

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

DOCKET NO. 2010-01

**APPLICATION OF GROTON WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY**

**SECOND SUPPLEMENTAL PREFILED TESTIMONY OF
JOHN D. HECKLAU
ON BEHALF OF
GROTON WIND, LLC**

November 19, 2010

1 **Qualifications**

2 **Q. Please state your name, business address and qualifications.**

3 A. My name is John D. Hecklau. My business address is Environmental Design and
4 Research, P.C. ("edr"), 217 Montgomery Street, Suite 1000, Syracuse, New York 13202. My
5 qualifications are stated in my prefiled direct testimony that was submitted with the Groton
6 Wind, LLC Application filed on March 26, 2010 and have not changed since that time.

7 **Purpose of Testimony**

8 **Q. What is the purpose of your second supplemental prefiled testimony?**

9 A. The purpose of this testimony is to provide information regarding the visual
10 impacts of the alternative overhead power line that will run from the Project site to Route 25.

1 **Q. Have you conducted any supplemental visual studies since the preparation of**
2 **the Visual Impact Assessment (VIA) for the Groton Wind Project?**

3 A. Yes. At the request of Groton Wind LLC, the **edr** Companies conducted an
4 assessment of the visibility of an alternative overhead electrical line that is proposed to
5 connect the Groton Wind Power Project with the regional transmission grid. The line is
6 proposed to run through approximately 1.24 miles of forested private land before
7 intersecting with State Route 25 in the Town of Rumney. Once on Route 25, the line
8 would then be carried on over-built roadside poles that currently parallel the highway.
9 The section of overhead line running along Route 25 was not considered in **edr's**
10 evaluation because the visual impact of adding the proposed conductors to existing
11 roadside utility poles is assumed to have limited adverse visual impact. Therefore, the
12 focus of our evaluation was the 1.24 mile section of new alternative right-of-way (ROW)
13 that was proposed in the October 12, 2010 Supplemental Application from the Groton
14 Wind Project site to Route 25.

15 **Q. Please describe the proposed overhead line that was the subject of your evaluation.**

16 A. The overhead line between the Groton Wind Project site and Route 25 is currently
17 anticipated to include approximately 37 single wood pole structures on a 35-foot wide
18 cleared ROW. Approximately 10-12 of the poles would be on the current leased land for
19 the Groton Wind Project, and the remainder on two property easements. The poles would
20 carry a total of six conductors on two davit arms (three on each), and would range in
21 height from 34 to 42 feet above existing ground level. The taller poles would typically be
22 located at angle points in the line. The line has been sited to follow existing logging

1 roads/skid trails where possible, and will include multiple angles and shifts in orientation.
2 Although the forest being traversed by the line has been logged, a significant mixed
3 conifer/deciduous overstory still exists, with tree height averaging approximately 60 feet
4 on and adjacent to the proposed ROW. No permanent access roads or other man-made
5 features, beyond the wood poles, are proposed on the ROW.

6 **Q. Please describe the methodology used in the supplemental visibility assessment.**

7 A. To evaluate potential visibility of the proposed line, **edr** conducted a viewshed analysis
8 of the proposed overhead structures, and evaluated existing views of the proposed ROW
9 in the field on November 11, 2010. The viewshed analysis was prepared using USGS
10 digital elevation model (DEM) data (7.5 minute series), and ESRI ArcView Software
11 with the Spatial Analyst extension. The analysis was based on pole locations provided by
12 Groton Wind and the proposed pole heights described above. The ArcView program
13 defines the viewshed (using topography only) by reading every cell of the DEM data and
14 assigning a value based upon visibility from observation points throughout a one-mile
15 radius study area (the standard study area **edr** uses for utility line viewsheds). The results
16 of this analysis were then grouped by number of poles potentially visible. Four pole
17 count groups were defined to create an even distribution of poles within each group, and
18 to allow easy interpretation of the final map.

