGATORIES – SET 1**

**Preliminary Statement and General Objections**

The responses provided were prepared by Northern Pass Transmission LLC and Public Service Company of New Hampshire d/b/a Eversource Energy (the "Applicants"). All responses contained herein are subject to the following general objections.

The Applicants object to each data request to the extent the data request seeks information that is irrelevant to the Site Evaluation Committee's determination of whether issuance of a Certificate will serve the objectives of RSA 162-H and is therefore not reasonably calculated to lead to the discovery of admissible evidence. The Applicants further object to each data request to the extent that the data request is vague and/or ambiguous, overbroad and unduly burdensome, or seeks information that is not within the Applicants' possession custody or control; calls for attorney-client privilege and/or work product privilege protected information; seeks business confidential information and/or information that is either fully contained in the Application or information that is in the public domain and equally available to Counsel for the Public and Counsel for the Public's Experts as well as the Applicants.

To the extent any data or document request herein seeks to obtain prior drafts, notes, or edits of any expert or consultant report, drawings, diagrams, photosimulations, or any other information contained in the Application, pre-filed testimony, and attached appendices, the Applicants object as the request is unduly burdensome, duplicative, irrelevant and not likely to lead to admissible evidence, and/or is attorney/client privileged or protected as work-product pursuant to state and federal law. *See* RSA 541-A:33 (stating that the "presiding officer may exclude irrelevant, immaterial or unduly repetitious evidence" and providing that "[a]gencies shall give effect to the rules of privilege recognized by law"); RSA 516:29-b (requiring a witness retained or specifically employed to provide expert testimony to only disclose "the facts or data considered by the witness in forming the opinions"), which was recently amended to remove the requirement that an expert disclose such "other information" and to make the New Hampshire expert disclosure law consistent with recent amendments to Fed. R. Civ. Pro. 26, which explicitly protects prior draft reports from experts. *See also* Fed. R. Civ. Pro. Rule 26(b)(4)(B) (protecting drafts of any report or disclosure required under the general witness disclosure rules regardless of the form in which the draft is recorded).

To the extent any data or document request herein seeks Critical Energy Infrastructure Information (“CEII”), the Applicants object as this information is not discoverable. *See* RSA 91-A:5, IV (exempting production of “confidential, commercial, or financial information” from the Public Right to Know Law). *See also* 18 C.F.R. § 388.11 (CEII means “specific engineering, vulnerability, or detailed design information about proposed or existing critical infrastructure that: (i) Relates details about the production, generation, transportation, transmission, or distribution of energy; (ii) Could be useful to a person in planning an attack on critical infrastructure; (iii) Is exempt from mandatory disclosure under the Freedom of Information Act, 5 U.S.C. 552; and (iv) Does not simply give the general location of the critical infrastructure”).<sup>1</sup> The Applicants are not in a position to disclose information that is deemed CEII. Any person seeking such CEII is required to sign a non-disclosure agreement consistent with the applicable requirements of ISO-NE, NERC and any other relevant standards. Should any party enter into the required non-disclosure agreement, the Applicants will provide copies of the requested CEII information if the requesting party demonstrates a required need to obtain such information.

If NPT inadvertently produces or discloses a document or information to another party (the “Receiving Party,” which term is intended to include all parties receiving such disclosure) that is allegedly privileged or otherwise immune from discovery, once it learns of the inadvertent production, NPT will so advise the Receiving Party in writing, state and substantiate the basis for the alleged privilege or immunity, and request that the item or items of information be returned. If these conditions are met in a timely manner, the Receiving Party will return such inadvertently produced item or items of information and all copies thereof within ten (10) calendar days of the written request and shall refrain from utilizing said items in any manner or form. Inadvertent production of documents or information that is allegedly privileged or otherwise immune from discovery shall not automatically constitute a waiver of any privilege or immunity.

To the extent that any data or document request herein seeks to obtain information that is protected as confidential pursuant to the Committee’s May 25, 2016 Order on Motion for Protective Order and Confidential Treatment, or otherwise qualifies for protective treatment pursuant to PSA 91-A:5, the Applicants object to production unless a party has complied with the requirements of an SEC order or agreement for protective treatment governing confidential documents in this proceeding. To the extent that a Data Response refers to a document that has been afforded confidential treatment or otherwise provides information in response to any data or document request relating to materials that are protected as confidential, the Applicants do so without waiving the confidentiality of the respective documents.

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<sup>1</sup> Confidential infrastructure information includes, but is not limited to, CEII information, critical infrastructure information as defined by the Department of Homeland Security (“DHS”), including any Protected Critical Infrastructure Information (“PCII”), to the extent certified as such by the DHS, pursuant to the Critical Information Act of 2002 (See Final Rule at 6 C.F.R. Part 29, Sept. 1, 2006); Confidential information regarding critical assets and critical cyber assets, which are subject to the North American Electric Reliability Council (“NERC”) Critical Infrastructure Protection (“CIP”) standards (CIP-002 through CIP-009) pertaining to the reliability and availability of the Bulk Electric System in North America (“Confidential CIP”); any other infrastructure information designated by an Applicant as proprietary and confidential, whether furnished before or after the date hereof, whether oral, written or recorded/electronic, and regardless of the manner in which it is furnished; and all reports, summaries, compilations, analyses, notes or other information which contain the foregoing information.

## **Responses**

**EXP 1-1** Please produce a copy of all technical reports (studies, specifications, plans, procedures, drawings) that evidence, describe, analyze or relate to the planning, design, procurement, construction and maintenance of the HVAC overhead Transmission Line sections of the Project.

**Response:** The Applicants object to this data request to the extent it seeks to obtain confidential, commercial and financial information or communications that are not discoverable. *See* RSA 91-A:5, IV (exempting production of “confidential, commercial, or financial information” from the Public Right to Know Law).

Notwithstanding the objection, the Applicants answer as follows:

Please see all documents already provided to the Counsel for the Public in response to the first set of data requests. More specifically, please refer to the PLS-Cadd Materials, LIDAR, and PAR contract specifications previously submitted to Counsel for the Public. The Applicants are also providing a copy of the Northern Pass Design Guide for the Overhead Transmission Line, which has been provided in response to this request.

Additionally, please refer to the Application: Volume IV, Appendix 1 – Project Maps, Typical Structure Designs. Please also see the Pre-Filed Testimony of Kenneth Bowes, starting at Page 13 to 17, for maintenance activities associated with the Project operations.

For documents relating to EMF or Sound please see the reports completed by Exponent and included in the Application: Appendices 37 to 39.

To the extent other parties seek confidential information, such as PLS CADD and LIDAR, the Applicants will make this confidential information available as requested as soon as the requesting party complies with the requirements of the SEC order governing confidential documents in this proceeding.



**EXP 1-2** Please produce a copy of all technical reports (studies, specifications, plans, procedures, drawings) that that evidence, describe, analyze or relate to the planning, design, procurement, construction and maintenance of the HVDC overhead Transmission Line sections and their Grounding Electrodes.

**Response:** Please see the Applicants' response to EXP 1-1 above. All documents referenced in response to EXP 1-1 above are also responsive to this document request.

The proposed project does not include a ground electrode. Please see section 8.0 of the Northern Pass Design Guide for information associated with individual structure grounding, which has been provided in response to EXP 1-1 above.

**EXP 1-3** Please produce a copy of all technical reports (studies, specifications, plans, procedures, drawings) that that evidence, describe, analyze or relate to the electro-magnetic compatibility between the Project and adjacent facilities, such as pipelines, railroads, and other utilities.

**Response:** The Applicants object to this question as the phrase “electro-magnetic compatibility” is vague and ambiguous.

Notwithstanding the objection, the Applicants answer as follows:

Pipeline safety regulations are included in Title 49 of the Code of Federal Regulations (“CFR”), Parts 190-199. The Project will be designed, constructed and operated to meet or exceed all applicable regulatory requirements. A natural gas pipeline was constructed in the existing electric transmission right-of-way where portions of the NPT Line are proposed and has been operating in the current configuration since 2004. As part of the detailed design, there will be further coordination with the pipeline owner/operator so that all facilities continue to operate safely in the shared right-of-way.

During the detail design phase, the Applicants will also be studying compatibility issues of adjacent electrical and communications lines or facilities within the Project area. The following references will be utilized to evaluate electro-magnetic compatibility:

- National Electric Safety Code (NESC)
- Electric Power Research Institute (EPRI) EL-3106
- Institute of Electrical and Electronics Engineers (IEEE) Standard 80
- National Association of Corrosion Engineers (NACE) SPO177-2014
- American Society of Mechanical Engineers (ASME) B31.8
- American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering

The Applicants have also submitted copies of EMF studies in the Application: Appendices 37 & 38.

Further, the Applicants have not produced any technical reports or studies for construction of the Project as they relate to railroads. During the detail design phase, the Project will assess electro-magnetic compatibility with railroad facilities that cross or are directly adjacent to the Project.

**EXP 1-4** Please produce a copy of all technical reports that describe the route selection process for the aboveground line sections of the Transmission Line.

**Response:** For a description of the route selection process, please refer to section 301.03(h)(2) of the Application dated October 19, 2015, beginning on Page 43. Please also refer to the Pre-Filed Testimony of James Muntz Pages 1 through 4.

For additional information regarding the route selection process, please refer to Section 4.0 of the Applicants' US DOE Amended Presidential Permit Application, July 1, 2013, available at [http://media.northernpasseis.us/media/northern\\_pass\\_amended\\_application\\_-\\_final\\_082313.pdf](http://media.northernpasseis.us/media/northern_pass_amended_application_-_final_082313.pdf). Please also see the Applicants' Response to Conservation Law Foundation, Appalachian Mountain Club, New Hampshire Sierra Club, and Ammonoosuc Conservation Trust's Data Request NGO 1-1 and the Applicants' Response to the New Hampshire Department of Environmental Services Wetlands Permit Application Question 1-1.

Finally, please refer to the "Preliminary Routing Study for the Northern Pass Transmission Project" dated March 2010. Please also see the "North Preferred Route Changes Since Issuance of Presidential Permit Addendum." These documents have been provided in response to this request.

**EXP 1-5** Please identify all design criteria and applicable codes and standards that were used for the design of the Project.

**Response:** The facilities are designed in accordance with international, national, industry and Eversource standards and codes. All preliminary design drawings and related data are contained in the Application: Appendix 1, Appendix 9, and Appendix 10. The standards and codes that have been used and will continue to be utilized as the basis for the Project design include, but are not limited to, the following:

- National Electric Safety Code (NESC)
- National Electric Code (NEC)
- Occupational Safety & Health Association (OSHA)
- International Building Code (IBC)
- New Hampshire State Fire Code (Saf-C 6000)
- National Fire Protection Association Code (NFPA)
- Institute of Electrical and Electronics Engineers (IEEE)
- Conference International des Grands Reseaux Electriques (CIGRE)
- American Society for Testing and Materials (ASTM)
- American Society of Mechanical Engineers (ASME)
- American National Standards Institute (ANSI)
- Northeast Power Coordinating Council (NPCC)
- Eversource Design Standards

The Northern Pass Design Guide contains the design criteria used for the overhead portions of the Project, which is being provided in response to question 1 above.

For the underground cable, please refer to the ABB Technical Proposal for Underground System, which has been provided in response to this request.

**EXP 1-6** Please identify all areas of the aboveground portions of the Project where the right-of-way is not 150 feet wide, and specify the width of the right-of-way in all such locations.

**Response:** The Applicants object to this question as the phrase "all areas of the aboveground portions of the Project" is vague and ambiguous.

Notwithstanding the objection, the Applicants answer as follows:

The ROW width varies along the entire Project route depending on the location and configuration with other existing and proposed transmission lines. The specific ROW widths for each section of the Project are identified on the NPT Project Maps, Volume IV, Appendix 1 at Sheets 1 through 179.

**EXP 1-7** Please produce a copy of all documents which evidence, describe, discuss or analyze the selection of the Transmission Line structure, conductor, shield wire, insulators, hardware, accessories and grounding system.

**Response:** The Applicants object to this data request to the extent it seeks to obtain confidential, commercial and financial information or communications that are not discoverable. *See* RSA 91-A:5, IV (exempting production of “confidential, commercial, or financial information” from the Public Right to Know Law).

Notwithstanding the objection, the Applicants answer as follows:

Please see the HVDC Line Optimization Study and Northern Pass Design Guide, provided in response to EXP 1-1 above.

**EXP 1-8** Please produce a copy of all specifications for material procurement.

**Response:** Please see the Applicants' Response to EXP 1-9 below.

**EXP 1-9** Please produce a copy of all documents that describe, specify, or depict the design of aboveground structures for the Project.

**Response:** Please refer to the Application: Volume IV, Appendix 1 – Project Maps, Typical Structure Designs. In addition to the overhead line structures, the preliminary plans of the Transition Stations are also provided in the Project Maps, Typical Structure Designs. Please also refer to the Applicants' Response to the Pemigewasset Local River Advisory Committee's Data Request PRLAC 1-40.

Please also see all documents already provided to the Counsel for the Public in response to the first set of data requests and in response to EXP 1-1 above. More specifically, please refer to the PLS-Cadd Materials, LIDAR, Northern Pass Design Guide, Converter layout and PAR contract specifications previously submitted to Counsel for the Public.

To the extent other parties seek confidential information, such as PLS CADD, LIDAR and vendor specific converter data, the Applicants will make this confidential information available as soon as the requesting party complies with the requirements of the SEC order governing confidential documents in this proceeding.

Please see the document provided in response to this request.



**EXP 1-10** Please produce a copy of all documents that describe, specify, or depict the design of foundations and subsurface investigation (techniques to be used at the various locations) for all aboveground structures for the Project.

**Response:** The Applicants have created design alignments for the overhead route of the Project. These can be found in the SEC Application: Volume IV, Appendix 1 - Project Maps. Details of the structures can be found in Volume IV, Appendix 1 - Typical Structure Designs.

As is typical for transmission projects of this scope, specific details of the foundation design will be completed prior to commencing the work. The Project will be conducting geotechnical investigations and utility and ground surveys, which will help refine the overall project design including determining the depth and size of structure foundations and whether or not blasting is required. It is expected that this work will be completed in the summer of 2017. For a general description of the foundations please refer to the Application Page 42. Also, for general information on installation of foundations please refer to the Application Page 28.

**EXP 1-11** Please identify the line-thermal rating and produce a copy of all documents which evidence or analyze the line-thermal rating of the Transmission Line.

**Response:** The thermal rating of the HVDC lines is based upon the requirement to deliver 1090 MW to Deerfield substation. The corresponding HVDC line temperature requirement is identified in the Northern Pass Design Guide, provided in response to EXP 1-1 above.

The HVAC conductor size was selected based upon the Eversource Energy standard conductor sizes and types factoring in criteria such as limiting audible noise, radio interference and corona effects. The conductor rating is based upon Eversource Energy's standard, which conforms to the Independent System Operator – New England Planning Procedure Number 7 for Determining and Implementing Transmission Facility Ratings in New England and IEEE 738-2006.

Typical Ratings for 345 kV lines utilizing Aluminum Conductor Steel Reinforced (ACSR) in a similar manner to the Project on the Eversource system and operated at its maximum operating temperature (Normal 100°C and Emergency 140°C) will have the following ratings:

Bundled 1590 ACSR 45/7 Construction	Thermal Ratings (Amps)	
	Summer	Winter
Normal	3384	4146
Long Term Emergency	4380	4932
Short Term Emergency	5158	5846
Drastic Action Limit	6548	7666

Thermal ratings are covered in Sections 4.0 Conductor and Shield Wire and 5.0 Electrical Clearances of the Northern Pass Design Guide. The criteria contained in the Guide is placed in the PLS-CADD software and utilized for modeling the line design.

**EXP 1-12** Please describe the line-insulation coordination for typical voltage stresses (steady-state, switching, lightning), and produce a copy of all documents which describe, discuss or analyze the line-insulation coordination for typical voltage stresses.

**Response:** Please see the Northern Pass Design Guide provided in response to EXP 1-1 above. The topic of insulation coordination along with associated design assumptions is covered within multiple sections of the Guide, including, but not limited to Section 2.0 Project Data, Section 3.0 PLS-CADD Design Criteria, Section 5.0 Electrical Clearances, Section 6.0 Insulators and Section 11.0 Structures.

In addition to the transmission line insulation coordination efforts performed to date, the final converter terminal design and associated insulation coordination parameters will be coordinated with the preliminary line design to verify the overall Project insulation design.

**EXP 1-13** Please describe the line-insulation coordination for live-line maintenance, and produce a copy of all documents which describe, discuss or analyze the line-insulation coordination for live-line maintenance.

**Response:** Live-line maintenance has been taken into account in the development of the Project design. For information related to the design of the line, please refer to the Applicants' Response to EXP 1-12 above and the Northern Pass Design Guide, Section 7.0 Hardware and Section 11.0 Structures provided in response to EXP 1-1 above.

**EXP 1-14** Please produce a copy of all documents which evidence, discuss, analyze or relate to clearance analysis: conductor blow-out, conductor to ground, and conductor to other facilities.

**Response:** Please see the Northern Pass Design Guide provided in response to EXP 1-1 above. The topic of clearances along with associated design assumptions is covered within multiple sections of the Guide, including but not limited to Sections 3.0 PLS-CADD Design Criteria, 4.0 Conductor and Shield Wire and 5.0 Electrical Clearances.

**EXP 1-15** Please produce a copy of all documents which evidence, discuss, analyze or relate to ruling-span selection and sag-tension tables.

**Response:** Please see the Northern Pass Design Basis Guide and PLS-CADD provided in response to EXP 1-1 above. The area of ruling span and sag tension along with its associated design assumptions are covered within Sections 2.0 Project Data and Section 3.0 PLS-CADD Design Criteria.

To the extent other parties seek confidential information, such as PLS CADD and LIDAR, the Applicants will make this confidential information available as requested as soon as the requesting party complies with the requirements of the SEC order governing confidential documents in this proceeding.

**EXP 1-16** Please produce a copy of all documents which evidence, describe, analyze or relate to structure spotting, long crossings, and airport approaches.

**Response:** The Applicants object to this question to the extent that it calls for the review, compilation, or production of publicly available documents that could be obtained by the requesting party.

Notwithstanding the objection, the Applicants answer as follows:

Please refer to the Northern Pass Design Guide and the PLS-CADD in response in the Applicants response to question 1. The structure spotting and crossings along with their associated design assumptions are covered within multiple sections of the manual, which include but are not limited to, Sections 2.0 Project Data, 3.0 PLS-CADD Design Criteria, 4.0 Conductor and Shield Wire, 5.0 Electrical Clearances and Section 11.0 Structures.

The Project has submitted the Northern Pass structures to the Federal Aviation Administration ("FAA") for evaluation. These structures are in the vicinity of the Concord Airport and the White Mountain Regional Airport.

For copies of all current and future FAA analysis and correspondence, please visit:  
<https://oeaaa.faa.gov/oeaaa/external/searchAction.jsp?action=showSearchDeterminedCasesForm>  
Please also refer to the Applicants response to Non-Abutting Property Owners Group 2's Data Request NA2 1-26.

To the extent other parties seek confidential information, such as PLS CADD and LIDAR, the Applicants will make this confidential information available as requested as soon as the requesting party complies with the requirements of the SEC order governing confidential documents in this proceeding.

**EXP 1-17** Please produce a copy of all documents, which evidence, describe, analyze or relate to vibration analysis (Aeolian galloping) for the Project.

**Response:** Please refer to the Northern Pass Design Guide and the PLS-CADD in the Applicants' Response to EXP 1-1 above. The area of vibration analysis is covered in Section 4.0 Conductor and Shield Wire, subsections 4.7 Aeolian Vibration and 4.8 Galloping.

To the extent other parties seek confidential information, such as PLS CADD and LIDAR, the Applicants will make this confidential information available as requested as soon as the requesting party complies with the requirements of the SEC order governing confidential documents in this proceeding.



**EXP 1-18** With respect to the electro-magnetic environmental disturbances along the Transmission Line (electric field, magnetic field, audible noise, radio noise), please produce a copy of all calculations, measurements, exposure limits, and regulations regarding the Project.

**Response:** Reports summarizing exposure limits and regulations can be found in the SEC Application: Appendix 37 - Review of Research Relevant to Direct Current and Alternating Current Transmission Lines and Health, and Appendix 38 - Electrical Environment of the Proposed Northern Pass Transmission Project: DC Electric Field, DC Magnetic Field, Air Ion Density, AC Electric Field, AC Magnetic Field, Audible Noise, and Radio Noise.

Calculations of all of the electrical parameters listed in the request can be found in the Application: Appendix 38 - Electrical Environment of the Proposed Northern Pass Transmission Project: DC Electric Field, DC Magnetic Field, Air Ion Density, AC Electric Field, AC Magnetic Field, Audible Noise, and Radio Noise. Please see also the Applicant's Response to the Ashland, Northfield, Canterbury, Allenstown and Concord Abutting Property Owner's Data Request A5 1-17 as well as the documents provided in response to that request.

**EXP 1-19** Please produce a copy of all documents which evidence, discuss, analyze or relate to the electro-magnetic compatibility with adjacent objects and/or facilities, including without limitation, vehicles, fences, pipelines, railroads, and low-voltage electrical circuits.

**Response:** The Applicants object to this question as the meaning of the phrase “low-voltage electrical circuits” is vague and ambiguous.

Notwithstanding the objection, the Applicants answer as follows:

Calculations to address electromagnetic compatibility will be done during the detailed design process as is typical for large-scale transmission line projects. Please refer to the Applicants' Response to EXP 1-3 above for a list of references that will be used to evaluate electro-magnetic compatibility.

In addition, the electromagnetic compatibility of the Project with persons and implanted medical devices, and radio communication services (low-voltage electrical circuits) are addressed in the Application: Appendix 37 - Review of Research Relevant to Direct Current and Alternating Current Transmission Lines and Health, and Appendix 38 - Electrical Environment of the Proposed Northern Pass Transmission Project: DC Electric Field, DC Magnetic Field, Air Ion Density, AC Electric Field, AC Magnetic Field, Audible Noise, and Radio Noise.

**EXP 1-20** Please produce a copy of all documents which evidence, describe, analyze or relate to reliability indexes (lighting performance and pollution related outages).

**Response:** The overhead lines are designed for a shield wire trip out rate of less than 1/100 miles/year. This rate is consistent with accepted industry practices. This rate has been incorporated into the structure geometry identified in the Project design basis manual.

For the AC portion of the line, insulation requirements are controlled by the switching surge levels, which exceed any contamination requirements (pollution) in the Project area.

For the DC line, the recommended contamination (pollution) levels for insulation is based upon International Electrotechnical Commission (IEC) standards TS 60815 and TS 60071-5 for light pollution conditions (zone 1), which can be found at [www.iec.ch](http://www.iec.ch).

Please refer to the Northern Pass Design Guide and the PLS-CADD in response in the Applicants response to question 1. The topic of shield wire and insulation along with associated design assumptions is covered within multiple sections of the guide, which includes but is not limited to Sections 2.0 Project Data, 3.0 PLS-CADD Design Criteria, 4.0 Conductor and Shield Wire, 5.0 Electrical Clearances, 6.0 Insulators and 11.0 Structures.

To the extent other parties seek confidential information, such as PLS CADD and LIDAR, the Applicants will make this confidential information available as requested as soon as the requesting party complies with the requirements of the SEC order governing confidential documents in this proceeding.

**EXP 1-21** Please produce a copy of all documents which evidence, describe, analyze or relate to voltage unbalance and short circuit currents.

**Response:** To the extent any data or document request herein seeks Critical Energy Infrastructure Information (“CEII”), as noted in the general objections, the Applicants object as this information is not discoverable. The Applicants are not in a position to disclose information that is deemed CEII. Any person seeking such CEII is required to sign a non-disclosure agreement consistent with the applicable requirements of ISO-NE, NERC and any other relevant standards. Should any party enter into the required non-disclosure agreement, the Applicants will provide copies of the requested CEII information if the requesting party demonstrates a required need to obtain such information.

The Project fault current studies were performed and submitted to the ISO-NE as part of the I.3.9 approval process. Section 13 and Appendix O-1, O-2 and O-3 from the ISO Final Report for the QP499 ETU Project (Northern Pass) will be provided should the requesting party sign a non-disclosure agreement as set forth above.

Relating to voltage unbalance, an Electranix Report dated January 9, 2015 – “Determining the Need for Transpositions on the Proposed 345kV Transmission line between Franklin and Deerfield Substations” has been provided in response to this request.