19 **Q. How many viewshed analyses were conducted?**

20 A. Three separate analyses were conducted. The first evaluated potential "worst case"
21 visibility within the one-mile radius study area based on the screening effects of
22 topography alone. The resulting topographic viewshed map defines the maximum area

1 from which any portion of any pole on the proposed overhead line could potentially be
2 seen within the study area.

3 **Q. Is this an accurate evaluation of where the proposed line will be visible?**

4 A. Because the line is proposed in a forested setting, this analysis greatly overstates potential
5 project visibility. However, it does accurately indicate where views of the project will
6 not be available under any circumstances (i.e., even if forest vegetation were cleared).

7 **Q. How was the effect of forest vegetation addressed in the analysis?**

8 A. The second two viewshed analyses conducted by **edr** factored in the screening effect of
9 forest vegetation as mapped by the USGS National Land Cover Dataset (NLCD). A base
10 vegetation layer was created using the USGS NLCD to identify the mapped location of
11 forest land (including the Deciduous Forest, Evergreen Forest, Mixed Forest and Woody
12 Wetland NLCD classifications). Because the project involves clearing an approximately
13 35-foot wide corridor through forest, the NLCD was modified to include this proposed
14 clearing. The forest layer was then assigned two alternate heights (40 feet and 60 feet)
15 and the viewshed analysis was rerun to illustrate potential project visibility taking into
16 account the screening provided by forest vegetation. The 40-foot tree height is the
17 standard height typically used in a vegetation viewshed analysis, while the 60-foot height
18 more accurately reflects the average height of trees on and adjacent to the proposed
19 ROW. After running the viewshed analysis with the modified NLCD forest layer, areas
20 covered by the forest vegetation layer were designated as “not visible” on the resulting
21 data layer. This reflects the fact that in most forested areas outward views will be well
22 screened by the overhead tree canopy.

1 **Q. Please describe the fieldwork you conducted.**

2 A. To verify the results of the viewshed analysis, I visited the site on November 11, 2010.
3 This field effort involved walking portions of the proposed ROW to verify average tree
4 height (through visual estimation), and driving the surrounding area to document open
5 views of the proposed ROW and line from representative viewpoints. All views were
6 documented with photos, and mapped using a hand-held global positioning system (GPS)
7 unit.

8 **Q. Please describe the results of the viewshed analysis.**

9 A. Viewshed results are presented in the figures and table attached to my Supplemental
10 Prefiled Testimony. The topographic viewshed analysis indicated that the overhead line
11 will be screened from view by topography alone in approximately 30% of the area within
12 a one-mile radius of the proposed line. Areas of topographic screening occur primarily
13 north of the line along Route 25, and to the south and west of the line on private forest
14 land. Thus, even without the screening afforded by vegetation and structures, views of
15 the proposed line would not be available from these locations. The vegetation viewshed
16 analyses illustrate the potential screening effect of forest vegetation. Assuming a
17 conservative 40-foot tree height, project visibility (i.e., visibility of portions of anywhere
18 from one to 13 poles) is predicted to be limited to approximately 6% of the one-mile
19 radius study area. Areas of potential visibility are concentrated along a segment of the
20 Route 25 corridor (primarily to the southeast of the line) and some open agricultural areas
21 to the northeast, across the Baker River. Publically accessible views in this area are
22 essentially limited to open viewpoints on Quincy Road. Increasing the assumed tree

1 height to a more accurate 60 feet reduces potential visibility to approximately 1% of the
2 one-mile radius study area. Areas of potential visibility occur in the same general areas
3 as indicated for the 40-foot analysis, although the areas covered and number of poles
4 potentially visible are substantially reduced (i.e., no more than three poles would ever be
5 visible). This reflects the fact that the proposed poles are generally lower than the
6 surrounding forest vegetation, and project visibility is essentially limited to vantage
7 points on Route 25 (that include the pole at the road intersection) or more distant views
8 oriented directly up the cleared ROW.