**EXP 1-22** Please produce a copy of all documents which evidence, discuss, analyze or relate to the impact of the Project on the Coos Loop, including without limitation, creating or increasing overloads on the Coos Loop.

**Response:** The Project will have no direct impact to the Coos Loop because it does not directly interconnect with the Coos Loop. The Project, however, will rebuild portions of the Coos Loop. Please see the Applicants' Responses to the City of Berlin Data Request FB 1-1 through 1-8 for details relating to the Coos Loop and see documents provided in response to these requests.

**EXP 1-23** Please produce a copy of all construction specifications for the construction of the overhead portion of the Project.

**Response:** The Applicants object to this data request to the extent it seeks to obtain confidential, commercial and financial information or communications that are not discoverable. *See* RSA 91-A:5, IV (exempting production of “confidential, commercial, or financial information” from the Public Right to Know Law).

Notwithstanding this objection, the Applicants answer as follows:

The Applicants are providing Division 2 - Technical Requirements OH and Foundation that are a part of the PAR contract directly to Counsel for the Public only. These documents contain business confidential information that is competitively and highly sensitive. While the PAR contract itself has only been provided to Counsel for the Public, the Applicants will disclose the specific portion referenced above to other parties in this proceeding once a requesting party complies with the requirements of the SEC order governing confidential documents in this proceeding.

**EXP 1-24** Please describe all commissioning tests to be performed for the aboveground sections of the Transmission Line before it comes into operation.

**Response:** The Applicants do not anticipate conducting commissioning tests of the actual aboveground transmission line. The Applicants will conduct visual inspections of the transmission line prior to energizing the line. As is typical with overhead transmission line construction, the Applicants will conduct commissioning tests of the terminal equipment (including, for example, the protective relays, the DC converter controls, circuit breakers, and transformers) in accordance with manufacturer recommendations and Eversource standards and in coordination with ISO-NE.

**EXP 1-25** Please produce a copy of all environmental management plans for the construction of the Project.

**Response:** The DES Wetlands, Alteration of Terrain and 401 Water Quality Certification applications (SEC Appendices 2, 6 and 4, respectively) and wetland permitting plans (SEC Appendix 47) describe and illustrate how the project will avoid, minimize and mitigate for project-related impacts to the environment. For example, the Wetlands and AOT Plans show temporary timber mats for wetland crossings and spanning/bridging of streams and the locations of erosion and sedimentation controls to be used for protection of wetland and aquatic habitats during construction. Other landscape characteristics such as topography, floodzones and steep slopes are also shown on permit plans to alert DES as well as the contractors to these environmental features. Detailed site development plans accompanying the AOT permit application are provided for the substation expansion sites, transition stations and converter terminal. These full size plans provide existing conditions, grading and drainage and erosion and sediment control measures as well as permanent storm water management systems, and detail figures for constructed stormwater features and BMPs. The 401 WQC application includes a draft Storm Water Pollution Prevention Plan (SWPPP) which will be fully developed by the contractor prior to construction commencing. The SWPPP provides information related to existing conditions and sensitive environmental resources, proposed construction activities, BMPs, good housekeeping measures, spill prevention and control, environmental training, monitoring and reporting activities. In addition, project contractors will comply with the provisions of the DES Stormwater Manual relating to erosion and sediment control during construction phases and through final stabilization of work areas.

Specific to flora and fauna, several tables describing the Northern Pass commitments for impact avoidance and minimization are found in Appendix B of the Natural Resource Mitigation Plan. In totality, this list of commitments, various permit conditions and avoidance and minimization measures form the basis for Project Compliance Work Plans (PCWPs) that will include detailed maps, tables and other information for the Contractor to use for different construction tasks to remain in compliance during construction of the project. The PCWPs will describe timing restrictions, access limitations, fencing/signage requirements, environmental monitoring tasks, restoration details, etc. for every ecologically sensitive location along the Project route. Details will be added as agency consultations continue and permit conditions are issued. After construction, the overhead ROW will be maintained following the Best Management Practices Manual for Utility Maintenance in and Adjacent to Wetlands and Waterbodies in New Hampshire, which is the standard for all utility ROW maintenance in New Hampshire.



**EXP 1-26** Please produce a copy of EPC time frames and asset management (maintenance) plans for construction of the overhead portion of the Project.

**Response:** The Applicants object to this question as the phrase “asset management (maintenance) plans for construction” is vague and ambiguous. The Applicants further object to the extent it seeks to obtain confidential, commercial and financial information or communications that are not discoverable. *See* RSA 91-A:5, IV (exempting production of “confidential, commercial, or financial information” from the Public Right to Know Law).

Notwithstanding the objection, the Applicants answer as follows:

As is typical with large scale transmission line project, a detailed schedule will be developed prior to construction. For this project, a schedule will be developed during the next 6-12 months with input from the project management team and general contractor. The development of the construction schedule is described in the Pre-Filed Testimony of John Kayser starting on page 5. Please also refer to the Pre-Filed Testimony of Kenneth Bowes at Pages 13-15 for maintenance of the Project.

A high level schedule submitted as part of NPT's proposal in response to the Clean Energy RFP is provided. It includes the Canadian side of the construction effort recognizing the need to coordinate installations. This schedule was created prior to the 9 month procedural delay in the siting process so it is only a representation, primarily of sequencing and duration. The Applicants are also providing an excerpt of Section 9.1 from NPT's proposal to the Clean Energy RFP regarding maintenance activities. The Applicants are providing these requested documents directly to Counsel for the Public only. These documents contain business confidential information that is competitively and highly sensitive. Broader disclosure of this information would risk placing NPT at a competitive disadvantage and would not serve the public interest.

The Applicants are also providing a List of Sample Maintenance Activities developed by ABB and included as Attachment 9.1.4 to NPT's proposal to the Clean Energy RFP, titled "Overview of Maintenance Activities – NPT Line." This document has been provided in response to this request.

**EXP 1-27** Please describe all visual impact mitigation techniques used for that portion of the Transmission Line that will be aboveground.

**Response:** A summary of the measures that have been incorporated into the planning and design of the NPT project to avoid, minimize, rectify, reduce, or eliminate potentially adverse visual impacts is found on Page M-16 in the Methodology, 9. Mitigation section of the Visual Impact Assessment of the Northern Pass Project (“VIA”), Appendix 17. Mitigations measures to address specific potential visual impacts are described in the visual impact assessment of each of the scenic resources evaluated in the VIA.

**EXP 1-28** Please produce existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to traffic control plans for work in all public roads for all portions of the Transmission Line that will be buried under or along roadways.

**Response:** As is typical with large scale transmission line Projects, traffic control plans for work in and along public roads will be developed prior to construction.

Detailed traffic control plans will be created and submitted to NH DOT within the overall traffic management plan and reviewed, revised and approved per the defined NH DOT process. Detailed traffic management and control plans are location specific and will be developed based on construction staging and work area needs determined when construction is imminent. The general traffic control method and process that will be followed is outlined in the Pre-Filed testimony of Lynn Farrington. The described process includes preparation to avoid disruptions to emergency services. Each Town or City will have an opportunity to discuss expected impacts to safety services and mitigation of such impacts during the development of the traffic control plans and traffic management plan. The Project will communicate directly with Hospitals, Fire Departments, Police Departments, schools and universities, and Offices of Emergency Management closer to the commencement of construction.

**EXP 1-29** Please produce existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to any subsurface investigation that identifies underground utilities for the proposed cable route for the underground portion of the Project.

**Response:** The Applicants of the Northern Pass Transmission Project (“Project”) have created preliminary design alignments for the underground route. These can be found in the Project’s SEC Application for a Certificate for Site and Facility: Volume X – Appendix #9 Petition for Aerial Road Crossings, and Underground Installations in State-Maintained Public Highways.

The Project has conducted preliminary geotechnical investigation along the underground route as a part of the underground alignment development. This included borings located one per mile along the southern 52 miles of the underground route in Bethlehem to Bridgewater and a more extensive program in the northern 8 miles in Pittsburg, Clarksville and Stewartstown. These documents are being provided in response to this request.

The Project is currently conducting detailed geotechnical investigations and utility and ground survey which will help refine the overall project design including determining the exact alignment in relation to roads, sidewalks and buildings. Part of this engineering survey will also determine the location of existing underground utilities such as water, sewer, storm, gas, electrical, etc. where applicable. It is expected that this data will be available for the Bethlehem to Bridgewater route by late summer or fall of 2016 and the data for Clarksville and Stewartstown will follow.

Please also refer to the Applicants Response to Municipal Group 1 South Question 9.

**EXP 1-30** Please produce existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to drawings or maps showing the routes and subsurface investigative results for the proposed underground portion of the Project.

**Response:** Please see the Applicants' Response to EXP 1-29 above.

**EXP 1-31** Please produce existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to trenchless crossings discussed in the Application and supporting pre-filed testimony including limits of disturbance during construction.

**Response:** As is noted in the Applicants' Responses to EXP 1-29 and EXP 1-30, the alignment of the underground route, including the trenchless crossings, is shown in Appendix 9 of the Application. Also, as is noted in the response to EXP 1-30, the alignment is preliminary in nature and the final design will be completed over the next several months.

There are an assumed six horizontal directional drills and two horizontal bores associated with the Route 3 Alignment and Northern Alignment portion of the project and an assumed thirty nine horizontal directional drills and three horizontal bores associated with the Bethlehem to Bridgewater Alignment portion. Overall types of installation, and lengths of installation are preliminary in nature and are dependent upon final design. Please see the summary list of trenchless crossings that has been provided in response to this request.

As is typical for large scale transmission line projects such as this, the Applicants are in the process of determining the final design of each crossing and the type of equipment required for the length of each crossing. This will determine the construction footprint required at each site and where the laydown areas for casing/conduits will be located.

**EXP 1-32** Please produce existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to the characteristics of the drilling fluid, including additives, that Applicants' contractor will use that minimize impacts on the environment, contamination of ground water, aquifers or streambeds.

**Response:** The design of the horizontal direction drills that will occur on the project will be completed prior to commencing construction as is typical for large scale transmission line projects of this nature. Each crossing is unique and will have its own bentonite solution depending on the characteristics of the in situ strata. Specific additives may be used in places where more porous geological strata is expected or encountered.

The Applicant is in the process of determining soil and rock types in the vicinity of the trenchless crossings which will help determine construction methods and the drilling fluids that will be used for the drills. As a condition of the Army Corps of Engineering Section 404 Water Quality Permit, and in cooperation with the NHDES, an HDD Monitoring and Response Plan will be created. A draft plan is attached for your review. This plan includes a description of the drilling operation and monitoring plan by site condition, remediation steps in the case of an accidental fluid release and a communication protocol regarding the release. As the general contractor continues to develop construction plans over the next year, the final plan will be created.

Please also see the Northern Pass Transmission Project, Operations and Monitoring Plan for HDD Crossings (April 2015), which has been provided in response to this request.

**EXP 1-33** Please produce existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to the use of splice pits versus manholes along the underground rights-of-way.

**Response:** Please see the Applicants' Response to EXP 1-30 above and the Applicants' Response to Abutting Property Owner Group 4's Data Request A4 1-14. As is typical for large scale transmission line Projects, the underground design will be finalized over the next several months in accordance with the NH Department of Transportation Utility Accommodation Manual and will include comments received from the NHDOT during the design review process. The design will include locations of the splice enclosures, types of splice enclosures, specific distances between the enclosures and the depths of the line. It is expected that the final detailed design will be completed by late 2016 / early 2017.

The specific type and dimensions of splice enclosures along roads will be finalized prior to construction. Details of the splice enclosures can be found at Appendix 9, Page 731.

It is anticipated that installation of splice enclosures along roads will require a specific design that will limit the impact at or near grade. This will likely be done by either utilizing a splice enclosure with no riser rings to grade, or a variation with the installation of riser rings that end a set distance below grade so that they are not visible at grade and should not impact vehicles or snow removal equipment. The final design of these splice enclosures will be determined during detailed design and will meet NH DOT requirements.

In general, vaults will be used in paved areas, pits will be used in dirt/grass areas. The installation of risers to grade will be developed with the NH DOT.



**EXP 1-34** Please produce existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to the decommissioning of the cable system, including removal of the cables, splice pits, conduits and related items, the restoration of roadways.

**Response:** Please see Applicants' Project Decommissioning Plan, submitted to the Site Evaluation Committee on July 22, 2016 and provided in response to this request.

**EXP 1-35** Please state whether the Applicants intend that the underground line will operate solely as a bipole or whether there will be situations where the line may operate as a monopole and identify all areas where the line will operate as a monopole.

**Response:** The Project will operate as a symmetrical monopole. This system is designed to operate in only one mode of operation where there is one negative polarity cable and one positive polarity cable. There is not an operating condition in which one of the cables is not energized.

**EXP 1-36** Please produce existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to the conductor size and design details that were selected for the HVDC cable design including conductor size, insulation thickness, etc., and produce a copy of all documents showing or specifying said details and/or discussing their selection.

**Response:** Please refer to the Applicants' Response to Municipal Group 1 South's Data Request MG1S 1-4 and the ABB Technical Proposal for Underground System provided in response EXP 1-5 above.

**EXP 1-37** The testimony of Nathan Scott suggests that a trenchless method will require a footprint of 20 feet by 60 feet near entry and exit locations. Trenchless methods include pipe-jacking, microtunneling and horizontal directional drilling (HDD). Please produce existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to specifying the expected footprint of HDD work areas and limits of disturbance for the locations where HDD will be used and describe the duration for this limit of disturbance to be utilized for each proposed HDD location.

**Response:** Please refer to the Applicants' Response to EXP 1-31 above. The footprint and type of installation (Jack and Bore, micro tunnel, etc.) for each location will be determined by the selected installer/designer.

As is noted in the Applicants' Response to EXP 1-30 above, the Applicants are in the process of determining the final design of each crossing and the type of equipment required for the length of each crossing. This will determine the construction footprint required at each site and the locations for the laydown areas for casing/conduits.

To clarify the testimony of Nathan Scott, the maximum excavation associated with horizontal bores should be twenty feet wide by twenty feet deep by sixty feet long. Horizontal directional drills may have a larger footprint associated with above grade equipment, but should have a much smaller excavation below grade.

**EXP 1-38** Please produce existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to the duration that equipment will be in place for the pulling and splicing of cable at each splice pit or manhole, and produce a copy of all documents that describe, discuss, or analyze the duration said equipment will be in place.

**Response:** Specific site studies will be performed for each splice locations prior to completing the final design as is typical for large transmission line projects of this nature. Therefore, at this time, there are no documents that are responsive to this question.

It is estimated, however, that once the civil preparation activities are complete at each splice location, eight to twelve days for pulling and splicing operations will be required. Typical splice activities include:

- Traffic control
- Delivery of cables
- Proofing of conduits
- Setup of pulling equipment
- Cable pulling operations
- Splicing operations
- Clean-up and demobilization

**EXP 1-39** Of the 60.5 miles of planned underground cable for the HVDC project, Applicants have identified 51 segments for trenchless methods. Please provide existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to details for each location and a summary of the trenchless method anticipated for each respective location, and produce a copy of all documents that describe, discuss, or analyze these trenchless methods.

**Response:** Please see the Applicants' Response to EXP 1-31 and EXP 1-37 above.

**EXP 1-40** Please state:

- (a) the estimated volume of spoils from open-cut trenching as a result of the construction of 60.5 miles of underground cable for the HVDC project;
- (b) what percentage of spoils will be returned to the cable trench; and
- (c) identify how and where the Applicants intend to dispose of the spoils from excavation not returned to the trench for each segment of the line.

**Response:**

(a) The trench width, as shown in the permit package, is 2 ft. – 9 in. wide. The backfill envelope around the conduits has a height of 1 ft. – 3 in., with an assumed average depth of cover of 3 ft. – 9 in., the average bottom of excavation would be approximately 5 ft. – 0 in. below grade. The assumed overall trench length was approximately 285,000 ft. The resultant excavated materials would be approximately 145,200 cubic yards, including roadway surface and bedding.

(b) The exact amount of spoils that will be returned to the cable trench cannot be determined until construction is in process. In general, the Project will return as much spoils as possible to the trench as long as the material meets the thermal characteristics required for the design. Rock and other non-thermal material will not be returned at all. The assumed ratio associated with the permit package is seventy percent of the open cut trench route would utilize native materials as backfill versus thirty percent of the route that would utilize an imported fill. For an approximate average depth to bottom of excavation of 5 ft. – 0 in.; approximately sixty percent of the trench would be backfill, roadway surfacing and bedding with the other forty percent the duct bank envelope and concrete cap. As the depth of excavation varies this ratio of fill also varies.

(c) The final disposal of the spoils from the trench will depend on the quality of the spoils. Where applicable, spoils will be brought to an appropriate disposal facility.

**EXP 1-41** Please estimate the volume of thermally approved sand mixture and fluidized thermal backfill to be used during the Project, and provide an estimate of the volume of each truck to be used for each material and the number of trucks to be used.

**Response:** As is noted in the Applicants' Response to EXP 1-40 (b) above, NPT will return as much native spoils back to the trench as possible, an assumed seventy percent of the route would utilize native backfill versus thirty percent of the route utilizing imported fluidized thermal backfill. For the Project there are potentially different backfill materials. The following materials may be used: thermal sand/thermal backfill for the duct bank backfill envelope, thermally designed concrete for the concrete cap, and fluidized thermal backfill for imported fill. For an open cut trench length of approximately 285,000 feet of installation, the envelope around the conduits would be approximately 32,000 cubic yards, the concrete cap would be approximately 19,350 cubic yards. Since the fluidized thermal backfill above the trench is assumed to be only present for thirty percent of the route, the assumed installation length associated was 85,500 feet, resulting in an assumed fluidized thermal backfill quantity and roadway surfacing and bedding of 26,850 cubic yards. The fluidized thermal backfill quantity provided above includes any surface and bedding required, so the overall value will be lower than stated. Also, as is typical with large scale transmission line construction, the estimated quantities are preliminary in nature and will vary based upon final design and local soil conditions.

In general, construction traffic will depend on many factors, including but not limited to the proximity to staging areas, source of material, amount of native soil returning to the trench, etc. This will be defined as the Project completes geotechnical analysis and advances the underground transmission line design as it gets closer to the construction phase.



**EXP 1-42** Please identify the location(s) where material for sand mixture or fluidized thermal backfill will be sourced and the number of trucks/trips required for each location for the duration of the Project.

**Response:** The sources of sand mixture or fluidized thermal backfill will be identified prior to construction phase as is typical for large scale construction projects. The Project believes that there is suitable material in the State of New Hampshire to supply the Project's needs. In general, the Project's goal is to minimize the distance from the supply points to reduce the travel time of vehicles.

**EXP 1-43** In the testimony of John Kayser, he indicates that "up to 750 feet of trench excavation will be open at a time to allow for efficient construction installation methods." Please state the duration of time the 750 feet of trench excavation would be open, describe how this will be accomplished in public roadways providing for factors such as safety, erosion control, public accessibility, and maintaining normal traffic flows, and produce a copy of all documents that describe, discuss, or analyze open excavation trenches.

**Response:** In the approximate 750 feet of work zone at any given trench location the activities will proceed generally as follows:

A portion of the work-zone will be in the process of excavation. An excavator located at one end will be removing spoils from the trench location and moving ahead of the completed portions of the trench. Dump trucks may be staged alongside the trench in order to receive the spoil material when removed. As this section of the trench is opened, electrical workers will be installing the conduit and spacers either in situ or by use of pre-set jibs. Once the conduit is secured in place, the trench will be back-filled with thermal concrete, thermal sand and/or suitable native material. Concrete and dump trucks containing back-fill material may be staged alongside the trench. The back-filled sections will be temporarily paved once back-fill is complete and/or any back-fill products containing concrete have achieved initial set.

The duration of open trench will vary depending upon production rates at each site specific location. The Applicants do not anticipate that a specific section of open trench will be open for more than 7 days at a time.

Traffic patterns along with certified flaggers and/or police details will be set up to protect the work-zone and the public and will in most cases allow one lane of alternating directional traffic. Any open excavations will be secured at the end of the work day by either steel road plates or jersey barriers.

**EXP 1-44** Please provide existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to the anticipated hours of work for civil construction activities and electrical cable installation activities. Provide a distinction, if necessary, between work activities related to open-cut trenching versus trenchless methods including sites where 24-hour work activities would be required.

**Response:** It is expected that the construction activities will be from 7:00 am to 7:00 pm Monday through Saturday. Details will be addressed in consultation with the NH DOT and with local municipalities. The NH DOT limits the timing of construction activities from April 15<sup>th</sup> to November 15<sup>th</sup> unless special permission is received. Trenching operations are expected to proceed at a rate of 20 to 100 feet per day depending on the substrata and local utility interferences.

There may be limited cases where a trenchless construction operation is at a critical point and may require additional hours to complete a task. The Project will seek the appropriate approvals for extended work hours to complete such activities.

Please also see the Applicants' Response to EXP 1-38 above.

**EXP 1-45** Please state what the expected magnetic field values are from the DC Transmission Line at one meter (3.28 ft.) above the surface at the expected range of cable burial depth. If this information is documented in Dr. Bailey's prepared testimony, please clarify.

**Response:** The expected static magnetic fields due to the DC Transmission Line associated with operation at half- and full-rated load directly above the buried DC transmission line and at 25 feet from the centerline are provided in the Application: Appendix 37 - Review of Research Relevant to Direct Current and Alternating Current Transmission Lines and Health, Table 1. These data and more detailed calculations are contained in the Application: Appendix 38 - Electrical Environment of the Proposed Northern Pass Transmission Project: DC Electric Field, DC Magnetic Field, Air Ion Density, AC Electric Field, AC Magnetic Field, Audible Noise, and Radio Noise. The calculated value of the static magnetic field with operation at full rated load at 25 feet from the centerline also is discussed in Dr. William Bailey's Pre-Filed Testimony at Pages 10-11.

**EXP 1-46**      Portions of the Application, supporting documents and prepared testimony indicate that the depth of burial for the cables will result in 2.5 feet of cover for open-cut trench installations. Please provide existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to selecting this depth of cover relative to expected work practices, hours of work, volume of spoils removed and volume of backfill needed.

**Response:**      Please see the Applicants' Responses to EXP 1-40, 1-41, and 1-44 above.

**EXP 1-47** Regarding the proposed installation depth of 2.5 feet, please describe existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to the impact of the ground frost depth during winter months on the cable installed at this depth.

**Response:** As is typical for large scale transmission projects of this type, the Applicants will complete the detailed cable design prior to construction. The selected cable manufacturer has indicated that there will be no adverse impacts for the cable being located in the vicinity of the frost line. Please refer to Section 1.3.1 of the ABB Technical Proposal for Underground System that has been provided in response to EXP 1-5 above.

**EXP 1-48** Please describe existing reports, documents, drawings or studies that have been done, or are done in the future, that discuss, analyze or relate to the extent of expected ongoing maintenance and operating activities along the underground cable circuits including the frequency and expected duration of each activity over the expected life of the system, and explain the basis for the respective operating and maintenance activities.

**Response:** The specific maintenance associated with an underground cable system is dependent upon a number of factors, and ultimately dependent upon final design. The detailed design of the underground system will be developed prior to commencing construction as is typical for large-scale transmission line projects of this nature. The use of splice pits and splice vaults at specific locations will be determined during the detailed design process. For splice vaults, it is anticipated that a visual inspection of the splices would occur every five years. For splice pits, where the interior of the vault is filled with sand, visual inspection would be completed only due to unplanned outages where necessary.

In addition, NPT will perform a visual inspection of cable terminations at the transition stations in accordance with Eversource Energy practices and ABB manufacturer recommendations.

Please also refer to the Pre-Filed Testimony of Kenneth Bowes at Pages 13 - 15 for general maintenance of the Project.

**EXP 1-49** Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to proposed traffic control measures and scenarios for underground portions of the route including existing right-of-way width, existing pavement width, location of existing pavement within rights-of-way, number of traffic lanes, location and width of existing road shoulders, location of traffic control measures, location of staging areas, location of equipment setup, location of proposed underground transmission line and proposed limits of disturbance.