9 **Q. Please describe the results of your field investigation.**

10 A. Field review confirmed that forest vegetation directly adjacent to the proposed ROW will
11 limit foreground views of the proposed ROW and poles to a short section of Route 25.
12 Depending on the final extent of clearing at the intersection with Route 25, a small
13 portion of the ROW and one or more poles may be visible for less than 0.2 mile as one
14 approaches the line from the east (i.e., on Route 25 westbound). This is due to a presence
15 of an open field on the south side of Route 25 that may offer some open views of the end
16 of the line and screened views of poles through the trees that will remain along the edge
17 of the ROW. Views of the line from the west (i.e., from Route 25 eastbound) will be
18 limited to the immediate area where the ROW intersects with the highway. This is due to
19 occurrence of dense forest vegetation (a mix of conifers and deciduous trees) west of the
20 line.

21 **Q. Will more distant views of the line be available?**

1 A. Beyond the immediate vicinity of the line intersection with Route 25, the only publicly
2 accessible views of the line and/or cleared ROW will be from Quincy Road,
3 approximately 0.5-1.7 miles to the northeast. Open views toward the line were
4 documented from several locations along this road including Long View Farm, the
5 Plymouth Municipal Airport, and the intersection with Loon Lake Road. However, at the
6 distance of these viewpoints from the line, it will be extremely difficult to see the
7 proposed poles and conductors.

8 **Q. What is the basis for this conclusion?**

9 A. Due to the narrow profile of the poles and the fact that the poles and conductors will be at
10 or below tree level, they will be either screened from view, or if visible, will be viewed
11 against a forested backdrop. The poles will not be viewed against the sky, and their color
12 will blend with the adjacent forest vegetation. The irregular, curving orientation of the
13 ROW will be consistent with the existing topography, and will largely avoid the
14 appearance of an artificial, straight cut through the forest. If views of the project are
15 available from Quincy Road, they are anticipated to be limited to an irregular shadow line
16 in the existing forest vegetation where the ROW has been cut on the background hill.
17 Any visibility or visual impact of this clearing will be extremely minor.

18 **Q. Does this complete your testimony?**

19 A. Yes it does.

20

21

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November 16, 2010

Ms. Kristen Goland
Iberdrola Renewables, Inc.
1125 NW Couch Street
Portland, OR 97209

**RE: Supplemental Visibility Assessment – Proposed Overhead Electrical Line
Groton Wind Project
edr Project No. 09048**

Dear Kristen:

At the request of Groton Wind LLC, the **edr** Companies (**edr**) conducted an assessment of the visibility of an alternative overhead electrical line that is proposed to connect the Groton Wind Power Project with the regional transmission grid. The line is proposed to run through approximately 1.24 miles of forested private land before intersecting with State Route 25 in the Town of Rumney. Once on Route 25, the line would then be carried on over-built roadside poles that currently parallel the highway. The section of overhead line running along Route 25 is not being considered in this evaluation because the visual impact of adding the proposed conductors to existing roadside utility poles is assumed to have limited adverse visual impact. Therefore, the focus of our evaluation is the 1.24 mile section of new alternative right-of-way (ROW) that was proposed in the October 12, 2010 Supplemental Application from the Groton Wind Project site to Route 25 (see Figure 1).

PROJECT DESCRIPTION

The overhead line between the Groton Wind Project site and Route 25 is currently anticipated to include approximately 37 single wood pole structures on a 35-foot wide cleared ROW. Approximately 10-12 of the poles would be on the current leased land for the Groton Wind Project, and the remainder on two property easements. The poles would carry a total of six conductors on two davit arms (three on each), and would range in height from 34 to 42 feet above existing ground level. The taller poles would typically be located at angle points in the line. The line has been sited to follow existing logging roads/skid trails where possible, and will include multiple angles and shifts in orientation (see Figure 2). Although the forest being traversed by the line has been logged, a significant mixed conifer/deciduous overstory still exists, with tree height averaging approximately 60 feet on and adjacent to the proposed ROW (see Figure 3). No permanent access roads or other man-made features, beyond the wood poles, are proposed on the ROW.

METHODOLOGY

To evaluate potential visibility of the proposed line, **edr** conducted a viewshed analysis of the proposed overhead structures, and evaluated existing views of the proposed ROW in the field on November 11, 2010. The viewshed analysis

was prepared using USGS digital elevation model (DEM) data (7.5 minute series), and ESRI ArcView Software with the Spatial Analyst extension. The analysis was based on pole locations provided by Groton Wind (see Figure 2) and the proposed pole heights described above. The ArcView program defines the viewshed (using topography only) by reading every cell of the DEM data and assigning a value based upon visibility from observation points throughout a one-mile radius study area (the standard study area **edr** uses for utility line viewsheds). The results of this analysis were then grouped by number of poles potentially visible. Four pole count groups were defined to create an even distribution of poles within each group, and to allow easy interpretation of the final map. Three separate analyses were conducted. The first evaluated potential "worst case" visibility within the one-mile radius study area based on the screening effects of topography alone. The resulting topographic viewshed map defines the maximum area from which any portion of any pole on the proposed overhead line could potentially be seen within the study area. Because the line is proposed in a forested setting, this analysis greatly overstates potential project visibility. However, it does accurately indicate where views of the project will not be available under any circumstances (i.e., even if forest vegetation were cleared). The second two viewshed analyses conducted by **edr** factored in the screening effect of forest vegetation as mapped by the USGS National Land Cover Dataset (NLCD). A base vegetation layer was created using the USGS NLCD to identify the mapped location of forest land (including the Deciduous Forest, Evergreen Forest, Mixed Forest and Woody Wetland NLCD classifications). Because the project involves clearing an approximately 35-foot wide corridor through forest, the NLCD was modified to include this proposed clearing. The forest layer was then assigned two alternate heights (40 feet and 60 feet) and the viewshed analysis rerun to illustrate potential project visibility taking into account the screening provided by forest vegetation. The 40-foot tree height is the standard height typically used in a vegetation viewshed analysis, while the 60-foot height more accurately reflects the average height of trees on and adjacent to the proposed ROW. After running the viewshed analysis with the modified NLCD forest layer, areas covered by the forest vegetation layer were designated as "not visible" on the resulting data layer. This reflects the fact that in most forested areas outward views will be well screened by the overhead tree canopy. During the growing season the forest canopy will fully block views of the proposed poles, and such views will typically be significantly screened even under "leaf-off" conditions.

To verify the results of the viewshed analysis, an **edr** staff member visited the site on November 11, 2010. This field effort involved walking portions of the proposed ROW to verify average tree height (through visual estimation), and driving the surrounding area to document open views of the proposed ROW and line from representative viewpoints. All views were documented with photos, and mapped using a hand-held global positioning system (GPS) unit.

RESULTS

Viewshed results are presented in Figure 4 and Table 1. The topographic viewshed analysis indicated that the overhead line will be screened from view by topography alone in approximately 30% of the area within a one-mile radius of the proposed line. Areas of topographic screening occur primarily north of the line along Route 25, and to the south and west of the line on private forest land. Thus, even without the screening afforded by vegetation and structures, views of the proposed line would not be available from these locations. The vegetation viewshed analyses illustrate the potential screening effect of forest vegetation. Assuming a conservative 40-foot tree height, project visibility (i.e., visibility of portions of anywhere from one to 13 poles) is predicted to be limited to approximately 6% of the one-mile radius study area. Areas of potential visibility are concentrated along a segment of the Route 25 corridor (primarily to the southeast of the line) and some open agricultural areas to the northeast, across the Baker River. Publically accessible views in this

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Ms. Kristen Goland
Page 3

area are essentially limited to open viewpoints on Quincy Road. Increasing the assumed tree height to a more accurate 60 feet reduces potential visibility to approximately 1% of the one-mile radius study area. Areas of potential visibility occur in the same general areas as indicated for the 40-foot analysis, although the areas covered and number of poles potentially visible are substantially reduced (i.e., no more than three poles would ever be visible). This reflects the fact that the proposed poles are generally lower than the surrounding forest vegetation, and project visibility is essentially limited to vantage points on Route 25 (that include the pole at the road intersection) or more distant views oriented directly up the cleared ROW.