**Response:** Please see the Applicants' Response to EXP 1-28 above.



**EXP 1-50** Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to road closure areas along the proposed route.

**Response:** Road closures may be needed in areas of the underground route where the roads are narrow. This is noted in the Pre-Filed Testimony of John Kayser Page 31. As is typical of large scale transmission projects of this type, the detailed construction schedule for the project will be developed over the next year. The Project has committed to work with each municipality to ensure that construction impacts are minimal and that access to houses, schools, commercial and industrial properties is maintained as much as possible. The Project has also committed to work with the appropriate emergency response agencies to ensure that temporary road lane closures are communicated and coordinated well in advance of construction. Specific area traffic management plans will be created for each project work zone. In general, please reference John Kayser's Pre-Filed Testimony Pages 33 and 34, Lynn Farrington's Pre-Filed Testimony for information regarding traffic control, and Samuel Johnson's Pre-Filed Testimony for outreach to municipalities. Please see documents uploaded to the ShareFile Site in response to Municipal Group 1 North # 1-4.

At this time, the Applicants do not have any documents that relate to road closures during the construction of the Project. The Applicants will generate traffic control plans closer to construction as described in the Pre-Filed Testimony of Lynn Farrington. Please also refer to the Applicants' Response to Abutter Group 1 Data Request 1-21.

**EXP 1-51** Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to proposed limits of disturbance along the proposed route.

**Response:** The Project is currently conducting detailed geotechnical investigations and utility and ground survey which will help refine the overall project design including determining the exact alignment in relation to roads, sidewalks and buildings. It is expected that this data will be available by late summer or fall of 2016. The data collected during the geotechnical investigations will be incorporated into the detailed engineering plans. Once the detailed engineering plans are complete, the revised route alignment will detail the proposed limits of disturbance.

**EXP 1-52** Project maps submitted with the Application indicate the route shown is the proposed centerline location of the route. In many areas the route is shown generally in the center of the existing road. Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to how traffic flow will be maintained in these areas, particularly on roads with less than 24 feet of pavement.

**Response:** In general, the current proposed underground alignments are either on one side of the road or the other to minimize the impact to traffic. It is anticipated that construction activities will be limited to the edge of the ROW, the shoulder of the road or one travel lane. The final route alignment will meet the restrictions imposed by the NH DOT Utility Accommodations Manual and will be coordinated with and approved by the NH DOT during the design process. Please refer to plan drawings and alignments showing proposed trench installation locations within the roadway cross sections contained in Appendix 9 of the Application. Please also see the Applicants' Responses to EXP 1-28, 1-29, 1-31 and 1-32.

Detailed traffic control plans will be created and submitted to NH DOT within the overall traffic management plan and reviewed, revised and approved per the defined NH DOT process. Detailed traffic management and control plans are location specific and will be developed based on construction staging and work area needs determined when construction is imminent. The general traffic control method and process that will be followed is outlined in the Pre-Filed testimony of Lynn Farrington. The described process includes preparation to avoid disruptions to emergency services. Each Town or City will have an opportunity to discuss expected impacts to safety services and mitigation of such impacts during the development of the traffic control plans and traffic management plan. The Project will communicate directly with Hospitals, Fire Departments, Police Departments, schools and universities, and Offices of Emergency Management closer to the commencement of construction.

**EXP 1-53** Please produce existing reports, documents, drawings or studies that have been done, or are done in the future, that describe, discuss or analyze all measures that are being taken regarding traffic control, traffic routing, work hours and time of year restrictions to minimize impacts on businesses and tourism during construction.

**Response:** Please see the Applicants' Responses to EXP 1-28, 1-44. and 1-52 above.

In addition, the Applicants do not anticipate that the construction of the project will impact businesses and tourism. However, the Applicants will take all reasonable and necessary precautions to limit the potential for any impacts to businesses and traffic as result of the proposed construction, including, all the precautions identified in the Application on Pages 32-33 and 82-84.

More specifically, the Project will take a proactive approach to mitigate impacts to traffic and businesses to the extent practicable. The Project will take into consideration businesses requirements for operation such as delivery access as well as patron access by both vehicle and pedestrian means. The Project team intends to maintain access to all businesses during advertised business hours for the duration of the construction whenever practical. Closing urban roadways by use of detours will generally be avoided to encourage travel by local businesses. Optional routes to avoid the construction area may be suggested to the public in order to maintain traffic flow during peak hours. Pedestrian routes adhering to current Americans with Disabilities Act ("ADA") standards will be provided for all existing pedestrian routes impacted. The Pre-Filed Testimony of Samuel Johnson, on Pages 13 and 14, the Pre-Filed Testimony of John Kayser, on Page 10, 27, 33 and 34, and the Pre-Filed Testimony of Lynn Farrington provide more detailed information regarding traffic control.

**EXP 1-54** Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to work hours and staging of construction at and near schools, medical facilities, daycare centers, police, fire and other public facilities, within town limits (Pittsburg, Clarksville, Stewartstown, Bethlehem, Sugar Hill, Franconia, Easton, Woodstock, Thornton, Campton, Plymouth and Bridgewater), and main intersections along the route.

**Response:** As is typical with large scale transmission line projects, traffic control plans for work in and along public roads will be developed prior to construction.

Detailed traffic control plans will be created and submitted to NH DOT within the overall traffic management plan and reviewed, revised and approved per the defined NH DOT process. Detailed traffic management and control plans are location specific and will be developed based on construction staging and work area needs determined when construction is imminent. The general traffic control method and process that will be followed is outlined in the Pre-Filed testimony of Lynn Farrington. The described process includes preparation to avoid disruptions to emergency services, schools, and other public facilities. Each Town or City will have an opportunity to discuss expected impacts to safety and other public services and mitigation of such impacts during the development of the traffic control plans and traffic management plan. The Project will communicate directly with Hospitals, Fire Departments, Police Departments, schools and universities, and Offices of Emergency Management closer to the commencement of construction.

Please see the Applicants' Responses to EXP 1-28, 1-29, 1-49, 1-52, 1-53 and 1-66 regarding design and traffic control. For work hours please see the Applicants' Response to question EXP 1-44.

**EXP 1-55** Regarding the pre-filed direct testimony of James A. Muntz, please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to budget comparisons for placing the entire route below ground versus what is shown in the Application.

**Response:** The Applicants object to this question as it seeks information not relevant to the proceeding and therefore is not reasonably calculated to lead to the discovery of admissible evidence. RSA 162-H:7, V(b) requires the Applicant to “identify both the applicant's preferred choice and other alternatives it considers available for the site and configuration of each major part of the proposed facility and the reasons for the applicant's preferred choice.” The Applicants have done that. See Application Section 301.03(h)(2) . Other hypothetical alternatives are not subject to consideration under RSA 162-H:7 (application requirements for a certificate) or 162-H:16 (findings required for issuance of a certificate) and therefore are not relevant. See also *Decision Granting Certificate of Site and Facility with Conditions*, Application of Laidlaw Berlin BioPower, LLC, NH SEC Docket 2009-02 (Nov.8, 2010) at 36–40 (finding that RSA 162-H does not require the subcommittee to review all “available alternatives” and does not require consideration of every possible alternative).

Notwithstanding the objection, the Applicants answer as follows:

Please see the Applicants’ Response to the Counsel for the Public Non-Expert Assisted Data Request CFP 1-12.

**EXP 1-56** The pre-filed direct testimony of William J. Quinlan generally explains factors considered for routing the underground segments including "availability of aerial ROW and public highway." Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to placing underground sections of the route within interstate highway right-of-way in New Hampshire.

**Response:** The Applicants object to this question as it seeks information not relevant to the proceeding and therefore is not reasonably calculated to lead to the discovery of admissible evidence. RSA 162-H:7, V(b) requires the Applicant to "identify both the applicant's preferred choice and other alternatives it considers available for the site and configuration of each major part of the proposed facility and the reasons for the applicant's preferred choice." The Applicants have done that. See Application Section 301.03(h)(2) . Other hypothetical alternatives are not subject to consideration under RSA 162-H:7 (application requirements for a certificate) or 162-H:16 (findings required for issuance of a certificate) and therefore are not relevant. See also *Decision Granting Certificate of Site and Facility with Conditions*, Application of Laidlaw Berlin BioPower, LLC, NH SEC Docket 2009-02 (Nov.8, 2010) at 36–40 (finding that RSA 162-H does not require the subcommittee to review all "available alternatives" and does not require consideration of every possible alternative).

Notwithstanding the objection, the Applicants answer as follows:

Please see the Applicants' Response to the Counsel for the Public Non-Expert Assisted Data Request CFP 1-12. Please also see the Applicants' Response to Conservation Law Foundation, Appalachian Mountain Club, New Hampshire Sierra Club, and Ammonoosuc Conservation Trust's Data Request NGO 1-1.

**EXP 1-57** The pre-filed testimony of Samuel Johnson explains that NPT or its Contractors will have temporary easements or licenses to accommodate construction activities (*e.g.*, access and lay down areas) along some portions of the proposed route outside existing easement areas.

- (a) Please state whether these additional property rights have been secured, and if so, provide a map showing their location and size; and
- (b) produce existing reports, studies, etc., or produce any studies done in the future regarding location, size and access of laydown and staging yards and areas along the proposed route.

**Response:** The location of and proposed impacts associated with temporary storage and staging areas located within lands owned or controlled by the Project have been included in the applicable state and federal permit applications, including the NHDES wetlands permit (Sections 6.1.15 and 6.1.16); however sites that may be identified in the future or where a formal agreement for use have not been completed or does not exist have not been included. As is typical of large scale transmission projects of this type, additional sites may be identified once the Contractors for the Project are more fully engaged. Any storage and staging areas identified in the future will be subject to the same site selection, avoidance and minimization standards and protocols that have been applied to the remainder of the Project; and no impacts will be allowed unless explicitly permitted by NHDES.

Please also see the Applicants' Response to Counsel for the Public's Data Request CFP 1-13 for Access Roads and the Applicants' Response to Counsel for the Public's Data Request 1-14, or Municipal Group 3 North's Data Request MG3N 1-8 for Laydown Areas.



**EXP 1-58** Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to areas of permanent easements (if they are required) along public right-of-way that will be needed for long term maintenance of operations, including permanent access roads or staging yards/areas.

**Response:** The Project does not anticipate additional permanent easements along the public rights of way will be required for long term operation or maintenance.

**EXP 1-59** Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to the location of temporary access and haul roads for the Project and temporary staging areas.

**Response:** Appendix 47, NHDES Project Wetland Maps, of the Application identifies the proposed on-ROW access roads and necessary vegetation clearing. In general, access roads are described in John Kayser's Pre-Filed Testimony starting on Page 19. Please also refer to the Applicants' Responses to Counsel for the Public's Data Request CFP 1-13 and EXP 1-57 above.

**EXP 1-60** Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze, or relate to utility designating and mapping for the underground portions of the route that support the proposed alignment, including within the town limits of Pittsburg, Clarksville, Stewartstown, Bethlehem, Sugar Hill, Franconia, Easton, Woodstock, Thornton, Campton, Plymouth and Bridgewater.

**Response:** Please see the Applicants' Response to EXP 1-30 above.

**EXP 1-61** Identify areas along the route where existing underground utility infrastructure exist and is contemplated for relocation to accommodate the proposed Transmission Line, and produce a copy of all existing documents, or documents to be prepared, that describe, discuss, depict or analyze the relocation of said underground utility infrastructure.

**Response:** Please refer to the Applicants' Responses to Grafton County's Data Requests GCC 1-1, 1-5, and 1-12 and Municipal Group 2's Data Request MG2 1-21.

**EXP 1-62** The pre-filed testimony of Jerry Fortier identifies that the depth of jack and bore will be 25 to 30 feet below grade and directional boring sections will be 65 feet below grade at its maximum depth. Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to size, location and construction staging for each trenchless construction area proposed along the route as they relate to the existing right-of-way and road bed, including the following.

- (a) entrance and receiving pits;
- (b) pipe laydown areas and pullback areas necessary for the pipe;
- (c) location, size and construction staging of transition areas for connecting open trench and trenchless sections;
- (d) location, size and construction staging of splicing pit(s) and operations;
- (e) location and size of underground vaults within the public right-of-way; and whether all proposed concrete encasement materials and manholes/vaults meet or exceed NH Department of Transportation loading limits

**Response:** As an initial matter, the Pre-Filed Testimony of Jerry Fortier has been adopted by Kenneth Bowes, whose Testimony was provided as part of the Applicants' supplemental filing in February of 2016.

(a) – (d): Please see the Applicants' response to EXP 1-31 above regarding trenchless crossings. In general, please also refer to the plan drawings for preliminary design locations of the underground alignment and assumed trenchless crossing locations contained in the Application: Appendix 9 and 10. As previously noted, the alignment is preliminary and will be finalized prior to commencing construction as is typical for transmission line projects of this nature.

(e): The underground design will be finalized over the next several months in accordance with the NH Department of Transportation Utility Accommodation Manual and will include comments received from the DOT during the design review process. The underground installation will be designed to meet HL-93 traffic loading requirements.

**EXP 1-63** Trenchless methods are discussed only generally in terms of what is involved. Each trenchless project site is an elaborate effort requiring detailed analysis. Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to the detailed evaluations of the trenchless crossings discussed in the Application and supporting prepared testimony.

**Response:** Please see the Applicants' Response to EXP 1-62 above. Detailed evaluations of the trenchless crossing layouts and technology will be performed and detailed plans will be created prior to construction in accordance with the NH Department of Transportation Utility Accommodation Manual and will reflect comments received from the DOT during the design review process.

**EXP 1-64** Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to how sediment and erosion control will be addressed for the overhead and underground sections, including:

- (a) where will foundation and trench excavation that is not reused be displaced;
- (b) the treatment of stockpiled topsoil and wetland soils to be reused; and
- (c) produce a copy of all documents that describe, discuss or analyze sediment and erosion control on the Project.

**Response:**

- (a) where will foundation and trench excavation that is not reused be displaced;

Although not specified in the question, we assume that this query is asking about soil/earthen materials removed from foundation holes and trenches. Materials removed during foundation and trench excavation will be disposed of in accordance with applicable state law and any applicable permit conditions. These materials could be reused within upland portions of the ROW by spreading a layer and then seeding the surface to establish stabilizing vegetation or they could be trucked off, stockpiled and stabilized until needed elsewhere. Materials will not be placed in wetlands, streams, vernal pools or other sensitive resource areas.

- (b) the treatment of stockpiled topsoil and wetland soils to be reused; and

If soil is stockpiled onsite, then it will be stabilized or covered. Stabilization could consist of vegetation or covering with a layer of mulch or covered with a secured tarp and ringed with erosion/sediment control barriers so that sediment does not migrate. Wetland soil, specifically if it is to be reused, will be segregated by type. Also, please refer to the notes contained at the end of the Wetland Permit Plan set.

- (c) produce a copy of all documents that describe, discuss or analyze sediment and erosion control on the Project.

Please refer to the Applicants' Response provided for EXP 1-25.

**EXP 1-65** The pre-filed testimony of John Kayser notes a "combination of temporary storage areas/construction laydown yards, staging areas, and crane pads are necessary. Temporary storage areas/construction laydown yards are typically previously disturbed large paved or gravel surface lots 5 to 50 acres in size." Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to information on the number, size and location of the proposed laydown yards and staging areas along the route together with temporary and permanent access roads to same.

**Response:** Please see the Applicants' Responses to EXP 1-57 and 1-59 above for information on Laydown areas.



**EXP 1-66** Regarding the pre-filed testimony of John Kayser, please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to:

- (a) a detailed schedule indicating permitting and construction timelines;
- (b) identify which areas of the route where potential night work may be performed and if this has been coordinated with local NH jurisdictions and stakeholders;
- (c) construction staging and maintenance of traffic information including use of steel plates, and when pavement restoration will occur;
- (d) details on the frequency of geotechnical testing of *in situ* soils to determine their applicability for backfill;
- (e) if sufficient space does not exist to maintain traffic flow and provide for worker safety on roads/rights-of-way with less than 24 feet of pavement/travel way along the route during construction, please identify those areas where adequate room does not exist and describe the actions to compensate for the lack of room; and
- (f) produce a copy of a sample of an evacuation plan.

**Response:**

- (a) Please refer to the Applicants' Response to EXP 1-26 regarding the schedule.
- (b) Locations for night work will be determined prior to commencing construction. Please refer to the Applicants' Response to EXP 1-44 above. As noted in the Pre-Filed Testimony of Samuel Johnson, the Project will work with municipalities to establish work hours protocols.
- (c) Please refer to the Applicants' Responses to EXP 1-28, 1-49, 1-52, 1-53 and 1-66 regarding traffic control. The Project will determine whether to use steel plates during the development of the traffic plan. In general, steel plates will be used to cover the trench at night or to provide access to residences / businesses. Pavement restoration will occur as a part of the trenching process by placing temporary hot patches. Once the pavement has settled for a period time, final paving will occur.
- (d) Please refer to the Applicants' Responses to EXP 1-40 and 1-41 above. A geotechnical testing plan of *in situ* soils to determine their applicability for backfill will be created as a part of the construction planning. This is expected to be completed by mid-2017.
- (e) Please refer to the Applicants' Response to EXP 1-50 for information regarding road closures.
- (f) The location of the project is not in a mandated evacuation area (like the seacoast). Communication plans and protocols will be established with the appropriate authorities and will include emergency management plans for events that would require evacuations. Moreover, the Applicants will have an opportunity to discuss expected impacts to safety services and mitigation of such impacts during the development of the traffic control plans

and traffic management plan with each city and town. Correspondence with the Hospitals, Fire Departments, Police Departments, schools and universities, and Offices of Emergency Management will also occur during the development of the traffic management plan.

**EXP 1-67** Please provide existing reports, studies, etc. or produce any studies done in the future that discuss, analyze or relate to how wetland crossings in open trench construction areas will be staged along with material laydown, construction traffic and construction equipment locations, and identify where excavation and stockpile materials will be placed.

**Response:** There are few locations where wetlands will be crossed with open trenches, as most of the underground construction will occur within previously disturbed roads and road shoulders. Where the transmission line is constructed within previously disturbed roads, the Project will use trenchless technologies or hand digging to traverse under streams, rivers or other water courses. Culvert replacements will be addressed on an as needed basis and will comply with the appropriate NHDES stream crossing rules (Env-Wt 900).

The construction approach, including information regarding trenching, temporary storage and staging areas, and stormwater management, and BMPs is discussed in Sections 6.1.15 and 6.1.16 of the NHDES wetlands permit (SEC Appendix 2), the 401 Water Quality Certification application (SEC Appendix 4) and in the testimonies of John Kayser and Jacob Tinus. Known laydown areas and off-ROW access roads are shown on the permitting plan set (SEC Appendix 47). We expect that additional sites that may be identified in the future will be subject to the same site selection, avoidance and minimization standards and protocols that have been applied to the remainder of the Project; and no impacts will be allowed unless explicitly permitted by NHDES. All work will be conducted in compliance with Best Management Practices and state and federal permit conditions.

Finally, detailed traffic control plans will be created and submitted to NH DOT within the overall traffic management plan and reviewed, revised and approved per the defined NH DOT process. Detailed traffic management and control plans are location specific and will be developed based on construction staging and work area needs determined when construction is imminent. The general traffic control method and process that will be followed is outlined in the Pre-Filed testimony of Lynn Farrington.

**EXP 1-68** Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to how new overhead structure locations will be constructed within wetland, marsh, bog, pond or other "wet" areas including access for construction vehicles, sediment and erosion control measures and displacement of excavation materials unable to be reused at that location (for example, in Northumberland at DC-501/502, in Deerfield at 3132311/312 and in Concord at Turtle Pond).

- (a) Provide similar information regarding removal of existing overhead structures from similarly "wet" areas including in standing water (for example, in Northumberland between DC-519/520, in Deerfield at 3132-310 to 3132-313 and in Concord at Turtle Pond).

**Response:** The construction approach, including information regarding overhead construction, access roads and erosion and sediment controls, is discussed in Sections 6.1.15 and 6.1.16 of the NHDES wetlands permit application (SEC Application: Appendix 2), the 401 Water Quality Certification application (SEC Application: Appendix 4) and in the testimony of John Kayser. Wetland impacts, on-ROW and off-ROW access roads, and erosion and sediment controls are shown on the permitting plan set (SEC Application: Appendix 47). Methods to minimize potential impacts to wet areas (and other sensitive natural resources) during construction are provided in Section 2.7 and Appendix B of the Natural Resource Mitigation Report (SEC Application: Appendix 32 ).

There are several options available for crossing and accessing proposed structure locations in shallow ponded areas. The proposed NPT route crosses several ponded, palustrine unconsolidated bottom ("PUB") wetlands many of which are also associated with beaver activity. In addition, the number of structures proposed for these areas was limited where possible. All of these ponded wetlands are relatively shallow and are at least partially, with many completely, vegetated with aquatic emergent and floating-leaf plants. Water depths fluctuate seasonally and with changes in hydrology associated with beaver activity and other climatic influences; however none of the ponded areas crossed within the NPT ROW are considered deep-water, or Lacustrine systems and water depths do not exceed 2 meters (6.6 feet). The majority of the areas within the ROW range from 1-4 feet in depth.

Several access and work area alternatives exist for the means and methods of construction at these ponded wetland areas, including but not limited to:

- Avoidance: several of the proposed temporary construction access crossings of ponded wetland areas may be able to be avoided by utilizing access opportunities from public roads on opposite sides of the proposed pond crossing (e.g. DF31, Sheet 670, Deerfield). Avoidance will ultimately be decided in the field by the contractor based on current conditions along the proposed access roads leading to and from the proposed crossing site and other variables including safety, weather, seasonal conditions, schedule and structure type.
- Minimization: multiple ponded or partially ponded wetlands utilize existing access road and/or ORV trail crossing sites that have been previously disturbed and are continually

utilized by private landowners. Many of these sites have hardened bottoms for better performance (e.g. CH46, Sheet 695, Chester; RA5, Sheet 691, Raymond)

- Winter/Frozen Conditions: After avoidance and minimization, working in these ponded areas is most easily accomplished under winter/frozen conditions typically experienced in late December through late February in New Hampshire. Additional opportunities for winter/frozen condition work will be available in northern New Hampshire. This is the preferred method after avoidance for minimizing impacts to the wetland system assuming that seasonal conditions are appropriate.

Frozen conditions can be enhanced through simple practices including:

- The removal (plowing) of snow from underlying ice to reduce the natural insulating action of snowpack thereby increasing the depth and strength of the ice;
- Application of water to plowed icy areas to strengthen ice;
- Utilizing timber matting over ice or deep snow
- Stacking timber matting in shallow water to achieve the stability needed
- Shallow water work barges where needed

For the disposition of excavated materials, please see the Applicants' Response to EXP 1-64 above. The Project will follow the above construction methods for the removal of existing overhead structures in "wet areas" where applicable.

**EXP 1-69** Please describe and provide documents on whether NPT has coordinated the type of road restoration desired by each NH jurisdiction whose roads will be impacted by construction, describe and provide documents on the pavement restoration required by each New Hampshire jurisdiction, and state whether the Project's budget and schedule includes all such pavement restoration.

**Response:** In general, where the underground installation is located in undeveloped, gravel, or paved areas, the surface would be restored to meet the existing conditions prior to construction. Roadways will be restored in accordance with NH DOT requirements. Underground construction, including the restoration process is outlined in the Pre-Filed Testimony of John Kayser starting on Page 25. Please also see Pages 83 - 84 of the Application and Appendix 9 - Petition for Aerial Road Crossings, and Underground Installations in State-Maintained Public Highways, Pages 4 -11.

The cost for road restoration is included in the overall Project budget.

**EXP 1-70** The pre-filed testimony of Jerry Fortier notes that only contractors with the experience and capabilities to perform the scale of Project will be contracted with. Please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to how contractors will be able to find and employ local labor with the skills and experience needed to successfully complete the Project.

**Response:** As an initial matter, the pre-filed testimony of Jerry Fortier has been adopted by Kenneth Bowes, whose testimony was provided as part of the Applicants' supplemental filing in February of 2016. Mr. Bowes' testimony provides a high level description of the Project's selection process for reviewing the qualifications and choosing contractors and their qualifications on Page 8.

NPT has retained a highly experienced team of major contractors with proven track records in constructing and managing similar projects of this scope and size. Each selected contractor has significant experience in bringing together workers with diverse backgrounds, experiences and skill sets to effectively and successfully construct large-scale transmission line projects. The retained contractors will put New Hampshire's diverse and experienced labor force to work on this Project.

On pages 11 and 12 of Kenneth Bowes' testimony there is a description of the Project Labor Agreement (PLA) for the Project. This agreement outlines the requirements of PAR Electric to hire both union and non-union personnel. For a copy of the PLA, please refer to the Applicants' response to Counsel for the Public Non-Expert Assisted Data Request CFP 1-29.