Field review confirmed that forest vegetation directly adjacent to the proposed ROW will limit foreground views of the proposed ROW and poles to a short section of Route 25 (see Figure 5). Depending on the final extent of clearing at the intersection with Route 25, a small portion of the ROW and one or more poles may be visible for less than 0.2 mile as one approaches the line from the east (i.e., on Route 25 westbound). This is due to a presence of an open field on the south side of Route 25 that may offer some open views of the end of the line and screened views of poles through the trees that will remain along the edge of the ROW. Views of the line from the west (i.e., from Route 25 eastbound) will be limited to the immediate area where the ROW intersects with the highway. This is due to occurrence of dense forest vegetation (a mix of conifers and deciduous trees) west of the line.

Beyond the immediate vicinity of the line intersection with Route 25, the only publically accessible views of the line and/or cleared ROW will be from Quincy Road, approximately 0.5-1.7 miles to the northeast. Open views toward the line were documented from several locations along this road including Long View Farm, the Plymouth Municipal Airport, and the intersection with Loon Lake Road. However, at the distance of these viewpoints from the line, it will be extremely difficult to see the proposed poles and conductors. This is due to the narrow profile of the poles and the fact that the poles and conductors will be at or below tree level. They will thus be either screened from view, or if visible, will be viewed against a forested backdrop. The poles will not be viewed against the sky, and their color will blend with the adjacent forest vegetation. The irregular, curving orientation of the ROW will be consistent with the existing topography, and will largely avoid the appearance of an artificial, straight cut through the forest. If views of the project are available from Quincy Road, they are anticipated to be limited to an irregular shadow line in the existing forest vegetation where the ROW has been cut on the background hill. Any visibility or visual impact of this clearing will be extremely minor.

Sincerely,
edr Environmental Services, LLC

John D. Hecklau
Executive Vice President

Table 1. Overhead Electrical Line Viewshed Summary - One Mile Study Area

Vegetation Viewshed 60 ft. Trees			Vegetation Viewshed 40 ft. Trees			Topographic Viewshed		
Pole Count	Visible Acres	Percent Visibility	Pole Count	Visible Acres	Percent Visibility	Pole Count	Visible Acres	Percent Visibility
0	3450.13	98.72	0	3298.33	94.38	0	1057.07	30.25
1	43.54	1.25	1 - 3	111.98	3.20	1 - 6	640.5	18.33
2	0.96	0.03	4 - 6	21.34	0.61	7 - 13	723.06	20.69
3	0.25	0.01	7 - 9	39.76	1.14	14 - 19	311.39	8.91
			10 - 13	23.35	0.67	20 - 37	762.74	21.83



Groton Wind Project

Town of Groton - Grafton County, New Hampshire

Figure 1: Location Map

November 2010

Notes:

Base Map: 2009 NAIP Orthoimagery.

- Proposed Wind Turbine
- Proposed Overhead Electrical Line
- ▭ 1 Mile Buffer of Proposed Overhead Electrical Line





Groton Wind Project

Town of Groton - Grafton County, New Hampshire

Figure 2: Proposed Overhead Line Route

November 2010

Notes:

Base Map: 2009 NAIP Orthoimagery.

- Pole
- Right of Way (35 ft.)



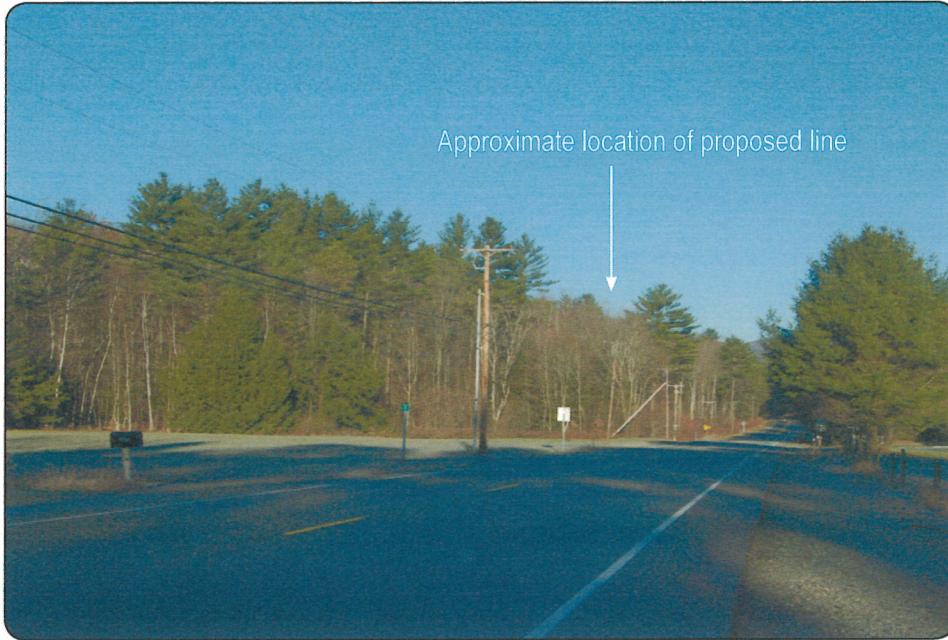


PHOTO 01:

Vegetation immediately east of proposed intersection of ROW and Route 25.



PHOTO 02:

Vegetation on proposed ROW south of Route 25.

Groton Wind Project

Town of Groton - Groton County, New Hampshire

Figure 3: Existing Vegetation Conditions

November 2010



PHOTO 03:

Vegetation on proposed ROW at intersection with Route 25.



PHOTO 04:

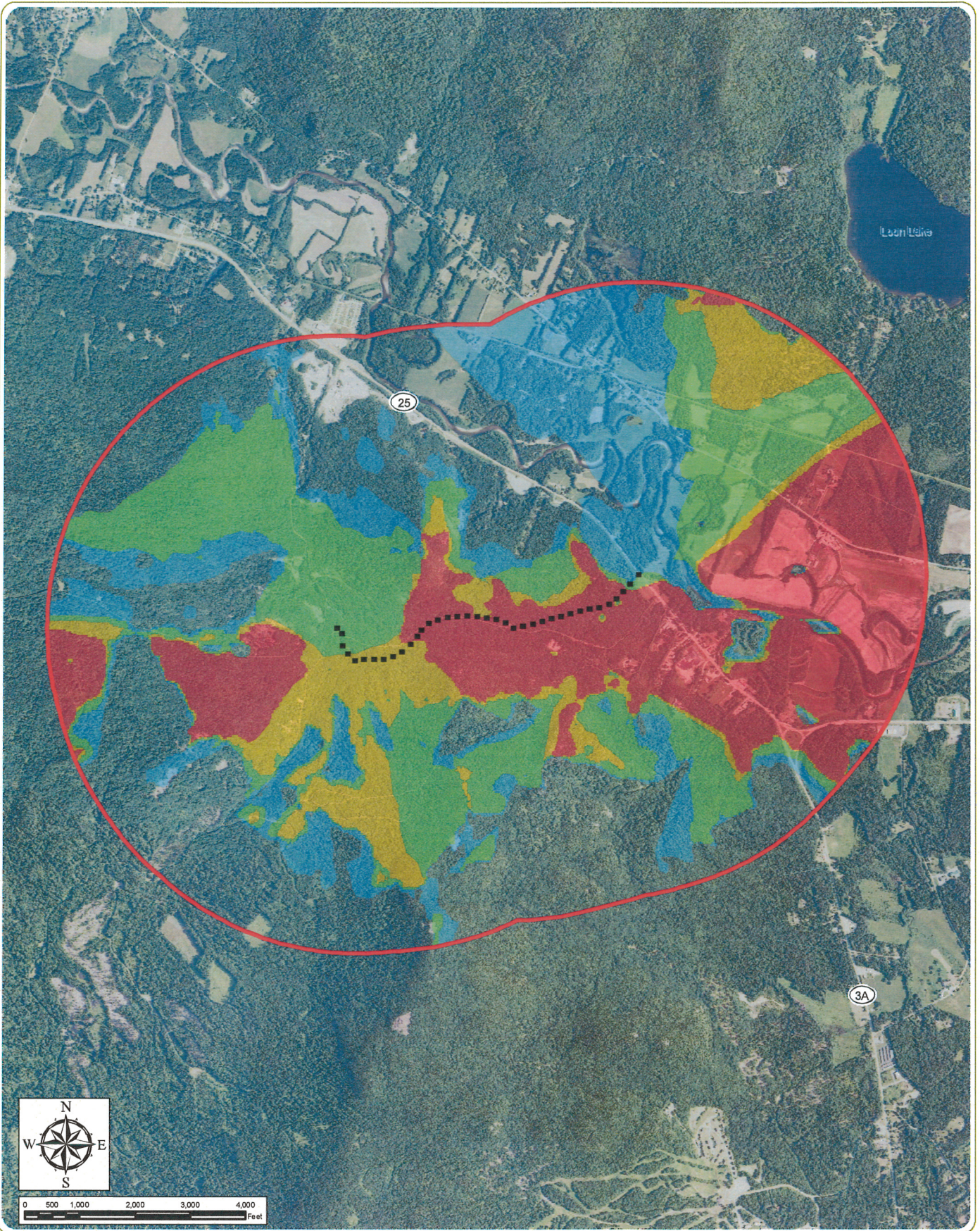
Vegetation immediately west of proposed intersection of ROW and Route 25.