The major engineering, construction, and equipment suppliers will generally hire trade personnel and/or subcontractors directly. The PLA requires that these contractors hire NH labor first to ensure that local suppliers and businesses will be used to the extent practicable.

To ensure that the skill sets of New Hampshire's workers are engaged effectively, the PLA specifically identifies non-union job opportunities that are not subject to the agreement, including logging, landscaping, land clearing, maintenance and warranty work on equipment, training, testing, and equipment installation. Numerous "service vendors" providing such services as trash haulers, security, fuel delivery, and janitorial services, are also included in these non-union opportunities. Non-union job opportunities also include a number of "non-manual job categories" needed for Project support. These include inspectors, timekeepers, clerical and administrative workers, guards, emergency medical technicians, quality assurance/quality control staff, and engineering, real estate, survey, technical, and supervisory personnel.

Additionally, over the last several years, the Project has maintained a database of over 1,000 individuals and corporations that have expressed interest in working on the project that has been provided to our general contractor for their consideration. To date, we have conducted several contractor fairs in New Hampshire to identify qualified contractors that have an interest in working on the Project. We anticipate holding additional contractor and job fairs as we get closer to construction. We expect the local hiring process to begin four to six months prior to the start of construction.

**EXP 1-71** Regarding the pre-filed testimony of Lynn Farrington, please provide existing reports, studies, etc., or produce any studies done in the future that discuss, analyze or relate to over height and /or overweight vehicles that will be used as part of this Project, where they are anticipated to be used and proposed travel routes to be used to reach their destinations.

**Response:** To date no reports, drawings or studies have been created concerning overheight/overweight (OH/OW) vehicle travel routes for the Project. A permit will be filed with NH DOT for any vehicles meeting the OH/OW criteria (available at <http://www.nh.gov/dot/org/operations/highwaymaintenance/overhaul/documents/overweightloadbridgecriteriasheet.pdf>) to review the routes and ensure the safety of bridge structures within the State. When possible the timing and routes of the OH/OW trucks will be altered to reduce impacts to the traveling public; for example known areas of congestion will be avoided during peak hours.



**EXP 1-72** Provide examples of non-stormwater discharges that are anticipated and how they will be addressed, including coordination with local NH jurisdictions that have occurred.

**Response:** There are a few allowable non-stormwater discharges that may be derived from the Project. To the extent that a local NH jurisdiction has specific concerns related to non-stormwater discharges, NPT anticipates these will be resolved during the SEC permitting process. Allowable non-stormwater discharges are regulated through the US EPA Construction General Permit which includes development of a Stormwater Pollution Prevention Plan (“SWPPP”). The SWPPP identifies these as discharges that NPT contractors and subcontractors are responsible for ensuring do not generate any unapproved discharges to stormwater. As described below, they include dust control, uncontaminated air conditioning or compressor condensate, uncontaminated dewatering activities, vehicle washing and water sources.

- Dust control will be implemented as needed by the NPT contractor once site grading has been initiated and during windy conditions (forecasted or actual wind conditions of 20-mph or greater) while site grading is occurring. Spraying of potable water at a rate of 300 gallons/acre or less will be performed by a mobile pressure-type distributor truck up to three times per day (or potentially more) during the months of May – September, and once per day during the months of October-April, or whenever the dryness of the soil warrants.
- Where possible, any equipment or machinery that has the potential to create uncontaminated condensate will be positioned in upland. If such equipment is necessary for work in a wetland or directly adjacent to a waterbody, it will be stationed on timber mats to allow for absorption and energy dissipation.
- Dewatering activities will likely be necessary at some locations during foundation work, and or as part of the structure installation process. Any necessary dewatering will be done based on site conditions at time of construction activity, and be compliant with the appropriate BMP. If the use of a typical dewatering structure (e.g. straw bale corral with filter bag or upland sediment basin) is not practical due to location (e.g. within or adjacent to a wetland), then the NPT contractor may opt for using a pre-fabricated self-contained unit (i.e. frac tank) to contain and control silt-laden water.
- Vehicle washing must not be conducted at sites of active construction. If vehicle washing is required, a designated area must be selected where runoff can be contained and disposed of properly. Concrete trucks are not allowed to wash out or discharge surplus concrete or drum wash to waters of New Hampshire. Concrete washout bins will be constructed in accordance with approved BMPs. As requested by DES in its May 16, 2016 comments on the 401 Water Quality Certification application, the contractors will need to submit a plan to address concrete wash water at least 90 days prior to commencing construction.
- Water used to establish and maintain grass, control dust, or for other construction purposes must originate from a public water supply or private well approved by the State of New Hampshire or local health department. Potable water must adhere to local and State regulations for water standards.

Any changes in construction activities that produce other allowable non-stormwater discharges will be identified and the SWPPP will be amended. The appropriate erosion and sediment controls will be implemented to minimize the effect of these additional allowable non-stormwater discharges.

**EXP 1-73** The Application provides that foundations to be abandoned are described to be removed to below grade. Provide information regarding the minimum distance below grade for foundation removal.

**Response:** Please refer to the Applicants' decommissioning plan, which was provided to the SEC on July 22, 2016 and provided in response to EXP 1-34 above. As is noted in Section 4.2.2.4 Foundation Removal, in general, the Project will remove foundations to 48 inches below ground surface. The Applicants will also comply with the SEC rules regarding decommissioning for each structure foundation.

- EXP 1-74** The Application indicates that blasting may be required for portions of the underground route. Please identify the locations where blasting may occur and:
- (a) Provide information on the size and location of expected blasting areas along the route;
  - (b) Provide information on Applicants' coordination with local NH jurisdictions regarding their blasting requirements and work hours for same; and
  - (c) Produce a copy of all documents that describe, discuss or analyze blasting for the Project and coordination with local New Hampshire jurisdictions.

**Response:**

- (a) The Applicants are currently conducting additional geotechnical investigations and utility and ground surveys to support the design for the underground portion of the project. Part of this engineering survey will also determine the location of existing underground utilities such as water, sewer, storm, gas, electrical, etc. where applicable. During the construction portion of the Project, we will proactively notify abutters of the work, and perform relevant pre and post blast testing. More detailed information regarding blasting is included in the Pre-Filed Testimony of John Kayser (Pages 10 and 11) and in the Application (Pages 68 and 84). Please also see the Applicants' Response to Municipal Group 2's Data Request MG2 1-18 as well as geotechnical reports provided in response to that request.
- (b) Any blasting activities will be communicated to the appropriate authorities, municipal leaders and residents. Please refer to the Applicants' Response to subpart (a) and the Applicants' Response to EXP 1-29.
- (c) Please refer to the Applicants' Response to subpart (b).

**EXP 1-75** Please identify all natural gas pipelines located within the Project's ROW in the Stark to Bethlehem section of the Proposed Route, describe all measures that will be taken to ensure the safety of co-locating the Transmission Line in the ROW where natural gas pipelines are located, and produce a copy of all documents that describe, discuss or analyze the co-location of a natural gas pipeline and the Transmission Line within the ROW, including without limitation, the Joint Use Agreement.

**Response:** The Project is aware of the Portland Natural Gas Transmission System (PNGTS) that is co-located within the overhead transmission corridor in Stark and Northumberland.

Please also see the response to Non-Abutting Property Owner Group 2's Data Request NA2 1-7 and the joint use agreement with PNGTS provided in response to this request.

**EXP 1-76** Please provide all inputs to the REMI model used to generate economic impact estimates for the Project, including without limitation, all spreadsheets and other documents that show the sources and derivation of all model inputs, as well as documents explaining the rationale behind these inputs, and REMI .rwb files used for the six-state, 70-sector model used in the economic impact analysis.

**Response:** Pursuant to the SEC's July 6, 2016 Order Clarifying Access to Confidential Information, the Applicants will provide the requested information directly to Counsel for the Public.

**EXP 1-77** Please provide all anticipated Project expenditure detail provided by the Applicant in connection with the development, construction, operation and maintenance of the Project used in the economic impact analysis, including without limitation, all budgets by month or year, with the most granular budget detail available, including engineering, legal, environment, management, and overhead, in addition to construction, operating, and maintenance costs for the pre- and post-construction periods.

**Response:** Please see documents provided in Applicants' response to EXP 1-76 and 1-78.

**EXP 1-78** Please provide full and detailed expected annual expenditures data on NPT labor (by occupation, if known), including wages and/or wage rates (if known) and by materials requirements (with NAICS producing industry or product description, or assembly description, if known) by state of origin (or country of origin if not United States), if known, for: (a) the construction phase of the Project, and (b) the operating phase of the Project, including any equipment and/or facility leasing expenditures in the Project expenditures for (a) and (b).

**Response:** Pursuant to the SEC's July 6, 2016 Order Clarifying Access to Confidential Information, the Applicants will provide the requested information directly to Counsel for the Public.



**EXP 1-79** Please describe the derivation of both direct and indirect state and local fiscal impacts associated with the development and operation of the Project, as proposed, including tax payments made to New England localities, states and the federal government. (This should include incorporation of others' estimates of direct tax levies.)

**Response:** Please see the Pre-Filed Testimony and Report prepared by Dr. Shapiro, Application: Appendix 44, for a description of the approach and methodology to estimating the NPT property tax payments to local, county and state government in New Hampshire. See Pre-Filed Testimony of Dr. Shapiro, Page 4, for a discussion of estimated property taxes paid during construction, and Appendix 44, Page 16, for the estimated NPT aggregated property taxes paid over the first twenty years of operation.

A table of the breakdown of federal and state income tax payment of the project by year is provided in the attached file entitled "State income tax payment.xlsx."

The REMI analysis in the SEC application provides GDP - an indicator of additional economic activity generated by NPT. LEI has not estimated additional tax revenues as a result of this extra GDP.

**EXP 1-80** Please provide all anticipated Project expenditure flows for the development, construction, operation and maintenance of the proposed Transmission Line, including without limitation, detailed Project expenditure categories, expenditure timing (annual or monthly), any knowledge regarding the geographic location (in-state, out-of-state or unknown) of subcontractors, company employees and other purchases associated with each Project expenditure, and Project labor costs and materials costs.

**Response:** Please see the document provided by the Applicant in Response to EXP 1-78 above.

**EXP 1-81** Please state annual property leases undertaken to serve NPT needs by dollar amount by term (years.)

**Response:** The Applicants object as to relevance inasmuch as the request is not reasonably calculated to elicit evidence that is admissible in this proceeding. Applicants further object to the extent that the request calls for the production of confidential information. *See* RSA 91-A:5, IV (exempting production of “confidential, commercial, or financial information” from the Public Right to Know Law). Notwithstanding the foregoing, for publicly available information, please see the Petition filed by PSNH in PUC Docket No. 15-464.

**EXP 1-82** Please provide an itemization of the annual dollar amount of all other NPT expenditures (or funding) for NPT-related economic development programs or community grant programs from January 1, 2013 to the present, including a listing of all such programs and the annual amount of funds provided to each program.

**Response:** Below is a list of economic development or community betterment programs that NPT has funded since January 1, 2013.

Program	Description	Date	Amount Paid
Groveton Cell Tower	One time contribution to fund a new cell tower on Morse Mountain	October 2013	\$200,000
Jobs Creation Fund	\$7.5 million to the Coos County Job Creation Association to support job creation in the North Country	April 2015	\$200,000
North Country Cell Service	One time contribution to Coos Economic Development Corporation to facilitate cell service in and around Groveton	April 2015	\$60,000
Roger's Campground	\$120,000 (estimate) to provide tourism, clean energy and economic benefits by funding the acquisition and installation of an electric vehicle charging station at Roger's Campground in Lancaster NH.	August 2015	
Public Safety Services Initiative	\$259,995 (Lease payment of \$12,000/yr. for 20 years plus \$19,995 for equipment and installation) to provide community betterment funding for the attachment and rental expense associated with a public safety service antenna on the Morse Mountain cell tower.	August 2015	
NFWF Partnership	\$3 million over three years to support cost-effective science based conservation with measurable outcomes in New Hampshire	December 2015	\$1.5 million
LED Street Lighting	\$105,000 (estimate) to provide community betterment funding for conversion of existing street lighting to light emitting diode (LED) technology in Lancaster NH.	August 2015	
The Balsams Resort	\$2,000,000 to facilitate economic development, tourism and the use of clean energy in the North Country by providing a loan in support of the redevelopment of the Balsams resort.	February 2016	\$2,000,000

**EXP 1-83** Please provide any current updates or changes to the assumptions and inputs used in the economic impact analysis submitted with the Application, including without limitation, changes in Project timelines, macroeconomic assumptions, relevant natural gas prices, regional electricity price savings, newly announced and/or planned ISO-New England capacity additions, and Project expenditure details.

**Response:** LEI has not performed any further updates on the economic impact analysis as part of the Project's Application at this time.

**EXP 1-84** At the SEC Joint Agency Hearing on March 10, 2016, in Merrimack County, the Applicants indicated that the total Project cost increased from \$1.4 billion to \$1.6 billion with the addition of 52 miles of buried Transmission Line. Please state the additional cost to bury the remaining sections of the Transmission Line, by line segment.

**Response:** The Applicants object to this question as it seeks information not relevant to the proceeding and therefore is not reasonably calculated to lead to the discovery of admissible evidence. RSA 162-H:7, V(b) requires the Applicant to “identify both the applicant's preferred choice and other alternatives it considers available for the site and configuration of each major part of the proposed facility and the reasons for the applicant's preferred choice.” The Applicants have done that. See Application Section 301.03(h)(2) . Other hypothetical alternatives are not subject to consideration under RSA 162-H:7 (application requirements for a certificate) or 162-H:16 (findings required for issuance of a certificate) and therefore are not relevant. See also *Decision Granting Certificate of Site and Facility with Conditions*, Application of Laidlaw Berlin BioPower, LLC, NH SEC Docket 2009-02 (Nov.8, 2010) at 36–40 (finding that RSA 162-H does not require the subcommittee to review all “available alternatives” and does not require consideration of every possible alternative). The Applicants also object as the phrase "line segment" is vague and ambiguous. The Applicants further object the question to the extent it requires the Applicants to develop additional data that is not presently in the care, custody, or control of the Applicants.

Notwithstanding the objections, the Applicants answer as follows:

Please see "An Evaluation of All Underground Alternatives for the Northern Pass Transmission Project" which has been provided in response to this request.

**EXP 1-85** Since the Applicant's economic impact analysis was performed, two transmission lines from the Canadian border being developed by TDI New England that could affect the pricing of wholesale electric power in ISO-New England, have secured permit approval for construction and operation. One is a 1,000 MW line referred to as the New England Clean Power Link (NECPL) and the other, delivering 1,000 MW to the New York metro area, is the Champlain Hudson Power Express (CHPE). Please state whether these capacity additions were included in the NPT economic impact analysis and, if not, please state how their inclusion would change; and if you assume both TDI projects are built; how would that affect the incremental energy market cost benefits and overall economic impacts of the Project?

**Response:** Neither of TDI's projects were included in LEI's analysis in relation to NPT's impact on the wholesale electricity market in the region or local economies. To our knowledge, neither of the TDI projects has a firm power supply, received project financing and/or definitively committed to construction, including siting the necessary interconnection facilities to a generation source. Therefore, these projects would not be reasonable to include in a Base Case. At this time, without performing specific modeling, LEI cannot estimate how these other projects would affect the wholesale electricity market benefits and local economic impacts associated with NPT.

In addition please see the Applicants' Response to Conservation Law Foundation, Appalachian Mountain Club, New Hampshire Sierra Club, and Ammonoosuc Conservation Trust's Data Request NGO 1-16.

**EXP 1-86** The cost of the recently approved TDI CHPE transmission lines, all of which are underground or underwater, and which will deliver approximately the same quantity of Canadian-sourced electricity as the Transmission Line, is projected to cost \$2.2 billion to construct. Explain why those projects may be built economically and competitively but complete burial of the Transmission Line is considered not to be economically feasible by NPT.

**Response:** The Applicants object to the question as it seeks information not relevant to the proceeding and, therefore, is not reasonably calculated to lead to the discovery of admissible evidence. The Applicants also object to the extent the question seeks to obtain information that is not within the care, custody, or control of the Applicants.

Notwithstanding the objection, the Applicants answer as follows:

While TDI CHPE and TDI NECPL (New England Clean Power Link) have received certain permit approvals, NPT cannot address the economic feasibility of constructing these projects. That being said, perhaps some inference as to the economics of each project can be drawn from the fact that both projects appear to have received all required permits, and construction has not commenced on either project. See also the Applicants' Response to EXP-85 above.

For an overall discussion of Project economics and a discussion of additional burial of the Project, please refer to the Applicants' Response to Conservation Law Foundation, Appalachian Mountain Club, New Hampshire Sierra Club, and Ammonoosuc Conservation Trust's Data Request ENV 1-1.



**EXP 1-87** Mr. Muntz testified that, "The Proposed Route builds on the 2013 changes and provides the appropriate balance among several important considerations, including public concerns over iconic viewsheds, environmental and economic impacts as well as technical feasibility and the availability of land rights necessary to support the Project." Please describe pre-2013 economic impact concerns and the remedy selected to address those concerns.

**Response:** The Applicants object to the request as the phrase "economic impact concerns" is vague and ambiguous. The Applicants also object to the premise of the request on the grounds that it misstates the conclusions that James Muntz presented in his Pre-Filed Testimony relative to the Proposed Route as compared with the 2013 changes.

Notwithstanding these objections, the Applicants answer as follows:

Assuming that the question is what were the pre-2013 concerns and what was done to address them, Applicant states that the 2013 changes sought to address concerns over the fact that the original route included approximately 40 miles of new right of way through northern population centers, including potential construction impacts within those population centers. To address this, the Project was modified so that the route would travel from the U.S./Canadian border further east and then south through a less densely populated area of New Hampshire than the original route. In addition, the route in the North section was modified so that it would be located on existing ROW in the towns of Dummer, Stark and Northumberland, land that an affiliate of NPT has purchased or leased, or land over which NPT had obtained easements from willing landowners, including a 24 mile segment through a working industrial forest. Compared to the original preferred route, this portion of the proposed route used fewer parcels of land and included two underground segments, approximately 0.7 mile and 7.5 miles in length respectively.

As it is referenced in Mr. Muntz's Pre-Filed Testimony, "economic impact" refers to project economics in the context of the proposed route announced in August 2015. The Project's economics were one factor that the Applicants considered in determining that the proposed route represents the appropriate balance among the multiple considerations listed in Mr. Muntz's Pre-Filed Testimony on Page 3. For a discussion of Project economics, please see the Applicants' Response to Conservation Law Foundation, Appalachian Mountain Club, New Hampshire Sierra Club, and Ammonoosuc Conservation Trust's Data Request ENV 1-1.

**EXP 1-88** If "iconic viewsheds" have an economic value worth "balancing" via higher development costs associated with underground burial, please describe how these economic values and costs were calculated, identify which areas along the Project route were determined to be "iconic viewsheds," and describe the criteria used to calculate their value.

**Response:** The Applicants object to the premise of the request on the grounds that it assumes an improper conclusion about the Project's economics. The Applicants further object to the request to the extent it requests the Applicants to develop additional data that is not presently in the care, custody, or control of the Applicants and is outside the scope of the Applicants' responsibilities in this docket. The rules do not require a study to assess the economic value of "iconic viewsheds." Therefore, the information was not included in the Applicants' reports and has no bearing on the Committee's determination as to whether the Project will have an unreasonable adverse effect on aesthetics. Notwithstanding the objections, the Applicants respond as follows:

The Applicants did not calculate an economic value for "iconic viewsheds" as part of the Project's economic analysis. Changes in the route and construction approach, including the decision to bury an additional 52 miles of the transmission line through the White Mountain National Forest (WMNF), were based on careful consideration of multiple factors. One factor was New Hampshire stakeholder input. Significant public input related to avoiding viewshed impacts in and around the WMNF. This, coupled with various other considerations articulated in Mr. Muntz's pre-filed testimony on page 3, led to the balanced approach currently being proposed. For a discussion of Project economics, please see the Applicants' response to ENV-1-1.

**EXP 1-89** Mr. Muntz testified that, "If Northern Pass is selected and constructed, New Hampshire customers will not bear any of the expenses but will still experience the State and regional benefits of the Project." Please state whether New Hampshire ratepayers are exempt from all the expenses associated with the Project, including substation and line upgrades for existing transmission and distribution facilities, and state all additional expenditures entailed in these upgrades that are not considered to be part of Project's costs.

**Response:** All expenditures associated with the Project, including substation and line upgrades for existing transmission and distribution facilities, are included in the Project costs. As proposed, New Hampshire customers will not be charged any costs of construction, operation or maintenance associated with the Northern Pass transmission line or related upgrades. Please also see the Applicants' Response to request EXP 1-90.

**EXP 1-90**      How much recovery does NPT intend to seek pursuant to the Settlement Agreement with PUC Staff, entered in PUC docket no. DE 15-459, and under what circumstances would such a recovery be sought?

**Response:**      NPT is not seeking any cost recovery through the Settlement Agreement and, in fact, the Settlement Agreement does not provide a mechanism for cost recovery. The Project is participant funded pursuant to a FERC-approved Transmission Service Agreement (“TSA”). Accordingly, all costs associated with the Project will be recovered from Hydro Renewable Energy, Inc. through the TSA, not from New Hampshire retail ratepayers. The Settlement Agreement acknowledges a possible, but unlikely, future change in the treatment of the AC portion of the Project under the ISO-NE tariff. However, ISO-NE has not identified a reliability need in its most recent 10 year forecast that would lead to such a change.

**EXP 1-91**      What criteria did NPT use to conclude that seeking a recovery under that Settlement Agreement is "currently remote"?

**Response:**      As noted in response to EXP 2-15, NPT is not seeking cost recovery through the Settlement Agreement and the Settlement Agreement does not provide a mechanism for cost recovery. However, because ISO-NE has not identified such a need for a reliability upgrade in its latest 10-year transmission forecast, NPT believes the likelihood of a future change in the treatment of the AC portion of the line is remote.

**EXP 1-92**      What mechanism will NPT utilize to "hold harmless New Hampshire retail electric customers" in the event of a FERC Order 1000 process as referenced on page 9 of the Settlement Agreement?

**Response:**      NPT has made a contractual and regulatory commitment in the Settlement Agreement to hold customers harmless and is bound by this contractual agreement.

**EXP 1-93**      What circumstances would give rise to a FERC Order 1000 process or other regional cost sharing mechanism?

**Response:**      The circumstances giving rise to an ISO-NE led "Order 1000 process" is spelled out in the ISO New England Transmission, Markets and Services Tariff, most particularly in Attachment K to the Tariff. FERC, in its orders approving the revisions to the Tariff to comply with Order 1000, recognized that the New England states could pursue their own process to solicit public policy transmission, but such a process falls outside the scope of the ISO-led process, and would not constitute regional cost allocation.

**EXP 1-94** Mr. Fortier testified that the Project includes several parcels of land already leased by NPT. Please state whether the lease expenditures are completely captured in the Project expenditures (i.e., the expenditures are presently "prefunded," or are these parcels that would otherwise be leased and not considered part of the NPT Project) and state the total value of the combined leases over the lifetime of the leases and the average annual lease expenditures.

**Response:** The Applicants object as to relevance inasmuch as the request is not reasonably calculated to elicit evidence that is admissible in this proceeding. Applicants further object to the extent that the request calls for the production of confidential information. *See* RSA 91-A:5, IV (exempting production of "confidential, commercial, or financial information" from the Public Right to Know Law). Notwithstanding the foregoing, the Applicants respond as follows:

Lease expenditures are completely captured in the Project expenditures and will be recovered through the Transmission Service Agreement. See response to CFP 1-17. For publicly available information regarding lease expenditures, please see the Petition filed by PSNH in PUC Docket No. 15-464.

In addition, as a point of clarification, the pre-filed testimony of Jerry Fortier has been adopted by Kenneth Bowes, whose testimony was provided as part of the Applicants' supplemental filing in February of 2016.



**EXP 1-95** Mr. Fortier testified that suppliers are few and worldwide and that NPT has solicited bids. Please state:

- (a) where each bidder is located;
- (b) whether bidders have U.S. plants that can supply converter station equipment;
- (c) where the converter station equipment will be manufactured; and
- (d) whether the converter station installation will require the manufacturer's own labor.

**Response:** The Applicants object to the question as it seeks information not relevant to the proceeding and therefore is not reasonably calculated to lead to the discovery of admissible evidence. The Applicants further object to the request as it seeks to obtain confidential information that is not discoverable. *See* RSA 91-A:5, IV (exempting production of “confidential, commercial, or financial information” from the Public Right to Know Law).

Notwithstanding the objection, the Applicants answer as follows:

As an initial matter, the Pre-Filed Testimony of Jerry Fortier has been adopted by Kenneth Bowes, whose testimony was provided as part of the Applicants’ supplemental filing in February of 2016.

The bidding process for the project is complete, with contracts awarded. The contract for the Franklin converter terminal was awarded on the basis of a joint bid submitted by ABB and MJ Electric. ABB will manufacture the bulk of the converter terminal elements at its plants in Sweden, but the insulated gate bipolar transistor (“IGBT”) valves will be manufactured in Switzerland. Certain materials that are not directly related to the HVDC electrical portion of the converter will be supplied domestically. This material includes but is not limited to building and internal systems (plumbing, electrical HVAC, etc.), foundations, steel support structures, conduit, copper wire, control cables, fence, batteries & chargers, aluminum conductors and connectors, 345 kV power circuit breakers, disconnect switches, etc.

The labor to install the Franklin converter terminal will come from three primary sources that include the local labor work force, technical supervision from the Swedish manufacturing facility and the ABB Engineering Facility in Raleigh, North Carolina. The selection of local labor is subject to the Project Labor Agreement. Please see the Applicants' Response to EXP 1-70 above for additional information regarding the PLA.

The majority of the labor to construct the converter will come from the local workforce and includes the following major construction activities:

- Site development materials
- Site work preparation and foundations
- Erection of equipment support structures
- Substation electrical construction
- Valve hall superstructure

- Building plumbing, electrical, mechanical and fire control systems
- Security systems
- HVDC electrical equipment installation and testing (under the supervision of ABB)
- Protection and Control systems installation (under the supervision of ABB)
- Commissioning support (under the supervision of ABB)

**EXP 1-96** Please state whether the costs of remediating environmental violations is part of the Project budget, and if it is not part of the Project budget, provide an itemization of the cost of remediating environmental violations.

**Response:** The Applicants do not anticipate that construction of the Project will result in environmental violations. The Project will be constructed in accordance with all environmental BMPs and will develop and follow compliance plans as outlined on Page 24 of the Application and on Pages 8, 11, 13-14 of John Kayser's Pre-Filed Testimony. Each contractor will be required to comply with all environmental laws and all certificate and permit conditions applicable to the Project. In the event that a violation occurs during construction of the Project, each contractor will also be responsible for the cost of remediating any damage resulting from a violation arising from their work. It is not, therefore, necessary for the Project budget to include any contingency for the cost of violations as any such costs would be borne by the contractors and would not become a project expense.

Moreover, the NPT Project management team and selected contractors have significant experience in constructing large transmission line projects of this nature while limiting potential environmental impacts. NPT will also carry pollution liability insurance, which will address the cost of potential releases of pollutants during construction.

**EXP 1-97** Please state to what extent the presence of the Project Labor Agreement (PLA) will affect your expectations of in-state versus out-of-state employment on the Project, and provide specific estimates of in-state employment without the PLA and with the PLA, by type of labor (occupation and budget expense area).

**Response:** The Applicants object to the question as it requires the Applicants to develop additional data that is not presently in the care, custody, or control of the Applicants. Moreover, the phrase "type of labor (occupation and budget expense area)" is vague and ambiguous.

Notwithstanding the objection, the Applicants' answer as follows:

The Project expects the PLA to have a significant effect on the hiring of local New Hampshire workers across the State and across a variety of job categories and skills. Please refer to the PLA, which details union versus non-union employment opportunities as well as the priority of hiring New Hampshire residents and businesses. Additionally, the PLA specifically identifies non-union job opportunities that are not subject to the agreement, including logging, landscaping, land clearing, maintenance and warranty work on equipment, training, testing, and equipment installation. Numerous "service vendors" providing such services as trash haulers, security, fuel delivery, and janitorial services, are also included in these non-union opportunities.

Please also see the Applicants' Response to EXP 1-70 above. The Project has not calculated specific estimates of in-state employment without the PLA and with the PLA, by type of labor by occupation and budget expense area. However, please refer to the Application: Volume 34, Appendix 43 - Cost Benefit and Local Economic Impact Analysis of the Proposed Northern Pass Transmission Project produced by London Economics.

**EXP 1-98** Mr. Quinlan testified that "NPT has also established a \$7.5 million North Country Jobs Creation Fund, and provided initial seed money in the amount of \$200,000. The fund is directed by local individuals and the money has been and will be spent toward important economic development and job creation opportunities in the region." Please provide an itemization of the fund's annual spending schedule to date and over the next 10 years, and describe the types of expenditures it will provide.

**Response:** The North Country Jobs Creation Fund provides funding to projects designed to facilitate job creation in New Hampshire's North Country. The Coös County Job Creation Association has been established to oversee the fund and is independently operated by a board of directors composed of local business leaders.

Northern Pass provided \$200,000 in seed money out of a total commitment of \$7.5 million. To date, the Association has made the following grants:

Greetings Jewelers, Berlin, NH

- A \$20,000 grant for purchase of desktop laser welder for jewelry repair business

Enriched Learning Center and ELC Outdoors, Berlin, NH

- A \$15,000 grant for two seasonal employees who, among other things, will be functioning as whitewater guides

Dancing Bear at River's Edge, Colebrook, NH

- A \$22,500 grant to Colebrook Hospitality Holdings, LLC, Colebrook, NH for exterior siding improvements to make facility more appealing to tourists

White Mountain Regional High School, Whitefield, NH

- A \$61,000 grant to be used to purchase a Construction Excavation Simulator Trainer (which can also be used for timbering) for the Career and Technical Education program

Tillotson Performance Polymers, Colebrook, NH

- A \$7,000 grant for purchase of package sealing equipment and materials, and will employ two new employees

Centennial View Childcare and Enhancement, LLC, Lancaster, NH

- A \$10,500 grant to fund expansion of daycare capacity to facilitate parent employment

**EXP 1-99** Mr. Bradstreet testified about design considerations in choosing routes to reach various substations and line transitions from overhead to underground and vice-versa, and noted that a number of "upgrades" to existing substations would be performed. Please state whether work on these has already begun, and whether these upgrades are necessary for the Project and if they are not in the Project's budget, please provide an itemization of the costs to date and to complete these upgrades.

**Response:** The necessary upgrades required for the Project are fully described in the Pre-Filed Testimony of Derrick Bradstreet at Pages 12 to 14. Work on the necessary upgrades has not yet begun. All upgrades required for the project are already contained within the Project budget.

**EXP 1-100** Please state whether there is a traffic detail budget that will be used to compensate police detail officers and/or private flag-persons for traffic control during construction of the Project, and if so, provide an itemization of said budget.

**Response:** All costs associated with traffic control operations are included in the overall Project budget and fall under the responsibility of the general contractor. The Project has not developed an itemized budget for police officer details and/or flag-persons for traffic control.

**EXP 1-101** The London Economics, Inc.'s ("LEI") report refers to gas infrastructure/gas price model and simulation results produced by RBAC. Please provide:

- (a) a description of the specific RBAC, Inc. model used; and
- (b) simulation results for the "GPCM/HH" and "GPCM/MS" scenarios, including input assumptions and exogenous variable values specified by LEI.

**Response:**

(a) RBAC is the developer of the Gas Pipeline Competition Model (GPCM), a network flow model of North American gas market. GPCM was created in 1997 and is now widely used by the natural gas industry. GPCM is based on a set of "nodes" and "arcs". Nodes represent production regions, pipeline zones and interconnections, storage facilities, delivery points, and customers or customer groups. The connections between these nodes are called arcs. Arcs represent transactions and flows, including supplier deliveries to pipelines, transportation across zones and from one zone to another, transfers of gas by one pipeline to another, and pipeline deliveries of gas to customers. Based on supply and transportation cost curves, consumption curves, and pipeline and storage tariffs, the model solves for the lowest-cost path from a given supply node to a given demand node. Given the buildup of supply and demand conditions, GPCM allows the user to project gas prices for various supply-area and market-area hubs. The model has been used by government agencies, consultancies, and industry participants such as gas pipeline companies. For additional detail, please see attached PDF file entitled "GPM Presentation 2014 .ppt."

(b) Please see Figure 65 of Section 10.6 for the forecasted delivered gas prices under both the GPCM/MS and LCOP/HH gas methods. The 2Q2015 version of the GPCM model was used to develop the GPCM forecasts. The underlying assumptions were:

LEI used the demand projections provided in the 2Q2015 GPCM data set for New England as a whole. This gas demand outlook incorporates a very slight decline of 0.1% on an annual average basis from 2015 through 2028.



**EXP 1-102** With respect to fuel prices, please state:

- (a) to what extent have the EIA Annual Energy Outlook forecast of fuel prices changed and to what do you attribute any such changes;
- (b) how will these changes affect the economic impact of the Project; and
- (c) in preparing forecasts for the various gas, oil, and coal prices using the Energy Information Administration's "Annual Energy Outlook 2015," please provide the data and estimating procedures used to develop regional delivered fuel price forecasts for the 2019-2029 period.

**Response:**

(a) LEI relied on data available as of the date of the LEI report. Specifically, LEI relied on EIA Annual Energy Outlook 2015. EIA is in the process of releasing AEO 2016, and as such LEI has not completed a thorough comparison at this time.

(b) Please see answer to (a) above.

(c) Please see Section 10.6 of the LEI Report for the estimating procedures of fuel prices and the numbers used in the modeling.

**EXP 1-103** In its report, LEI states on page 59 that, "Based on extensive research conducted by LEI on the presence of long term contracts in New England ... ." Please provide a detailed description of this research as it applies to the New England states, giving details of data collection methodology and statistical compilation used to derive the exposure figures given in this paragraph, and produce a copy of this research.

**Response:** LEI's research began with a state-by-state, plant-level inventory of long term contracts or self-supply arrangements (for example, for generation under regulated, cost of service). LEI relied on publicly available data, for example, FERC Electronic Quarterly Reports for suppliers with Market-Based Rate Authorization in New England and official press releases from state commissions regarding procurement on behalf of the consumers. We also cross-checked the primary research with data from third party data providers, such as SNL Energy. We then excluded those capacity or generation (that are under contract or self-supply) when calculating the capacity and energy market impacts for retail consumers. Please see Figure 69 and 70 in Section 11 Appendix D: Calculation for retail cost impact of the LEI Report).

**EXP 1-104** Regarding Ms. Frayer's testimony, please state:

- (a) what you assumed about additional energy capacity coming on-line between 10/16/15 and start of service for the Project, specifically, whether you made allowance for capacity provided by Champlain-Hudson Power Express, TDI-New England Clean Power Link, and projects of the Greenline Infrastructure Alliance (Vermont and Maine); and
- (b) what you assumed about existing capacity going off-line between October 16, 2016 and May, 2019, specifically, whether you made allowances for the lost capacity due to the shutdown of Vermont Yankee, Pilgrim, Brayton Point, Salem Harbor, Bridgeport Harbor, Norwalk Harbor, Mt. Tom, and potential shutdown of Millstone, any other NY nuclear plants, or any other fossil-fuel plants in the New England region.

**Response:**

(a) LEI included all capacity that had cleared FCA 9. LEI also added generic renewables and CCGTs in the Base Case and the Project Case, as shown in Figure 63 of Section 10.5 of the LEI Report. The generic new entry schedule varies between the Project Case and the Base Case. Please see the document titled "Input Assumptions for Generic New Entry" provided in response to EXP-2-1 (76) for a full list of generic resources that LEI added.

The generic new entry was added when it was required, either as a result of current RPS policies or based on projected FCM dynamics. Neither of TDI's transmission projects, nor the Green Line Alliance project, have cleared the FCM to date or received I.3.9 approval. As such these projects were not included in the Base Case or Project Case. If these projects were to be added into the modeling, LEI would need to revise the generic new entry profile. As such, the generic new entry can serve as a proxy for these projects as well.

(b) LEI included all announced retirements up to FCA 9. The retired plants include: Vermont Yankee in (2015); Salem Harbor (2015); Mt Tom (2014); Brayton Point (2017). LEI also modeled certain retirements in the longer term. Please see Figure 64 and Section 10.5 of the LEI Report for any retirements beyond FCA 9 and details about how these were determined.

**EXP 1-105** Please provide the underlying tax payment and likely employment training program expenditure amounts to permit a broader estimation of the local economic impact of the Project.

**Response:** Using an aggregated model, the estimated total property taxes paid by NPT to local, county and state government over the first 20 year of operation is estimated to be between \$564 million and \$692 million with an annual average of \$28.2 million to \$34.6 million. A 20 years schedule is also estimated. Please see Northern Pass Transmission Project - Estimated New Hampshire Property Tax Payments Report, Volume 34, Appendix 44, page 16, Figure 9.

Annual property tax payments for the first 20 years of operation were also estimated separately for local, county and state utility property taxes and can be found in the spreadsheets titled Local Depreciation Schedules, Summary Depreciation Schedules, and County Model in the SEC notebook provided. The annual averages are summarized here:

Estimated Annual Average NPT Property Taxes Paid over first 20 years of operation:

- Local: \$19 million to \$23 million
- County: \$3.5 million
- State Utility Property Tax: \$7.6 million

Please also see "State property tax payment.xlsx" uploaded to in response to EXP 1-106.

Employment training expenditures are likely to be made as part of the \$7.5 million North Country Jobs Creation Fund. The North Country Jobs Creation Fund will be allocated pursuant to plan to be developed by its Board of Directors. In addition, it is possible that employment training expenditures could be made as a result of initiatives supported by the \$200 million Forward New Hampshire Fund.

**EXP 1-106** Please provide the estimated property tax and income tax liabilities attributable to NPT at the state level.

**Response:** A table of the breakdown of federal and state income tax payment of the project by year has been provided in response to this request entitled “State income tax payment.xlsx.”

A table of the estimated NPT property taxes paid to the State of New Hampshire during the first 20 years of operation has been provided in response to this request entitled “State property tax payment.xlsx”

The estimated property taxes paid during construction to the State of New Hampshire are aggregated with local and county property taxes. See Pre-Filed Testimony of Dr. Shapiro, Page 4.

**EXP 1-107** Please provide the estimated costs for construction and operations/maintenance allocated to the ratepayers of each of the six New England states, including in any scenarios envisioned under the Settlement Agreement with PUC Staff entered in PUC docket no. DE 15459.

**Response:** NPT is not seeking cost recovery through the Settlement Agreement and the Settlement Agreement does not provide a mechanism for cost recovery. The Northern Pass Project is participant funded and NPT will recover its construction costs from Hydro Renewable Energy Inc., through a FERC-approved transmission service agreement. Therefore, there is no allocation of costs for construction or operations/maintenance relative to the Settlement Agreement in PUC Docket No. DE 15-459. Also, see the Applicants' Responses to EXP 1-90 and 1-108.

**EXP 1-108** Please provide a detailed disaggregation of costs to be borne by ratepayers and those to be paid by the owners of NPT and Hydro-Quebec.

**Response:** Please see the response to EXP 1-89.

**EXP 1-109** Ms. Frayer testified that, "NPT has developed more detailed information on local spending and direct hires." Please provide any documentation or assumptions with regard to the geographic location of labor and/or materials to be used on NPT.

**Response:** Please see the Applicants' Response to EXP 1-78 above and the document provided in response to that request.



**EXP 1-110** Please produce a copy of Ms. Shapiro's entire file, including the tax estimating spreadsheets of likely tax payments referred to in Ms. Shapiro's report.

**Response:** Please see the documents provided in response to this request.

**EXP 1-111** Please produce the latest tax impact estimates based on current Project estimates, incorporating known changes in local (town-level) expenditures, aggregated with county and state tax estimates to yield annual property tax payments by NPT for 2016 to the end-of-construction and from that point for an additional 20 years.

**Response:** The most recent property tax estimates were filed in the Application and were based on Project cost estimates provided by the Project team in October, 2016. Updated town by town Project cost information has not been provided. Please see the Pre-Filed Testimony of Dr. Shapiro, Page 4 for a discussion of estimated property taxes paid during construction, and the Application: Appendix 44, Page 16, for the estimated NPT aggregated property taxes paid over the first twenty years of operation. Please also see the spreadsheet provided in response question 1-105 above.

**EXP 1-112** Please produce a copy of Mr. Chalmers' entire file for work on the Project.

**Response:** Please see Mr. Chalmers' file provided in response to this request.

**EXP 1-113** Mr. Chalmers cites studies that show increased property values associated with industrial land-use and with parcels several hundred feet away from the Transmission Line. The stated basis for this includes: The possibility that new electrical service could be made available to unserved locations, the value of increased visibility or views created by clearing in the ROW, and new public access in the ROW for recreational purposes. Please state whether these factors were considered or estimated in any way for the NPT study, and if so, please provide specific line segments where these effects would be present and any estimated or approximate values of the magnitude of each of these effects.

**Response:** The New Hampshire-specific research initiatives presented in the Chalmers Study address residential property. No additional research was carried out in New Hampshire with respect to HVTL effects on industrial land use. Based on the professional literature, no additional research was warranted and it is Mr. Chalmers' opinion that the value of industrial real estate will be unaffected by the Project.

**EXP 1-114** Please produce an entire copy of Mr. Nichols' file for work on the Project.

**Response:** Please see Mr. Nichols' file materials provided in response to this request.

**EXP 1-115** In Section 4, pages 15-17, of the Nichols' Tourism Impact Report, Mr. Nichols offers information and conclusions based in part on "Tourism Industry Interviews." Please provide specific information regarding the number of participants in each of the four "listening sessions," their names and associated contact information, business or government affiliations, specific geographic business location in the State (address) if operating tourist-related businesses, and the dates of each session.

**Response:** Please see the documents provided in response to EXP 1-114.

**EXP 1-116** Please provide any notes, minutes, recordings, videos and transcripts, if available, of each of these sessions.

**Response:** Please see the documents provided in response to EXP 1-114.

**EXP 1-117** In its most recent Strategic Marketing Document, The New Hampshire Department of Travel and Tourism Development (DTTD) stresses the importance of strengthening "New Hampshire tourism brand identity" in sustaining and expanding the tourism industry in New Hampshire. One of the most important aspects the New Hampshire brand is the state's "scenic beauty" (see: <http://www.visitnh.gov/uploads/brand/brand-press-release.pdf>). Consumer tourism research by DTTD reinforces this focus, showing that the terms "Natural" and "Unmatched Scenery" are among the most attractive attributes for tourists visiting the state. Please explain how the development of the Project in the areas where the viewshed will be altered is consistent with the New Hampshire brand and the preservation of the state's most important tourism attributes.

**Response:** Mr. Nichols did not analyze specifically the impacts of altered viewsheds on New Hampshire's brand. He has concluded that the Northern Pass Project will not affect regional travel demand and that it will not have a measurable effect on New Hampshire's tourism industry. That conclusion is not inconsistent with New Hampshire's continuing efforts to brand itself as a scenic destination. As explained in the Nichols report (SEC Application: Appendix 45) and Pre-Filed Testimony, visitors choose New Hampshire as a destination point for many reasons, and the presence or absence of transmission lines does not, except conceivably for a very small number of people, drive the decision to choose to visit New Hampshire. Rather, as Mr. Nichols concludes in his Pre-Filed Testimony, "the positive attributes of a destination far outweigh any speculative adverse effects from transmission lines."



**EXP 1-118** Please state whether you analyzed if the Project will negatively affect the scenic attributes of any historic site, historic district, traditional cultural properties, tourist-related business, vacation homes or hiking, biking, snowmobiling or ATV trails, and cultural landscapes in its viewshed, and if so, please indicate the site, properties, businesses, homes and trails, or landscapes that may be affected.

**Response:** Yes. The Application includes substantial analysis of the potential visual effect of the Project.

The Visual Impact Assessment of the Northern Pass Project (“VIA”), SEC Appendix 17, identified and evaluated the potential visual impact on Scenic Resources within 3 miles of the project. The supplement of February 26, 2016 identified and evaluated scenic resources within 3-10 miles of the project area. For each scenic resource, the VIA provides an assessment of the visual effect the project might have on the resource, a description of mitigation measures that have been taken or are being proposed, and a summary of overall visual impact.

Scenic Resources include:

- Publicly accessible places that have been designated or recognized by municipal, regional, state, or national authorities for their scenic or recreation quality and are visited by the general public for the use, observation, enjoyment, and appreciation of their scenic or recreational qualities.
- Conservation lands or easements that have been recognized for their visual quality and are open to the public.
- Tourism destinations (e.g., lakes, ponds, rivers, parks, trails, recreation areas, inns, grand hotels, etc.) that are open to the public.
- Town and village centers with recognized visual quality.

For more information on what type of resources are identified as Scenic Resources, see Page M-8 of the VIA. The scenic resources are listed and identified on maps by Town in the VIA report.

Visual effects on historic resources are also evaluated in the Assessment of Historic Properties, October 2015, Appendix 18 of the SEC Application.

Mr. Nichols concluded that the Northern Pass Project will not affect regional travel demand and that it will not have a measurable effect on New Hampshire’s tourism industry. He did not analyze impacts to any specific business or resource.

**EXP 1-119** In Nichols' resume, he mentions prior statewide tourism-related analysis performed for the State of New Hampshire. Please detail the dates of any such work, work product(s) and persons and entities in NH for whom Nichols performed such work and produce a copy of all reports produced by Nichols in connection with such work.

**Response:** Please see the documents provided in response to this request.

**EXP 1-120** The tourism (Nichols) analysis submitted as a part of the Application states that there may be benefits from increased public access to power line rights-of-way (e.g., Nichols report, page 17, "Participants from the [sic] northern New Hampshire believe access to new right-of-way corridors would be beneficial to the hunting, ATV, snowmobile, and mountain bike communities.") Please provide the total number of miles and the number of miles of hiking trails, snowmobile trails and ATV trails now open to the public on: (a) existing transmission line rights-of way that are included as a part of the planned NPT rights-of-way that are owned by Eversource or its subsidiaries; and (b) existing transmission line rights-of-way that are included as a part of the planned NPT rights-of-way that are on property not owned by Eversource or its subsidiaries. Please document these public access trails by type of trail and line segment and provide all documents that describe, discuss or analyze how these benefits were determined.

**Response:** The Applicants object to the question as it requires the Applicants to develop additional data that is not presently in the care, custody, or control of the Applicants and is outside the scope of the Applicant's responsibilities in this docket. The Committee has already addressed similar requests for information not presently in the possession an Applicant and held that such information was not discoverable. See Application of Antrim Wind Energy, Order on Outstanding Motions, Docket 2012-01, p. 11-12 (August 22, 2012)(Denying a request for the Applicant to provide a residential analysis requested by an intervenor group, the Committee held that "[i]t is not necessary to require the Applicant to undertake additional study merely because an intervenor requests the study."). See also *id.* at 15 (Data requests that are "not for data . . . presently in the possession of the Applicant . . . are not true data requests. Rather, it is a claim that the information provided . . . is incomplete."). Without waiving the objection, the Applicants respond as follows:

The question makes reference to a statement attributed in the Nichols report to participants in the listening sessions that were done as part of the tourism assessment. The tourism assessment did not elicit information of the kind described in this question, nor has NPT developed such information. However, in the past, Eversource has worked with the NH Bureau of Trails to make certain of its rights of way available for the statewide snowmobile trail system. In addition, Eversource has agreed to make land available for the North Country Endurance Challenge to be held in Stewartstown on September 10, 2016. Finally, it should be noted that, as part of the Forward New Hampshire Plan, NPT has committed to make 5,000 acres in the North Country available for mixed uses.

**EXP 1-121** Please provide 3D CAD drawings of all structures associated with the NPT Application submitted to the SEC and/or DOE.

**Response:** Please see the 3D model Structure Library provided by Burns and McDonnell, which has been provided in response to this request. The Applicants did not use CAD files for the visual impact analysis.

**EXP 1-122** Please refer to M-4 of the VIA and explain how the descriptions of the distance zones were determined. In your response, please explain how it was determined the distance where the "full spectrum of color" became sufficiently "muted" to separate foreground from midground, and how you determined the distance at which background begins, *i.e.*, where it "will obliterate ... forms of individual elements." In your response, please explain how you determined that transmission structures and ROW clearing are not visible at distances greater than 3 miles.

**Response: Determination of Distance Zones.** The concept of distance zones is based upon United States Department of Agriculture ("USDA") Forest Service visual analysis criteria for forested landscapes. The criteria is based upon forest management practices and activities, such as timber harvesting and road construction, predominantly in the western forests of the United States where atmospheric viewing conditions (*i.e.*, humidity and haze) can be significantly different than the eastern part of the country.

The distinction between the different distance zones (*i.e.*, foreground, midground, background) is an expression of how the eye perceives objects at different distances. In the foreground the distinguishing characteristics are differences in surface textures and color. In the midground, the distinguishing characteristics are the forms, colors, and textures of individual objects and areas. In the background, textures become less obvious and colors have largely faded; larger patterns become the noticeable feature in the landscape.

The distance zones used in the VIA are based upon the Forest Service criteria, and have been adjusted to reflect field observations of existing transmission lines and other similar man-made objects. The distinction between the zones is not a hard and fast delineation; the differences are often subtle and reflect lighting conditions, weather patterns, atmospheric haze, time of day, and other variables. The 3-mile line distinction between midground/background corresponds to the distance where transmission structures start to become uniquely recognizable and atmospheric haze starts to soften or even obliterate surface textures.

This effect is illustrated on Page 4-1 of the VIA in a photograph taken from the North Overlook at Weeks State Park. The photograph also illustrates how colors in the visible landscape start to become somewhat muted at the three-mile mark, and how the muted color becomes even more noticeable with increasing distance.

Three miles is also the limit used in the Draft Environmental Impact Statement as the transition between Far Middleground (1.5 to 3.0 miles) and Near Background (3.0 to 5.0 miles).

**Visibility at Distances Greater than 3 Miles.** The VIA does not assert that "transmission structures and ROW clearing are not visible at distances greater than 3 miles." The VIA states "most transmission structures cease to be uniquely recognizable at distances greater than 3 miles." VIA at Page M-4. The VIA also notes that transmission lines seen at distances greater than 3 miles are recognizable only if they present a noticeable contrast in form or line. VIA at Page M-4. Atmospheric haze and distance will obliterate surface texture, details, and the form of

individual transmission structures in the background, making them much more difficult to recognize, unless they present an obvious contrast within the surrounding landscape.

**EXP 1-123** The average heights of various land covers are shown on page A-3 of the VIA. Please provide information about the distribution of cell heights for each of the land cover types, both as percentiles and a histogram. Also, please explain the average height for water in Subarea 6, and explain how you determined the average heights of land cover used for the viewshed mapping.

**Response:** The average heights were calculated by using zonal statistics where the zone raster was derived from the New Hampshire Land Cover layer and the value raster was the heights of vegetation determined by the difference between the DSM and DTM files. Heights were calculated for each of the 6 subareas in order to account for variations in environmental conditions, harvesting patterns, and other factors throughout the State. The mean height was used to assign a height for each specific land cover type. Distribution of heights were not derived or used in this process. This method was used for all the land cover types except for Developed, Transportation, Row Crops, Water, Disturbed Land, and Other Cleared land. The Developed Land cover type was assigned a 30 foot height as a general estimation of the building heights. Transportation, Water, Disturbed Land, and Other Cleared land cover types were all assigned heights of 0, as they represent features that are at ground level. Finally, Row Crops were assigned a height of 6 feet to reflect an average of the row crops. The following table summarizes the land cover heights not related to the zonal statistics:

Landcover ID	Land Cover Name	Assigned Height
110	Developed	30
140	Transportation	0
211	Row Crops	6
500	Water	0
710	Disturbed Land	0
790	Other Cleared	0

The Applicants did not calculate the distribution of heights within each land cover type. The height of Water for Subarea 6 in the chart on Page A-3 is an error; the height used for the viewshed data was 0.

**EXP 1-124** The New Hampshire Land Cover Data used to assign a height to potentially screening land cover appears to come from the 2001 assessment, which is based on Landsat data collected between 1990 and 1999. Please confirm. Please explain why the more current 2011 National Land Cover Data was not used.

**Response:** The New Hampshire Land Cover Data (“NHLCD”) was used because it was developed specifically for the state of New Hampshire and is focused primarily on forest and agricultural classifications. The National Land Cover Data covers the entire country, making the data less specific to the New Hampshire landscape and the data verification less accurate. The national data also focuses on changes in development patterns, rather than forested classifications that are prevalent in the state of New Hampshire.

The improved detail in the NHLCD over the national data is evident in the number of land cover classifications. In the state data, there are 23 land cover classifications, including 9 forest cover classifications that are specifically categorized based on the New Hampshire landscape. In the national data, there are a total of 16 classifications, with only 3 forest cover classifications. The forest cover classifications are based on a nation-wide forest classification system, and are not specific to New Hampshire.

In addition to the increased number of forest land cover classifications, the collection and verification of the NHLCD was based on a more intimate knowledge about the New Hampshire landscape. The state data was developed using 2,600 training sites (areas where the remote sensing data is verified for accuracy in the field) across the state. The training sites were selected and controlled by those with local knowledge of the New Hampshire landscape. We do not have information about the training sites used at a national level, but the data is more likely verified on a grid system evenly distributed across the country, rather than based on a local understanding of the state of New Hampshire.

The primary purpose of the NHLCD is to classify forestry and agriculture distribution in the state. This is ideal for our purposes, since the majority of the landscape in the 10-mile wide Project area is forested. The primary purpose of the National Land Cover Data is to reflect changes in development across the nation over time. Updates are made to the national data on a five-year cycle so changes in development patterns at a national scale can be tracked. New Hampshire is a slow-growth state, with minimal changes in development patterns over a 10-year period, particularly in the northern part of the state.

Forested land cover classifications generally do not change over a 10-20 year period. Forest classification is based on factors such as soil type, hydrography, slope, aspect, wildlife, and micro-climate. It is very likely that an undeveloped area classified as a “spruce/fir forest” in the 1990s would receive the same classification today, since the determining factors are highly unlikely to change over this period of time. Land cover data does not account for clear-cuts, which are likely the largest changes in forested areas of the state.

In selecting which dataset to use for the viewshed mapping beyond the extent of the InterMap Data, the choice was between the detail and accuracy of the NHLCD versus a more recent dataset that was less detailed and less specific to New Hampshire (the national data). We



determined a more accurate classification system was superior to the more recently collected data. This determination aligns with our work with wind power projects in the State of Maine, where the Maine State Land Cover Classification is the data utilized.

**EXP 1-125** Please explain how the VIA evaluates scenic resources for: user groups, user expectations, effect on continued use and enjoyment, and extent, nature and duration of public use. In your response, please identify any systematically collected data and how the accuracy of this data is evaluated.

**Response:** Our evaluation of scenic resources was based on information researched through governmental publications, guidebooks, resource websites, onsite fieldwork and photography, experience gained from preparing visual impact assessments over the past several decades, and professional judgment. See Section 8.2, VIA Page M-13. As is typical of these situations, there is very little visitor use data on the parks, trails, scenic byways, and other resources that were evaluated. What data exists was reviewed and utilized in the evaluation and presented in the VIA.

Unlike our experience with wind energy facilities, no attempt was made to interact with the public to determine use patterns or the public's reaction to the project. Wind projects tend to affect a localized viewing area (typically within ten miles of the project). The area of potential effect for Northern Pass extends for over 200 miles. Intercept surveys performed for wind energy facilities are typically done at the initiation of the project before it is widely known to the public; while respondents are open and usually willing to discuss their feelings about a particular project, their reactions are not colored by public discourse. Northern Pass is a much different situation, since it has been known about and heavily publicized for many years.

**User groups** provide an indication of the types of people and the motivation of those who currently use a resource. They are based on research of available publications, fieldwork at the scenic resource, and experience in similar situations. It is also based on professional judgment and a common sense understanding of public use. For example, on a Scenic Byway, one would expect the user groups to include those who are attracted to the byway for that specific experience, as well as typical highway motorists (including local residents and commercial traffic), and cyclists.

**User expectation** is a description and rating of people's expectation of visual quality when visiting the scenic resource. Ratings are based on our observations while visiting the resource and professional experience with similar VIAs in the Northeast.

**Effect on continued use and enjoyment** is an evaluation of how the Project might affect the way a scenic resource is currently used or the public's enjoyment of the resource. The descriptions and ratings are based on our understanding of how the scenic resource is presently being used, our experience with similar VIAs in the Northeast, and the limited research on the effects of energy facilities and other changes to the visual landscape on continued use and enjoyment.

**Extent, nature and duration of public use** is an evaluation of current use patterns for each scenic resource. The ratings are based on the Extent, Nature, and Duration of Public Use Form provided on Page M-15 of the VIA. Since quantitative use data are typically not available for public recreation areas, a qualitative approach was developed, based on accessibility to the resource, types of facilities, observations during field visits, and information in publications.

**EXP 1-126** Please confirm that it is T.J. DeWan & Associates' policy to select viewpoints representing "worst case" conditions for photosimulations. Please explain and describe what "worst case" means and how these viewpoints were selected.

**Response:** The viewpoints selected for the photosimulations used in the VIA typically represent "worst case" conditions. In the context of the VIA, TJD&A considers "worst case" to mean those publically accessible viewpoints where the project would be most visible (based upon viewshed modeling) and where the greatest amount of public use is expected (based upon field observation and published reports). See 6.1 Key Observation Points (KOPs) on Page M-10 of the VIA for more information.

**EXP 1-127** The original NPT Proposed Action (Alt. 2 in the US Department of Energy Environmental Impact Statement) used mostly lattice towers. The new plan submitted to the SEC mitigates the original Proposed Action either by replacing a large number of lattice towers with weathered steel "tubular" or monopole structures, or by undergrounding segments of the line. Please describe the selection process for changing some of the lattice towers to the monopole structures, as well as the selection process used to select the original underground sections (*i.e.*, North Hill Road in Stewartstown, Subarea 1), the additional sections of undergrounding through Subarea 3, and why other areas were not proposed for undergrounding (*e.g.*, through Concord, near the Deerfield Center Historic District, and Bethlehem). In your response, please provide any analysis or documentation that explains, describes or analyzes why the Applicants did not underground the entire Project, or use weathered steel monopole structures for the entire above ground route.

**Response:** The Applicants object to this question as it seeks information not relevant to the proceeding and therefore is not reasonably calculated to lead to the discovery of admissible evidence. RSA 162-H:7, V(b) requires the Applicant to "identify both the applicant's preferred choice and other alternatives it considers available for the site and configuration of each major part of the proposed facility and the reasons for the applicant's preferred choice." The Applicants have done that. See Application Section 301.03(h)(2). Other hypothetical alternatives are not subject to consideration under RSA 162-H:7 (application requirements for a certificate) or 162-H:16 (findings required for issuance of a certificate) and therefore are not relevant. See also *Decision Granting Certificate of Site and Facility with Conditions*, Application of Laidlaw Berlin BioPower, LLC, NH SEC Docket 2009-02 (Nov.8, 2010) at 36–40 (finding that RSA 162-H does not require the subcommittee to review all "available alternatives" and does not require consideration of every possible alternative).

Notwithstanding the objection, the Applicants answer as follows:

Weathering steel monopole structures are proposed at several locations to minimize visual impacts from significant scenic resources. The use of this structure type at specific locations was generally based on recommendations from Terrence J. DeWan & Associates ("TJD&A"). TJD&A identified and recommended sections of corridor for monopole structures by the scenic resource. The Applicants made a determination based on the recommended areas. See the table of scenic resources used to identify locations for weathering steel monopole structures. This table is confidential in nature and is being provided to Counsel for the Public only.

Weathering steel structures can reduce the contrast in color and form with the surrounding landscape. Monopole structures are also thinner than lattice structures (*i.e.*, they occupy a smaller horizontal field of view) so they will appear less dominant than lattice structures.

The Applicants also propose to use monopole structures at all major river and scenic byway crossings.

For the portion of the question that seeks information regarding the underground portions of the Project, please refer to the Applicants Response to EXP 1-12 above, Counsel for the Public's Data Request CFP 1-2, and the Applicants' Response to Municipal Group 2's Data Request MG2 1-23. Please see also the Applicants response to Conservation Law Foundation, Appalachian Mountain Club, New Hampshire Sierra Club, and Ammonoosuc Conservation Trust's Data Request NGO 1-1 with regard to undergrounding the Project.

Please see the Northern Pass Project Change Request and attachments being provided in response to this request.

**EXP 1-128** Page M-16 of the VIA states that one form of mitigation is "matching materials for relocated 115-kV structures and proposed transmission structures to minimize contrasts in color and texture and contribute to a sense of visual continuity within the corridor." With respect to this statement please explain:

- (a) Whether multiple types of structure materials located in close proximity to each other create visual dissonance; and
- (b) If multiple types of structure materials create visual dissonance, please describe and explain how the VIA considered and evaluated the Project's visual dissonance caused by using multiple types of structures located in close proximity to each other (*e.g.*, the galvanized transition structures and weathered steel monopole structures in the Route 145 Moose Path/Connecticut River Scenic Byways crossing, leaf-on and leaf-off simulations; the weathered steel monopole and galvanized lattice structures in the Route 110 Woodland Heritage Scenic Byway leaf-on and leaf-off simulations; the weathered steel monopole structures in The Rocks Estate simulation; and the existing wooden 115kv and distribution poles and proposed weathered steel structures in the Turtle Pond simulation), regardless of whether existing structures are owned by others.

**Response:** In locations where existing 115-kV transmission structures are relocated and/or replaced, the materials used will match that of the adjacent 320-kV DC or 345-kV AC transmission structures. For example, a relocated weathering steel 115-kV structure will be used next to a weathering steel 345-kV structure and a relocated galvanized steel 115-kV structure will be used next to a 345-kV galvanized steel structure. The new structures were selected to minimize the contrast in color and texture between transmission structures of different lines within the corridor.

There are three conditions in the existing corridor where different materials are proposed to be adjacent to one another: (1) areas where the 115-kV wooded structures will remain next to the proposed steel structures; (2) areas where distribution lines, which are typically wood, will remain next to the proposed steel structures; and (3) areas where there is a transition between galvanized and lattice structures. The transition points between metal types were selected to minimize visibility from scenic resources and publically accessible areas.

Visual dissonance between materials was not evaluated as a specific category in individual scenic resource visual impact assessments, but it was taken into consideration in the contrast in color and texture ratings under landscape compatibility (see the visual effect rating form on page M-14 of the VIA). In each of the referenced photosimulations, the presence of contrast was taken into consideration in rating of landscape compatibility.

**Explanation of conditions cited in the examples:**

- Route 145: All the transmission structures in view are weathering steel monopoles. In the photosimulation, the top of the transition station is galvanized steel, which is the

standard used for most of the materials in the transition station. The final design of the transition station will evaluate the choice of available materials and will take into account the potential for visual dissonance.

- Route 110: The photosimulation includes the point where galvanized steel lattice structures change to weathering steel monopole structures. This view will only be seen by westbound motorists, where it will be in at the edge of their field of vision for approximately 11 seconds. The VIA rated the overall visual impact of the project at this location as low-medium. Transitions from one type of structure to another are not frequently seen from public vantage points and scenic resources.
- The Rocks: As seen in the photosimulation, the existing 115-kV wooden H-frame structures will remain in place and will not be replaced with metal structures. The dark color of the weathering steel monopoles blend in with the mixed vegetation that lines the edge of the transmission corridor, which results in less color contrast than the existing wooden H-frame structures. The visual dissonance produced by the two different structure types and materials is offset by the viewing distance, the wooded backdrop, and the relative complexity of the surrounding landscape. The transition from weathering steel monopole structures to galvanized steel lattice structures occurs at a distance of approximately 1.3 miles from the viewpoint, at a point where the cleared transmission corridor is no longer visible.
- Turtle Pond: The existing transmission corridor is characterized by a certain amount of visual dissonance resulting from differences in structure types and materials. One 115-kV transmission line is supported by steel monopole structures; a second 115-kV line is supported by wooden H-frame structures; and a local distribution line is supported on wooden poles. The project will maintain the existing 115-kV line on steel monopoles. The second 115-kV line will be relocated on weathering steel monopoles, which will have the same material and color of the 345-kV line, which will be supported on H-frame structures.

**EXP 1-129** Please explain how the VIA evaluated the effect of conductor glare. Please provide any documents that find or conclude that glare is determined not to be a visual concern, and that conductors not treated for glare are equivalent to conductors treated to reduce glare.

**Response:** The VIA, Appendix 17, considered the color, form, line, and texture of the proposed conductors as an integral part of the assessment of potential visual impacts on scenic resources throughout the study area. (See VIA Methodology, Pages M-13 and 14)

The photosimulations that were prepared for the VIA and for the Supplement, Attachments 8 and 9, represent the conductors as they would appear under the lighting and atmospheric conditions shown in the photographs. Where existing conductors are visible (e.g., Weeks State Park, the Rocks Estate, Slim Baker Area), the conductors proposed for the project generally appear more prominently visible in the photosimulations due to their larger diameter and more reflective surface.

Based upon our observations of high-voltage transmission lines in the northeast, glare is a relatively infrequent occurrence, and is most noticeable during those times of the day when sunlight strikes the conductors at relatively low angles and reflects light back to the observer. It is most commonly seen in situations where there is a wooded backdrop that emphasizes the color contrast between dark and light. Under most situations, conductors will either appear as dark lines when they are backlit or in shade, or as light gray lines when they are lit from the front.

To the Applicants' knowledge, there are no documents that find or conclude that glare is determined not to be a visual concern, and that conductors not treated for glare are equivalent to conductors treated to reduce glare. The few references to glare from conductor reflectivity that we have found are from situations in the southwestern part of the US, which is characterized by much different atmospheric, vegetation, and topographic conditions that allow conductors to be visible at much greater distances than in the northeast.



**EXP 1-130** Please describe the selection process for both the 60 sites photographed to represent private property and the 28 viewpoints used for preparing photosimulations. In your response, please identify what procedures and criteria were used to make these selections and any oversight used to evaluate adequate coverage and assure that important sites or conditions were not overlooked.

**Response:** As an initial matter, Site 301.05(b)(7) requires an applicant for a Certificate of Site and Facility to include in its application "Photosimulations from representative key observation points, from other scenic resources for which the potential visual impacts are characterized as "high" pursuant to (6) above, and, to the extent feasible, from a sample of private property observation points within the area of potential visual impact, to illustrate the potential change in the landscape that would result from construction of the proposed facility and associated infrastructure, including land clearing and grading and road construction, and from any visible plume that would emanate from the proposed facility." (emphasis added) The NH SEC's rules, however, do not specify a process for selecting a "sample" of private property observation points. The rules, therefore, do not require an applicant to follow any particular process when selecting the "sample" of private property observation points. Importantly, as a general matter, the Applicants did not and do not have access to private property along the Project route, and therefore, could not access private property to generate photosimulations, but did attempt to reasonably approximate the view from private properties by producing photosimulations based on photos taken from vantage points immediately adjacent to private properties.

Moreover, RSA 162-H and the Committee's rules do not require an Applicant for a Certificate of Site and Facility to conduct an analysis of a project's potential visual impacts on private property. The rules only require an applicant to produce photosimulations from a sample of private property observation points. Indeed, the criteria for determining whether a project would have an unreasonable adverse effect are set forth in Site 301.14, which makes no mention of conducting an analysis of private property. The rules require the Committee to consider the impact of the Project on "scenic resources," which are clearly defined as those resources that possess a scenic quality where the "public has a legal right of access." See Site 102.45.

Attachment 8: Sample of Private Property Photosimulations was submitted to provide a sample of private property observation points within the area of potential visual impact to satisfy Site 301.05(b)(7).

The ten-mile viewshed mapping contained in Attachment 6: Viewshed Analysis was used to identify approximately 100 development sites within ten miles where the project may be visible. The underground sections of the project were not included in the data collection.

Property types identified included forested rural residential, open field rural residential, medium-density neighborhood development, and high-density development. Non-residential properties, such as cemeteries were also selected for the sample. Distances from the corridor ranged from properties immediately adjacent to the Project to properties located approximately 5 miles away. A range in topographic relationships between the Project and the residential properties were also selected from the various distances, including properties that were located above the

Project (viewer superior) and others properties that are located below the Project (viewer inferior).

Approximately 60 sites were visited and photographed by TJD&A staff in January 2016. The sampled sites were selected to provide candidate locations for photosimulations at the full range of viewing distances: immediate foreground (< 300 feet), foreground (300 feet to 0.5 mile), midground (0.5 mile to 3 miles), and background (>3 miles), and to provide a distribution of private properties along the corridor. As noted in Attachment 6, there are very few instances where the transmission structures and cleared corridor would be able to be detected at distances greater than five miles.

Photographs taken at each site were geo-located with a GPS unit, following the protocol established for the October 14, 1015 VIA. Fieldwork included photographing the existing landscape that may be affected by the project, plus taking photographs of representative features in the immediate vicinity to establish the context of the photosimulation. At many of the locations visited, it was apparent that there would be no project visibility due to intervening vegetation, even though the viewshed map indicated the possibility of views. Prior to taking the photograph, TJD&A staff drove the roads in the immediate vicinity (usually within 0.2 miles) to determine where the project might be most visible, and to ensure that important sites or conditions were not overlooked.

Of the 60 sites that were visited, 28 were selected to provide a representative sampling of the potential visual effect of the proposed transmission corridor. The Table of Private Property Photosimulations and the accompanying project map (Page 8-2 in Attachment 8) illustrate the geographic and distance zone ranges provided in this sample. The DISTANCE column is a horizontal measurement of the distance from the observation point to the closest visible transmission structure.

The selection process involved evaluating individual photographs to arrive at a representative sampling of images that would be suitable for photosimulations to illustrate potential changes in the landscape. Photographs were selected for a variety of reasons: image quality, representativeness (viewing distance, geographic area, viewer position), maximum number of structures visible, visibility of existing transmission corridor, ability to align with the computer model. In some instances, the private property photograph was selected because it also provided a view of a scenic resource or a historic resource.

Most of the photographs were taken from roadways or other publicly accessible locations in front of or near the private properties. No attempt was made to enter onto private properties to take the photographs. The photographs were designed to approximate the view from the private property, or to show the context of the property relative to the proposed project. In addition to the photographs used in the photosimulation, additional images are provided in Attachment 8 to give the reviewer a better sense of the landscape context in the immediate vicinity of the property.

**EXP 1-131** Please explain how the Extent, Nature and Duration of Public Use Form located on M-15 of the VIA was adapted for private use.

**Response:** The Applicants object to this question as the phrase “adapted for private use” is vague and ambiguous. Moreover, the Applicants object to the question as it requires the Applicants to develop additional data that is not presently in the care, custody, or control of the Applicants. RSA 162-H and the Committee's rules do not require an Applicant for a Certificate of Site and Facility to conduct an analysis of a project's potential visual impacts on private property. The criteria for determining whether a project would have an unreasonable adverse effect are set forth in Site 301.14, which makes no mention of conducting an analysis of private property. Indeed, the rules require the Committee to consider the impact of the Project on "scenic resources," which are clearly defined as those resources that possess a scenic quality where the "public has a legal right of access." See Site 102.45.

Notwithstanding these objections, the Applicants answer as follows:

The VIA did not evaluate visual impacts on private properties where the public does not have a legal right of access; therefore, the Extent, Nature and Duration of Public Use Form (found on page M-15 of the VIA) was not adapted for private use. The Public Use Form was developed in part to address the evaluation criteria at Site 301.05.(b)(6), which requires a characterization of the potential visual impacts on identified scenic resources. By definition public (Site 102.45) scenic resources are “resources to which the public has a legal right of access...” Information on private views would not provide useful information in making the determination required under Site 301.05.(b)(6).

**EXP 1-132** Please explain why the VIA did not include ratings for the 28 private property photosimulations on their Cultural Value (M-8), Visual Quality Evaluation Chart (M-9), Visual Effect Rating Form (M-14), or on an Extent, Nature and Duration of Public Use Form (M-15) that was adapted for private use.

**Response:** The Applicants object to the question as it requires the Applicants to develop additional data that is not presently in the care, custody, or control of the Applicants and is outside the scope of the Applicant's responsibilities in this docket. The Committee has already addressed similar requests for information not presently in the possession an Applicant and held that such information was not discoverable. See Application of Antrim Wind Energy, Order on Outstanding Motions, Docket 2012-01, p. 11-12 (August 22, 2012)(Denying a request for the Applicant to provide a residential analysis requested by an intervenor group, the Committee held that "[i]t is not necessary to require the Applicant to undertake additional study merely because an intervenor requests the study."). See also *id.* at 15 (Data requests that are "not for data . . . presently in the possession of the Applicant . . . are not true data requests. Rather, it is a claim that the information provided . . . is incomplete.").

Notwithstanding the objections, the Applicants respond as follows:

A sample of photosimulations from private properties was provided to satisfy Site 301.05(b)(7) of the SEC criteria. The Applicants have not conducted a visual impact analysis for these private properties as it is not required by the SEC Rules. Moreover, in most instances, the public does not have a legal right of access to private property. The VIA Methodology is designed to evaluate scenic resources, which by definition are available to the general public (Site 102.45).

**EXP 1-133** On page C-3 in reference to the transition stations, the VIA states: "Additional native landscaping will be installed where necessary to screen the views from public roadways." Please:

- (a) Produce the planting plan showing where native vegetation will be installed; and
- (b) Explain why additional native landscaping is not installed as screening at all locations where project elements will be visible from public roads, including all road crossings of the ROW.

**Response:** The Applicants object to the question as it requires the Applicants to develop additional data that is not presently in the care, custody, or control of the Applicants and is outside the scope of the Applicant's responsibilities in this docket. The Committee has already addressed similar requests for information not presently in the possession an Applicant and held that such information was not discoverable. See Application of Antrim Wind Energy, Order on Outstanding Motions, Docket 2012-01, p. 11-12 (August 22, 2012)(Denying a request for the Applicant to provide a residential analysis requested by an intervenor group, the Committee held that "[i]t is not necessary to require the Applicant to undertake additional study merely because an intervenor requests the study."). See also *id.* at 15 (Data requests that are "not for data . . . presently in the possession of the Applicant . . . are not true data requests. Rather, it is a claim that the information provided . . . is incomplete.").

Notwithstanding the objections, the Applicants respond as follows:

The Applicant has not prepared planting plans for the transition stations as part of the application. Planting plans for the transition stations will be prepared as part of the detail design phase of the project once final approval has been received. The selection of trees and shrubs for buffer plantings, as well as other potential landscape treatments (such as earth berms) at individual transition station locations will be based on specific site conditions to determine the optimum species composition. The site evaluation and planting plan will consider a number of factors:

- Soil conditions (presence of wetland, depth to bedrock, soil types).
- Visibility from public viewpoints.
- Abutting land uses.
- Sun/shade patterns.
- USDA Plant Hardiness Zones.
- Desirable height and spread.
- Maintenance access into the transition station and transmission line corridor.
- Security: allowing for surveillance at substations.
- Effectiveness of existing vegetation.
- Four-seasonal interest, plant form, color, and other aesthetic considerations.
- Wildlife habitat.

There are no locations where the visual impact from the proposed transition stations was determined to be unreasonable. Plantings and possible other landscape elements, however, will be installed where necessary to screen the transition station from public viewpoints, supplement

natural plant succession, or to restore areas disturbed by construction.

**TS 1. Old Canaan Road, Pittsburg.** The transition station will be located in a wooded area on the north side of Old Canaan Road in Pittsburg. The location was selected to avoid visual impacts to the Connecticut River and Route 3 (Connecticut River Scenic Byway). At its closest point, the security fencing will be approximately 200 feet from the edge of the Old Canaan Road right-of-way. According to preliminary engineering plans, approximately 60 feet of vegetation will be left between the road and the station. Northbound motorists on Old Canaan road may have a brief view of the transition station along the proposed access road. Landscaping may include native trees to screen views from the road. The landscape plan will include several site-specific considerations: the drainage swales that parallel both sides of the gravel access drive into the site, existing native vegetation that will be preserved, and sight distance on Old Canaan Road.

**TS 2. Route 3, Clarksville.** The second transition station will be located above a gravel pit on private forestland, approximately 800 feet east side of Route 3 (Connecticut River Scenic Byway) in Clarksville. The location was selected to avoid visual impacts to the Connecticut River and the Scenic Byway. No additional plantings are anticipated to screen the transition station.

**TS 3. Wiswell Road, Clarksville.** The third transition station will be located in a wooded area approximately 350 feet south of Wiswell Road (a local town road) in Clarksville, and 0.25 miles west of Route 145 (Connecticut River Scenic Byway and Moose Path Scenic Byway). The transition station, which is being proposed to avoid crossing the scenic byway, marks the start of a 7.5-mile underground section of the project. Motorists on Wiswell Road may have a brief southerly view of the transition station through the woods at the point where the transmission line crosses the road. Northbound motorists on Route 145 will have intermittent views of the top of the transition station through the breaks in the roadside vegetation for approximately 20 to 25 seconds. Southbound motorists may see the transition station for approximately 10 to 15 seconds. Mitigation measures may include evergreen plantings on the east side of the transition station to reinforce existing vegetation. The landscape plan will include several site-specific considerations: the design of the gravel access drive into the site, existing native vegetation that will be preserved, potential for earthen berms to elevate new plantings, and possible plantings on the west side of Route 145 to reinforce existing vegetation in the vicinity of the transition station. See pages 1-15 and 1-16. See photosimulation on Pages 1-20 to 1-23.

**TS 4. Heath Road, Stewartstown.** The fourth transition station will be located on the north side of Heath Road, in a clearing surrounded by forestland in Stewartstown. Heath Road is a local gravel road that is also a segment of the Cohos Trail. Motorists and hikers will have a brief view of the transition station through openings in the roadside vegetation. Mitigation measures may include evergreen plantings on the north side of Heath Road and the east side of Bear Rock Road to reinforce the existing vegetation. The landscape plan will include several site-specific considerations: the design of the gravel access drive into the site, drainage structures, fencing, and other components of the transition station infrastructure, and existing native vegetation.

**TS 5. Route 302, Bethlehem.** The transition station will be located on the north side of Route

302, approximately 40 feet from the edge of the highway. An existing one-story house will be removed to construct the transition station. Landscaping, in the form of native evergreen and deciduous trees, and densely branched shrubs will be used to screen the station. The landscape plan will include several site-specific considerations: a gravel access drive off Route 302 into the site, an existing highway pull-off on the west side of the site, an existing 115-kV transmission line and a local distribution lines crossing the highway, views from Baker Pond on the opposite side of the highway, and sight distance on the highway. The VIA determined that the overall visual impact of the project would be medium. See Pages 2-68 and 2-69 in the VIA.

**TS 6. Route 3, Bridgewater.** The last transition station will be located on the east side of Route 3 at the edge of an industrial area bounded by the highway and a railroad line. The northern half of the site is already cleared to accommodate an existing 115-kV transmission line; the southern half of the site is wooded with mature mixed vegetation. Vegetation adjacent to the highway south of the site will block views of the facility for northbound motorists up until they reach the site. Southbound motorists will see the station over a distance of approximately 0.2 miles in an area characterized by a power generating station, an existing substation, a railroad siding, and a parking area for trucks associated with the power plant. Final landscaping plans will include evergreen trees and other species to revegetate the area between the security fence surrounding the transition station and the tow of slope adjacent to Route 3. The landscape plan will include several site-specific considerations: northbound views from Route 3, an existing 115-kV transmission line crossing the highway, offsets from the proposed 345-kV transmission line heading south from the transition station, and sight distance on the highway.

Additional native landscaping is not being proposed as screening at all locations where project elements will be visible from public roads for several reasons. A) The Applicant does not own the underlying land in the majority of the road crossings. B) Installation and continued maintenance of plantings at road crossings would require landowner permission. C) In certain areas, plantings may not be compatible with the landowner's objectives for using the land. D) In most locations where the transmission line crosses a public road, the view is already open with little or no screening vegetation.

The VIA references certain areas where additional plantings would afford some degree of screening, if landowner permission was forthcoming. See the Applicants' Response to EXP 1-134 below.

**EXP 1-134** Site 301.08 (Criteria Relative to Findings of Unreasonable Adverse Effects) provides:

(a) In determining whether a proposed energy facility will have an unreasonable adverse effect on aesthetics, the committee shall consider:

8. The effectiveness of the best practical measures planned by the applicant to avoid, minimize, or mitigate unreasonable adverse effects on aesthetics.

There are general references to "plantings" throughout the VIA, but no planting plans are presented with the Application. Please explain how the effectiveness of mitigation can be evaluated, as required by Site 301.8, without planting plans showing the mitigation.

**Response:** The Applicants object to the question as it requires the Applicants to develop additional data that is not presently in the care, custody, or control of the Applicants and is outside the scope of the Applicant's responsibilities in this docket. The Committee has already addressed similar requests for information not presently in the possession of an Applicant and held that such information was not discoverable. See Application of Antrim Wind Energy, Order on Outstanding Motions, Docket 2012-01, p. 11-12 (August 22, 2012) (Denying a request for the Applicant to provide a residential analysis requested by an intervenor group, the Committee held that "[i]t is not necessary to require the Applicant to undertake additional study merely because an intervenor requests the study."). See also *id.* at 15 (Data requests that are "not for data . . . presently in the possession of the Applicant . . . are not true data requests. Rather, it is a claim that the information provided . . . is incomplete.").

Notwithstanding the objections, the Applicants answer as follows:

Site 301.08 does not address or relate to aesthetics. The Applicants assume, however, that this data request refers to Site 301.14(a)(7).

The visual impact assessments for scenic resources is based on an assumption that no additional planting will be provided, beyond what is shown in the photosimulations. The VIA concludes that the project will not have an unreasonable adverse effect on aesthetics as currently proposed. The VIA does, however, describe possible additional mitigation measures that could be taken in some specific areas (see listing below). However, since the Applicant does not own the land underlying the transmission corridor along the majority of the proposed route, additional planting for screening or other forms of mitigation would be subject to landowner permission. The Applicant will prepare such planting plans after the final design is identified and the Applicants receive the necessary permissions from landowners for plantings.

In those areas where the Applicant does own the underlying land, planting and grading plans will be prepared as part of the detail design phase of the project once final approval has been received.



The VIA lists plantings as possible mitigation measures at the locations listed below. However, in none of these locations was the visual impact from the proposed project determined to be unreasonable. Plantings would be installed (with landowner permission) in most areas to supplement natural plant succession or to restore areas disturbed by construction. If plantings were to be installed on private property, they would be installed with the permission of the landowner. The installation costs would be paid in full by the Applicant.

- **Route 3, Pittsburg.** Plantings to partially restore the landscape disturbed for the installation of the underground cable. As presently configured, the installation of the cable would require a clearing of approximately 25 feet. The 25-foot wide corridor will be mowed and no additional planting will be installed in the corridor. With landowner permission the remaining land outside of the 25-foot corridor visible from Route 3 would be planted with native species to accelerate the restoration process.
- **Washburn Family Forest, Clarksville.** Similar situation to Route 3.
- **Wiswell Road, Clarksville.** Similar situation to Route 3.
- **Route 145, Clarksville.** Plantings and other measures to partially screen the transition station on the west side of Route 145. Planting and grading plans will be prepared as part of the detail design phase of the project once final approval has been received, and may be subject to underlying landowner permission. Existing vegetation in the vicinity of the transition station will continue to grow and increase in screening value between now and the time of construction. Final planting plans will evaluate existing vegetation and provide reinforcement for screening as necessary.
- **Kauffmann Forest, Stark.** With underlying landowner permission, planting along the edge of Christine Lake Road at the point where the transmission line crosses the road. Plantings would consist of non-capable native species in informal groupings to screen the view down the corridor.
- **Route 3, Whitefield.** New plantings around the substation on the west side of Route 3 to compensate for the loss of the clipped pines that currently provide a partial visual screen for highway travellers. Final planting plans will consider clearance requirements of proposed transmission lines once final designs have been completed.
- **Pemigewasset River Crossing, New Hampton – Bridgewater.** With landowner permission, plant non-capable riparian species to accelerate the rate of natural landscape succession within the riparian zone.
- **Pemigewasset River Crossing, Bristol at Ayers Island.** Similar to the riparian plantings described for the Pemigewasset River Crossing at New Hampton – Bridgewater.
- **Northern Rail Trail, Franklin.** With underlying landowner permission, install non-capable planting around the Webster substation to further separate the trail from the project.

- **Merrimack River, Northfield.** Similar to the riparian plantings described for the Pemigewasset River Crossing at New Hampton – Bridgewater.
- **Canterbury Shaker Village Byway Crossing.** With landowner permission, install non-capable planting to screen views of the corridor and maintain continuity of roadside vegetation that defines the edge of the right-of-way at the intersections.
- **Suncook River, Pembroke.** Similar to the riparian plantings described for the Pemigewasset River Crossing at New Hampton – Bridgewater. The intent would also be to limit the easterly view of the project from within Bear Brook State Park and to replace the existing line of evergreens with non-capable species on the west side of Bachelder Road.

**EXP 1-135** On page M-16, the VIA states that "Many mitigation measures have been incorporated into the planning and design of the NPT project in order to avoid, minimize, rectify, reduce or eliminate potentially adverse visual impacts." This statement is further explained by several bulleted points, for instance:

Maintaining and/or restoring vegetation at road crossings, subject to underlying landowner permission, to minimize or screen the view down transmission corridors and concentrate viewer attention in the immediate foreground. Vegetation specified in the vicinity of the transmission line must be non-capable, i.e., it cannot be capable of achieving a height tall enough to interfere with the electrical conductors.

Please produce a copy of the referenced mitigation plans and designs, and state whether NPT believes that it is responsible for providing mitigation planting on its own property, and whether affected landowners are required to provide the area for mitigation planting, or the mitigation planting itself.

**Response:** Please see the Applicants' Response to EXP 1-133 and EXP 1-134 above.

**EXP 1-136** To address a comprehensive review of possible Project impacts on the human environment as specified in NEPA Section 102(C), please provide a list, including name, resource description and geographic coordinate locations of properties along the Project corridor where resources considered in the separate reports assessing cultural resources, recreation, socioeconomics, land use, wildlife, water, scenic, historic and natural resources and ecological communities overlap or occur in conjunction with one another, e.g. an area representing both conserved land and recreational land in the separate Land Use and Recreation technical reports.

**Response:** The Applicants object to this request (1) on the grounds that it calls for review, compilation or production of publicly available documents that could be obtained by the requesting party in a less burdensome manner, including on a public website, (2) inasmuch as it calls for analysis under federal law that is not relevant to this SEC proceeding, and (3) because it is vague and ambiguous. Notwithstanding these objections the Applicants answer as follows:

The Applicants address the resources identified in the request in many parts of the SEC application, including the separate state and federal permit applications. There are numerous parts of the SEC application that address various of these resources together, including by way of example the assessment of the Project's visual effects on certain historic resources in both the Historic Properties Assessment Report (Appendix 18) and the Visual Impact Assessment (Appendix 17). As another example, the state and federal wetlands applications (Appendices 2 and 3) also address multiple resource considerations. We have not produced and do not have a separate list of properties mentioned in the separate resource reports that may "overlap or occur in conjunction with one another."

**EXP 1-137** Please produce a copy of all documents relating to efforts by the Applicants to identify and address potential indirect adverse effects, beyond visual impacts, to large areas as identified in Appendix 18, districts, and/or multiple properties during and/or resulting from the Project, including but not limited to those related to blasting and drilling, reduced access, and reduced water quality.

**Response:** Appendix 18 provides NPT's assessment of eligibility and potential effects on historical resources. NPT has not completed the subsurface geotechnical surveys and analysis for the underground portion of the route, so the location and extent of any necessary blasting and drilling in bedrock is not known. How to account for such areas of bedrock in relation to the determination of eligibility of historic resources and assessment of effects is being addressed in the Section 106 process with NH DHR and DOE.

**EXP 1-138** Please produce the results of efforts to identify and document publicly and privately held lands subject to conservation easements, and describe methods used to evaluate potential Project impact on these properties restricted by conservation easements, including but not limited to methods used to assess their societal values for environmental, scenic, cultural, recreational purposes, and/or historic preservation.

**Response:** The Applicants object to the premise of the question as the readopted SEC rules do not require that conservation lands be addressed in the application as a separate type of land use. Rather, the potential effect on all land areas including all land uses must be assessed under the various SEC criteria. Accordingly, several parts of the SEC application include references to conservation lands, as does the 2015 report on Recreation, Conservation and Public Lands that has been provided in response to this request.

In its land use and environmental assessment, Northern Pass obtained information regarding New Hampshire conservation lands and public lands from a variety of sources, including GRANIT (as of August 2014) and various state, regional and local planning documents and websites. This information was considered by the land use experts as the Project was evaluated for consistency with local, state, and regional land use plans and patterns. Factors such as proximity of the project; overhead vs underground design; and existing uses and land use patterns were considered by land use experts in the evaluation of potential land use impacts. Natural resources, including wetlands, streams, vernal pools, rare, threatened and endangered species, natural communities, and wildlife; and cultural resources on conservation lands were identified, surveyed, and assessed in the same way as in all other locations, following state and federal protocols. Note also that the existing transmission ROW that will be used by Northern Pass predates any conservation restrictions that are now in place. Consequently, the holders of the conservation land acquired the land subject to the pre-existing transmission line easement and the right to construct new lines on the property.

In its cultural resources assessment, NPT's consultants applied a reasonable and good faith effort as directed by 36 CFR Section 800.4 (b) (1) to identify all listed or eligible properties that may be affected by the undertaking within the Area of Potential Effect, irrespective of type of ownership or land use restrictions. The results of this identification effort are set forth in the Historic Resources Assessment Report included as Appendix 18 of the SEC Application.

The Visual Impact Assessment of the Northern Pass Project (VIA), Appendix 17, identified scenic resources as publically accessible conservation areas that are recognized for their scenic quality. Conservation areas were identified through the review of the New Hampshire Conservation and Public Land layer, available through GRANIT (New Hampshire's statewide GIS clearing house). Resources were also identified and evaluated through research into government documents, websites, publications, and fieldwork. A list of all resources used in the VIA is available in Appendix C of the VIA. Scenic resources were assigned a Cultural Value rating of high, medium, or low, following the methodology presented on page M-8 of the VIA. Conservation areas with limited public access and conserved for reasons other than recreation or scenic qualities were rated lower than conservation areas with high visual quality and documented public use. Resources with a Cultural Value rating of at least a medium and

potential visibility based on viewshed mapping were further evaluated with an individual visual impact assessment. See the Methodology section of the VIA (pages M-1 to M-19) for a detailed description of the visual impact assessment process.

**EXP 1-139** Please provide a detailed list including the names, geographic coordinate locations, descriptions, and judgment of potential impact for all linear cultural resources identified by the Applicants including but not limited to scenic byways, walls, canals, irrigation ditches; and hiking, canoe, snowmobile, bicycle, ATV and ski trails.

**Response:** The linear resources assessed by Northern Pass are included in the Historic Properties Assessment Report, SEC Appendix 18.



**EXP 1-140** Please provide a list including name, geographic coordinate location and extent of cultural landscapes and their ascribed societal values as determined by the Applicants for all districts and large areas as identified in Appendix 18.

**Response:** The cultural landscapes identified and assessed by Northern Pass are included in the Historic Properties Assessment Report, SEC Appendix 18.

**EXP 1-141** Please identify, and produce all documents prepared by the professionals engaged in disciplines such as ethnography and cultural landscapes tasked with completing research on "traditional cultural properties" or "cultural landscapes," including a list of local informants, and any related findings to these two fields of study, including those required by the Memorandum of Understanding between the New Hampshire Division of Historical Resources and the Applicants dated December 4, 2015.

**Response:** Other than the consultants who prepared the Historic Properties Assessment Report (SEC Appendix 18), no other consultants have been retained yet. It is anticipated that additional consultants will be retained as the expected guidance on inventory method is produced by NHDHR and USDOE.

**EXP 1-142** Please identify the materials, dimension and geographic coordinate locations along the Proposed Route where walls, fences, or other field boundaries would be impacted to allow for construction staging and ongoing maintenance.

**Response:** There are stone walls on the Deerfield Substation site that the Project will be disturbing or removing in the vicinity of the expansion area and in some areas where temporary access is required. During the restoration phase, the Project will rebuild the walls that are outside of the final expansion area footprint. These walls will be restored in consultation with the NHDHR. At this stage of design, we do not know what, if any, other such impacts there might be.

**EXP 1-143** Please provide a detailed list with names, descriptions, and geographic coordinate locations for the resources identified as historically significant (National Register listed or eligible) and/or those identified as scenically/aesthetically important which are also cultural landscapes.

**Response:** As stated in the response to Data Request #65, the cultural landscapes identified and assessed by Northern Pass are included in the Historic Properties Assessment Report, SEC Appendix 18.

**EXP 1-144** Please provide a copy of all documents that evidence, describe or discuss the methods used to select the 16 properties listed for avoidance or mitigation in Section IV Part I of the Historic Resource Assessment and identify other properties among the 40 large areas and 144 multiple properties with comparable levels of potential impact that were not listed for avoidance or mitigation.

**Response:** There is some discussion in both the Historic Properties Assessment Report and the pre-filed testimony of Cheryl Widell of how efforts to minimize effects were decided. As stated on p. 18 of the Historic Properties Assessment Report (SEC Appendix 18) the historic resources consultants provided information about potentially affected resources and about the Project's potential effects, and discussed them with Project managers and engineers. There is no other specific documentation of the methods followed to select these 16 properties or identify others.

**EXP 1-145** Please provide a detailed list with names, descriptions, judgment of potential visual impact, and geographic coordinate locations of the 130 scenic resources as defined in Site 102.45 potentially possessing diverse community values and use that were designated under the category "Low Cultural Value" in Appendix 17, Visual Impact Assessment.

**Response:** All scenic resources that were evaluated as part of the Visual Impact Assessment (VIA) are listed on maps and tables provided for each town in the Study Area. Scenic Resources and their Scenic Significance ratings (high, medium, low) are identified in the Scenic Resource Table and located with points on the maps provided for each Town in the VIA. The Scenic Resources tables also provide a brief description of each of the resources. The scenic resources identified as "low" for cultural value were evaluated through research into government documents, websites, publications, and fieldwork, following the methodology presented on page M-8 of the VIA.

- EXP 1-146** Please provide native .shp or file-geodatabase GIS data (preferred) or georeferenced CAD (.dwg) files detailing the project components and resources listed below. All data should include information as to its source, date and method of acquisition, assumed or documented spatial accuracy and clear explanations of any codes or abbreviations utilized in attributes, labels or file naming. Data should include attribution whenever generated including but not limited to: feature type, feature descriptors, assessment results, resource information (for example- natural community classification, wetland type, stream ordinary-high-water measurements, stream bed conditions, etc). Note: data utilized or referenced that is available through publically accessible online download may be provided by reference through a listing of dataset title, dataset date, download provider source, complete hyperlink to data. Please provide:
- (a) all project base-mapping and existing conditions data. Components should include, but not be limited to: natural community boundaries, land cover, topography, aquatic resources (wetlands, streams, rivers, lakes, ponds, vernal pools, etc), existing infrastructure (buildings, public roads, driveways, private roads, trails), property boundaries, existing easements, utility corridors, etc.;
  - (b) all project components including, but not limited to: project route, clearing limits, underground routes & disturbance envelopes, directional boring setup sites & disturbance envelopes, laydown areas and access roads;
  - (c) the extent of all study area boundaries or survey points for any field evaluations conducted for rare, threatened and endangered species, wildlife habitats, wildlife species and aquatic resources (wetlands, streams, rivers, lakes, ponds, vernal pools, etc.);
  - (d) all rare, threatened or endangered (RTE) plant and animal species identified, evaluated, encountered or reviewed remotely or acquired from other sources;
  - (e) all rare, threatened or endangered (RTE) plant and animal species identified, evaluated, encountered or reviewed in the field;
  - (f) all wildlife habitats identified, evaluated, encountered or reviewed remotely or acquired from other sources;
  - (g) all wildlife habitats identified, evaluated, encountered or reviewed in the field;
  - (h) all wildlife species identified, observed, encountered and documented in the field;
  - (i) all aquatic resources including wetlands, streams, rivers, lakes, ponds, vernal pools, etc. identified, evaluated, encountered or reviewed remotely or acquired from other sources;
  - (j) all aquatic resources including wetlands, streams, rivers, lakes, ponds, vernal pools, etc. identified, evaluated, encountered or reviewed in the field;
  - (k) all unique or uncommon natural community or land features such as, but not limited to: cliffs, ledge outcrops, rich forests, talus fields, early

- succession forests, identified, evaluated, encountered or reviewed remotely or acquired from other sources; and
- (1) all field collected GPS data pertaining to RTE plant and animal species or habitats, wildlife species or habitats.

**Response:** The Applicants object to this request, including but not limited to subsections (d), (e), (k) and (l), to the extent it seeks confidential information regarding rare, threatened or endangered plant and animal species and/or information subject to a Data Sharing Agreement (“Agreement”) with the New Hampshire Natural Heritage Bureau (“NHB”). Pursuant to the Agreement, any requests to the Applicants by other parties for the data provided under the Agreement must be referred directly to NHB. A copy of the Agreement is being provided in response to this request.

Notwithstanding this objection, the Applicants will produce those confidential materials not subject to the NHB Data Sharing Agreement. This information will be provided directly to Counsel for the Public in response to this request. In addition, please see the GIS data provided in response to this request and the publicly available datasets at:  
[www.granit.unh.edu/data/downloadfreedata/downloaddata.html](http://www.granit.unh.edu/data/downloadfreedata/downloaddata.html).



**EXP 1-147** Please provide all electronic or paper field notes and photographs not already included above.

**Response:** The Applicants object to this request, including but not limited to subsections (d), (e), (k) and (l), to the extent it seeks confidential information regarding rare, threatened or endangered plant and animal species and/or information subject to a Data Sharing Agreement (“Agreement”) with the New Hampshire Natural Heritage Bureau (“NHB”). Pursuant to the Agreement, any requests to the Applicants by other parties for the data provided under the Agreement must be referred directly to NHB. A copy of the Agreement is being provided in response to EXP 1-146.

Notwithstanding this objection, the Applicants will produce those confidential materials that are not subject to the NHB Data Sharing Agreement. This information will be provided directly to Counsel for the Public in response to this request. In addition, please see the data sheets, field notes and photographs provided in response to this request.

**EXP 1-148** Please provide a list of all spatial or species distribution or habitat modeling exercises employed in the identification, analysis and impact assessment of RTE species, wildlife resources and aquatic resources. Please include lists of all model inputs and derivatives. Please include process schematics describing these modeling activities. Please provide spatial data for any model inputs and derivatives not included in other requests.

**Response:** The following information clarifies and supplements the description contained in the Application: Appendix 36 - Wildlife Report and Impact Analysis, regarding the Turtle Nesting Habitat model. The GIS-based turtle nesting habitat suitability model consisted of the intersection between well-drained soil types and open water features. Locations with soil types designated as well-drained, somewhat well-drained, and excessively well-drained within 1,000 meters of an open water feature in the existing Project area ROW, from Canterbury southwards, were considered suitable turtle nesting habitat. The soil data and the open water features data are publically available from GRANIT.

The RTE Plant Survey Desktop research, described in the Application: Appendix 35 - Rare, Threatened and Endangered Plants and Exemplary Natural Communities Report, included the compilation of maps and imagery along the Project corridor and obtaining information relative to known occurrences of rare plants and exemplary natural communities. A list of species (including animals as well as plants) to be considered for evaluation of environmental effects within the White Mountain National Forest (WMNF) was obtained from the USFS (Appendix A2 of the RTE report). Data were mapped using ESRI® ArcMap™ Version 10.0. A 0.5-mile study area was drawn on each side of the Project area (one mile wide total) to identify EO's of rare plants and exemplary natural communities most likely to occur within the proposed route. The following data, mapped at 1:24,000, were obtained from the publicly available NH GRANIT GIS library:

- Topographic maps (scanned and georeferenced digital raster graphic of USGS 7.5 minute quadrangles);
- Wetlands (USFWS's National Wetlands Inventory [NWI]);
- Soils (USDA Natural Resource Conservation Service [NRCS] Soil Survey Geographic [SSURGO] database);
- Surface waters (NH Hydrography Dataset developed by the USGS, USEPA, NHDES and University of New Hampshire [UNH] Complex Systems);
- Roads (New Hampshire Department of Transportation [NHDOT]);
- Political boundaries (USGS);
- Conservation lands (Society for the Protection of NH Forests, USFS, and other organizations);
- Wildlife habitat types (NH Fish & Game 2010 Wildlife Action Plan [NHWAP]);
- Regional aerial photography [1-meter resolution imagery from the 2009 National Agricultural Inventory Program (NAIP)]

Bedrock types (carbonate-bearing, calc-silicates, intermediate, and mafic) from (Bailey 2000) and USFS Ecological Land Types data for the WMNF (USFS 2008) were also mapped. Please see all the documents provided in response to this request.

**EXP 1-149** Please produce all correspondence with State and or Federal regulators related to natural resource assessments for RTE species and habitats and wildlife species and habitats.

**Response:** Please see the documents provided in response to this request.

**EXP 1-150** Please produce all reports prepared including environmental impact studies and assessments, wildlife or plant inventories, wetland and stream assessments, or the like, and produce all documents relied upon in formulating expressed opinions in said reports.

**Response:** All reports and permit applications with inventory, assessment and impact information have already been submitted with the SEC Application, including Appendix 31 - Wetlands, Rivers, Streams, and Vernal Pools Resource Report and Impact Analysis; Appendix 36 - Wildlife Report and Impact Assessment; Appendix 35 - Rare, Threatened, and Endangered Plants and Exemplary Natural Communities; Appendix 34 - Vegetation and Ecological Communities; Appendix 33 - Fisheries and Aquatic Invertebrates Resource Report and Impact Analysis; Appendix 32 - Natural Resource Mitigation Plan; Appendix 2 - Application for State of New Hampshire Department of Environmental Services Wetland Permit; Appendix 3 - Application for Department of the Army Permit US Army Corps of Engineers Section 404 and Section 10; and Appendix 47 - Wetland Permitting Plans Set. Documents relied upon for the development of those reports and applications include field notes and data sheets were provided in response to EXP3-02, subject to the Applicants' objection.

**EXP 1-151** Please provide a list of all botanists that performed RTE plant inventories on the project along with their resumes.

**Response:** The botanists that performed RTE plant inventories include Susan Hegarty, Dan Sperduto, Dennis Magee, and Erik Lema. Their resumes have been provided in response to this request.

**EXP 1-152** Please provide complete species lists of plant species documented during the RTE surveys.

**Response:** There is no comprehensive list of all plant species observed during botanical surveys. All threatened, endangered and watch list species observed in the project area are included in the Application: Appendix 35 - RTE Plant Report and are subject to the SEC's Order on Motion for Protective Order and Confidential Treatment. For that reason, the information requested is being provided directly to Counsel for the Public. Other plant species observed during the botanical surveys may be noted in the botanical field notes provided in response to EXP 1-147 above, subject to the Applicants' objection.

**EXP 1-153** Please provide all field notes and photographs related to the RTE plant species surveys.

**Response:** The Applicants object to this request to the extent it seeks confidential information regarding rare, threatened or endangered plant and animal species and/or information subject to a Data Sharing Agreement (“Agreement”) with the New Hampshire Natural Heritage Bureau (“NHB”). Pursuant to the Agreement, any requests to the Applicants by other parties for the data provided under the Agreement must be referred directly to NHB. A copy of the Agreement is being provided in response to EXP 1-146.

Notwithstanding this objection, the Applicants will produce the confidential materials that are not subject to the NHB Data Sharing Agreement. This information will be provided directly to Counsel for the Public in response to EXP 1-147.

**EXP 1-154** Please provide the dates that the RTE plant species surveys were performed.

**Response:** Please see the document provided in response to this request.



**EXP 1-155** Please provide the methodology used to conduct the RTE plant species surveys.

**Response:** Please see the Application: Appendix 35 - RTE Plants and Exemplary Natural Communities Report, which has the work plans appended, including the methodology included in Appendix B. The report was provided to Counsel for the Public on May 11, 2016.

**EXP 1-156** Please provide all correspondence with State or Federal agencies related to the RTE plant species surveys.

**Response:** Please see the document provided in response to EXP 1-149.

**EXP 1-157** Please provide all reports created pertaining to RTE plant inventories, and provide all documents relied upon in formulating opinions expressed in reports.

**Response:** Please see the Application: Appendix 35 - RTE Plants and Exemplary Natural Communities Report.

**EXP 1-158** Please provide a list of all wildlife biologists that performed inventories on the project along with their area of expertise and resumes. Please include specifics as to which inventories or surveys were conducted by which biologists.

**Response:** The list of wildlife biologists who performed inventories on the Project are listed below. Resumes for each of these biologists have been provided in response to this request. Resumes were not available for George Leoniak and Joseph LaRue. A Tracking Certification for Mr. LaRue has also been provided in response to this request. The qualifications for Mr. Leoniak may be found at [www.leoniaktracking.com/about\\_george\\_leoniak](http://www.leoniaktracking.com/about_george_leoniak).

Barnum, Sarah	Designed, coordinated, and supervised all studies; participated in field work for all studies, including all the general habitat assessments, species specific habitat surveys, and species specific surveys described in the Wildlife Report
Coolidge, Tracy	Bicknell's, general habitat assessment
Carbonneau, Lee	Snakes, nighthawk
Theriault, Joanne	Snakes, general habitat assessment, Bicknell's thrush
Leoniak, George	Tracking
Casto, Sean	Tracking
Lapierre, Laura	Tracking
Emlaw, Brian	Acoustic Bat Surveys
O'Brien, Jamie	Acoustic Bat Surveys
LaRue, Joseph	Tracking

**EXP 1-159** Please provide a list of all wildlife species encountered during those inventories. Also provide spatial location data of species encountered as available.

**Response:** A list of all species observed during wildlife-specific surveys has been provided in response to this request. Please note that this list also includes some incidental observations of wildlife made during wetland delineations, but may not include all incidental wildlife observations. The list is divided into observations made in the existing ROW and observations made in the new ROW. Spatial data was recorded for lynx and marten tracks and the locations of the bat detectors; that data has also been provided in response to this request.

**EXP 1-160** Please provide a summary of wildlife inventories or surveys including dates these inventories were conducted along with weather conditions.

**Response:** Please see the Application: Appendix 36 - Wildlife Report for the dates and weather for the bat surveys that were conducted. A list of the other wildlife surveys, with dates and weather information, has been provided in response to this request.

**EXP 1-161** Please provide the methodology used to conduct wildlife and wildlife habitat surveys by location.

**Response:** The Wildlife Report, Appendix 36 of the SEC Application, describes the methods used to conduct wildlife and wildlife habitat surveys by species or species group. These methods were used consistently for a given species or species group at all locations.

**EXP 1-162** Please provide all correspondence with State and Federal agencies related to the wildlife and wildlife habitat surveys.

**Response:** Please see the documents provided in response to EXP 1-149.



**EXP 1-163** Please provide all reports related to wildlife and wildlife habitat surveys, and provide all documents relied upon to formulate expressed opinions in said reports.

**Response:** All reports related to wildlife and wildlife habitat surveys are included in the SEC Application: Appendix 36 - Wildlife Report. Section 17 of the Wildlife Report includes citations to the literature relied upon in the Report.

**EXP 1-164** Please provide the methodology utilized to delineate and map deer winter areas (DWAs) not already mapped by NH Fish & Game.

**Response:** The one deer yard observed that was not previously mapped by NHFG was in Pittsburg, and it was delineated within the ROW through summer field observation of browse scarred vegetation and remaining winter pellet groups.

**EXP 1-165** Please provide the methodology utilized to determine white-tailed deer use within DWAs when field work could not be conducted.

**Response:** Use of a DWA by white-tailed deer was determined only in locations where field work was conducted. Field work was conducted at various times of the year, and deer use of DWAs was determined through field observation of vegetation scarred by historic browsing, or, when sufficient snow was present to induce deer to use DWAs, the presence of tracks, trails, and beds in the snow.

**EXP 1-166** Please provide the methodology utilized to delineate, map, and determine significance and use of beech stands by black bear, particularly outside of the existing project right-of-way.

**Response:** The use of beech stands by bear was estimated by visually observing the amount of bear-claw scarring on the bark of beech trees. These observations also considered the severity of beech bark disease, which can obscure bear scars. The results of these observations within the ROW are described in the SEC Application: Appendix 36 – Wildlife Report, Section 13.4.4. Assessments of bear use were not conducted outside the existing ROW, due to access restrictions, except as described in Sections 13.3.4 and 13.4.4.

**EXP 1-167** Please provide the methodology utilized to adjust Coos County DWA boundaries.

**Response:** The extent of the DWA in Pittsburg in the ROW was delineated based on field observations. All other Coos County DWA boundaries were provided by NHFG.

**EXP 1-168** Please provide methodology utilized to determine moose usage of moose concentration areas (MCAs) in areas where field work could not be conducted.

**Response:** The use of MCAs by moose was determined only in locations where field work was conducted by visually observing the amount of browse scarring on species preferentially browsed by moose in winter. The results of these observations within the ROW are described in the SEC Application: Appendix 36 – Wildlife Report, Section 13.4.3.

**EXP 1-169** Please provide the methodology for the survey of Forest Service Sensitive Species (FSS) wildlife in the WMNF, including any winter tracking exercises.

**Response:** The Applicants object to this question to the extent it seeks information not relevant to the proceeding and therefore not reasonably calculated to lead to the discovery of admissible evidence. RSA 162-H:7, V(b) requires the Applicant to “identify both the applicant's preferred choice and other alternatives it considers available for the site and configuration of each major part of the proposed facility and the reasons for the applicant's preferred choice.” The Applicants have done that. See Application Section 301.03(h)(2) . Other hypothetical alternatives are not subject to consideration under RSA 162-H:7 (application requirements for a certificate) or 162-H:16 (findings required for issuance of a certificate) and therefore are not relevant. See also *Decision Granting Certificate of Site and Facility with Conditions*, Application of Laidlaw Berlin BioPower, LLC, NH SEC Docket 2009-02 (Nov.8, 2010) at 36–40 (finding that RSA 162-H does not require the subcommittee to review all “available alternatives” and does not require consideration of every possible alternative). Notwithstanding this objection, the Applicants respond as follows:

The methodology and results for the FSS wildlife survey conducted on the WMNF portion of the ROW are described in the Application: Appendix 36 – Wildlife Report, Section 14.

**EXP 1-170** Please describe all efforts that were conducted to "investigate blasting effects," including specific locations and impacts, for the small-footed myotis (as directed by NHF&G, dated September 03, 2015).

**Response:** General potential blasting impacts to small-footed bats are described in the Application: Appendix 36 – Wildlife Report, Section 10.5.2. The locations where blasting will be needed during construction have not yet been determined, precluding an analysis of specific locations and impacts.



**EXP 1-171** On July 15, 2015, Lee Carbonneau stated that US Fish and Wildlife Service indicated that acoustic monitoring surveys would not need to be repeated prior to construction, "as NLEB populations are expected to continue declining in New Hampshire." Please state if this was confirmed with the USFWS and produce a copy of all documents evidencing such confirmation.

**Response:** This information was provided by Tony Tur of the USFWS in a meeting on July 23, 2013. The meeting notes are recorded as entry 61 in the agency correspondence documents provided in the SEC Application: Appendix 2 - NHDES wetlands application and Appendix 3 - USACE 404 application. Please also see the documents provided in response to EXP 1-148, 1-149, 1-156, and 1-162.

**EXP 1-172** On September 10, 2015, Lee Carbonneau stated that the acoustic monitoring data were being reviewed by an expert. Please provide:

- (a) who was the bat acoustic expert that evaluated all potential myotine bat calls;
- (b) please provide CVs and technical experience of all acoustic experts, including Sarah Barnum, Lauren Hooten, and Stephen Lindsay;
- (c) describe the training this acoustic expert has to distinguish calls within the genus *Myotis*; and
- (d) describe what criteria were used to distinguish calls within the genus *Myotis*.

**Response:** Please see the document provided in response to this request.

**EXP 1-173** Please provide data files for all myotone bat calls as isolated by Kaleidoscope Pro.

**Response:** Please see the document provided in response to this request.

**EXP 1-174** In the Wildlife Report Impact Assessment, Survey Results (Section 4.2) the Applicants cite Appendix E as a summary of the call analyst's evaluation. The Appendix E actually contains small-footed bat 2015 Survey Results. Please provide the call analyst's evaluation.

**Response:** Please see the document provided in response to this request.

**EXP 1-175** In the Mitigation Parcel Summary Sheets (Parcel B in Pittsburg, Parcel C in Clarksville), the Applicants indicate that the forest habitats will be managed to benefit northern myotis and other forest species. Please describe the specific actions NPT proposes to manage the forest resources and produce a copy of all documents that describe or discuss such actions.

**Response:** Management plans for the mitigation sites will be developed in consultation with NHF&G and the easement holders, and submitted to NHDES for approval.

**EXP 1-176** The Wildlife Report and Impact Analysis does not mention the little brown myotis and the big brown bat, both re-classified as Species of Greatest Conservation Need in the NH Wildlife Action Plan. Please describe what research was conducted or considerations made to minimize impact to these species, and produce a copy of all documents or reports from such research.

**Response:** Consideration of Species of Greatest Conservation Need (“SGCNs”) are not a requirement under any of the state and federal permits needed by NPT. In addition, no state or federal agency requested NPT to consider SGCNs. Therefore, the little brown myotis and big brown bat were not explicitly surveyed or considered in the Wildlife Report or in the impact analysis. Although more general in their habitat preferences than northern long-eared bats (“NLEBs”), both of these species do use forested habitats and tree roosts similar to NLEBs, and mitigation measures implemented to benefit NLEBs will benefit these two species also.

**EXP 1-177** Please describe what habitat suitability assessments were conducted within the WMNF with regard to the northern myotis, eastern small-footed myotis, and the tricolored bat as requested by the US Forest Service. If these assessments were not done, please explain why they were not done.

**Response:** The Applicants object to this question to the extent it seeks information not relevant to the proceeding and therefore not reasonably calculated to lead to the discovery of admissible evidence. RSA 162-H:7, V(b) requires the Applicant to “identify both the applicant's preferred choice and other alternatives it considers available for the site and configuration of each major part of the proposed facility and the reasons for the applicant's preferred choice.” The Applicants have done that. See Application Section 301.03(h)(2) . Other hypothetical alternatives are not subject to consideration under RSA 162-H:7 (application requirements for a certificate) or 162-H:16 (findings required for issuance of a certificate) and therefore are not relevant. See also *Decision Granting Certificate of Site and Facility with Conditions*, Application of Laidlaw Berlin BioPower, LLC, NH SEC Docket 2009-02 (Nov.8, 2010) at 36–40 (finding that RSA 162-H does not require the subcommittee to review all “available alternatives” and does not require consideration of every possible alternative). Notwithstanding this objection, the Applicants respond as follows:

The survey conducted on the WMNF portion of the ROW and results of the survey are described in the Application: Appendix 36 – Wildlife Report, Section 14, including the results of the habitat assessment for northern long-eared bat and tricolored bat. The results of the eastern small-footed bat habitat assessment were inadvertently omitted from the report. Roost sites for this species include rocky ridge tops and outcrops, cliff faces, buildings and bridges. None of these features are present in the WMNF portion of the Project, and the potential for this species to be present is low.

**EXP 1-178** Please provide more information about Kaleidoscope Pro, specifically which version was used and what the filter settings were used.

**Response:** The Kaleidoscope Pro version and settings used for the Northern Pass project are:

version=3.1.0

[classifier]

classifier=classifiers-Bats\_of\_North\_America\_3.1.0

roc=0

MYLE=1

MYLU=1

MYSE=1

MYSO=0

[analysis]

filter=1

keepnoise=1

freqmin0=8

freqmax0=120

durmin0=2

durmax0=500

mincalls=2

[noise]

enabled=0

period=60

min=0

max=0

mean=1

selcum=0

adjdb=0

selon=12

seloff=3



**EXP 1-179** Please clarify the total detector-nights of sampling conducted, total calls identified, percent of calls classified to species, and average calls per detector night — the methods are unclear as to the total sampling effort and no summary statistics were provided.

**Response:** The Applicants object to the question as it requires the Applicants to develop additional data that is not presently in the care, custody, or control of the Applicants. The Applicants' expert conducted bat surveys in conformance with the methods and approach outlined in the USFWS' 2015 Guidelines. Please see the Application: Appendix 36 - Wildlife Report and Impact Assessment, Appendix D and E for details regarding the bat surveys. The metrics identified in the request are not part of the USFWS reporting requirements and, therefore, these summary statistics were not calculated.

**EXP 1-180** Please state whether you ran an analysis of sampling date on myotine bat activity, and state when the vast majority of your myotine bat calls were collected. Also, please state what percent of your sampling effort was in August and what percent of your myotine bat activity was from August.

**Response:** Please see the Applicant's Response to EXP 1-34 above. These metrics are not part of the USFWS reporting requirements, therefore the Applicant's experts did not run an analysis of the sampling date on myotine bats and there is no information to calculate.

**EXP 1-181** Please clarify the three known hibernacula within 5 miles of the Project site:

- (a) Beebe River Mine in Campton contained northern myotis and tricolored bats;
- (b) Bristol Mine in Bristol contained abundant northern myotis and tricolored bats; and
- (c) Whether the North Woodstock Silver Mine in Woodstock contains bats.

**Response:** The location of bat hibernacula in NH is considered sensitive information and providing details would be a violation of our data sharing agreement with the NHNHB. Pursuant to the Agreement, any requests to the Applicants by other parties for the data provided under the Agreement must be referred directly to NHB. A copy of the Agreement is being provided in response to EXP 1-146. Caves were not specifically surveyed by Northern Pass as they are not within the project ROW. All hibernacula were considered sensitive, regardless of current hibernation use by bats of any species.

**EXP 1-182** Please describe any research that was conducted or considerations made to minimize impact to the Karner blue butterfly, and produce a copy of all documents or reports that evidence, describe, discuss or analyze all such research.

**Response:** The Applicants object to this request to the extent it seeks confidential information regarding a rare, threatened and endangered species and/or information subject to a Data Sharing Agreement (“Agreement”) with the New Hampshire Natural Heritage Bureau (“NHB”). Pursuant to the Agreement, any requests to the Applicants by other parties for the data provided under the Agreement must be referred directly to NHB. A copy of the Agreement is being provided in response to EXP 1-146.

Without waiving this objection, the Applicants respond as follows: the surveys of Karner blue butterflies (Kbb’s) and their habitat conducted for the project are described in the Application: Appendix 36 - Wildlife Report. The survey approach and level of effort were approved by the USFWS and NHFG. Impact minimization and mitigation are described in the Application: Appendix 35 - RTE Plants and Exemplary Natural Communities Report and in a confidential April 15, 2015 memo to USFWS and NHFG. In addition, impact minimization and avoidance is currently being negotiated as part of the permitting process. The Applicant expects that the final mitigation plan will include the conservation of additional habitat in the Concord pine barrens that can be managed for Kbb habitat. Negotiations for a suitable parcel are currently being conducted by Northern Pass and consultation with the agencies continues.

## James F. Palmer

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**From:** Timothy Whitehead <timothy@gearthblog.com>  
**Sent:** Friday, October 28, 2016 3:07 PM  
**To:** James F. Palmer  
**Cc:** frank@gearthblog.com  
**Subject:** Re: Contact Google Earth Blog [#6935]

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

Hi James,

Its complicated. Google Earth uses the World Geodetic System of 1984 (WGS84) datum the same as GPS. The accuracy of altitude data varies considerably by location. The alignment of imagery is also variable often being out of alignment by 30 metres or more.

However, when you are viewing a particular photo, the proportions are typically quite good and the ruler tools etc are quite accurate.

When in ground view then Field of View comes into play. By default it is 60 degrees, but changes when you go into Street View I believe it changes to 85 degrees.

Not sure if that answers your question.

Regards

Timothy Whitehead - writer  
Google Earth Blog

On 2016-10-28 07:10 PM, Wufoo wrote:

**Name** James Palmer

\*

**Email** [james@tjboyle.com](mailto:james@tjboyle.com)

\*

**Talk to us** \*

I am trying to find information about the accuracy of Google Earth, and the projection used for the ground view.

I am reviewing visual impact simulations prepared for a long electric transmission line in New Hampshire. A KMZ is created from a CAD file and loaded into Google Earth. Then a Google Earth ground view with the KMZ stick figures of the transmission structures is aligned to a photograph to be used to make a photosimulation. A screen shot of this alignment is used to guide scaling of a SketchUp rendered image of the actual transmission structures in Photoshop.

This is submitted as a professional product, with the application for this project. I am asked by New Hampshire to evaluate the quality of the simulations, but can find no current information about the accuracy and projection of Google Earth data. Can you help?