Groton Wind Project

Town of Groton - Groton County, New Hampshire

Figure 3: Existing Vegetation Conditions

November 2010



Groton Wind Project

Town of Groton - Grafton County, New Hampshire

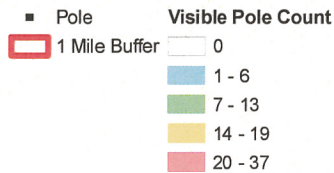
Figure 4: Viewshed Analysis

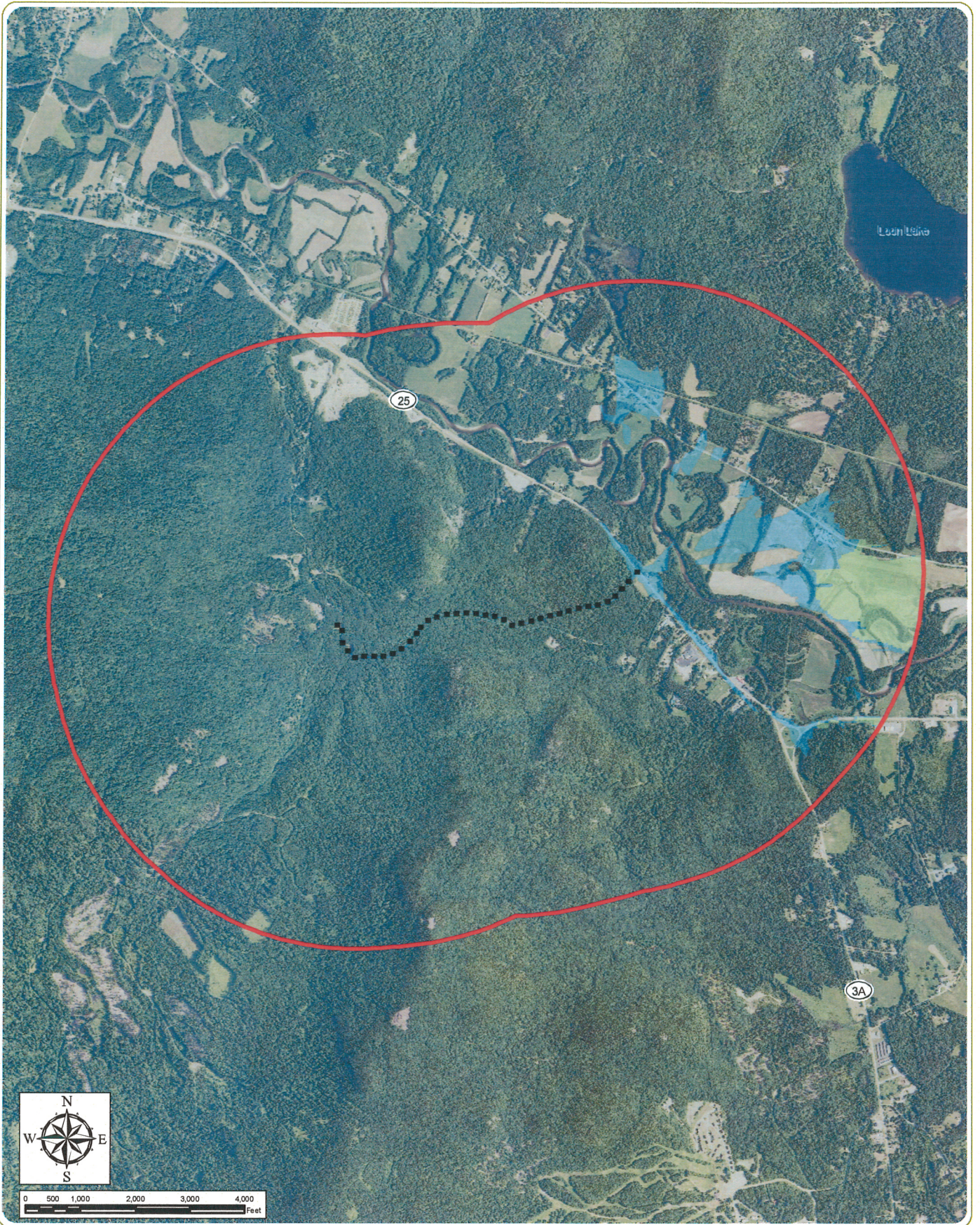
Sheet 1 of 3 - Topography Only

November 15, 2010

Notes:

Base Map: 2009 NAIP Orthoimagery.





Groton Wind Project

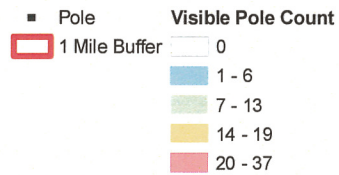
Town of Groton - Grafton County, New Hampshire

Figure 4: Viewshed Analysis
Sheet 2 of 3 - Vegetation, 40 ft. Trees

November 15, 2010

Notes:

Base Map: 2009 NAIP Orthoimagery.





Groton Wind Project

Town of Groton - Grafton County, New Hampshire

Figure 4: Viewshed Analysis
Sheet 3 of 3 - Vegetation, 60 ft. Trees

November 15, 2010

Notes:

Base Map: 2009 NAIP Orthoimagery.

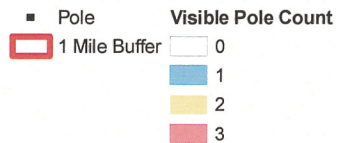




PHOTO 05:

View from Route 25 westbound.



PHOTO 06:

View from Route 25 eastbound.

Groton Wind Project

Town of Groton - Groton County, New Hampshire

Figure 5: Open Views of Proposed Line/ROW

November 2010



PHOTO 07:

View from Long View Farm on Quincy Road.

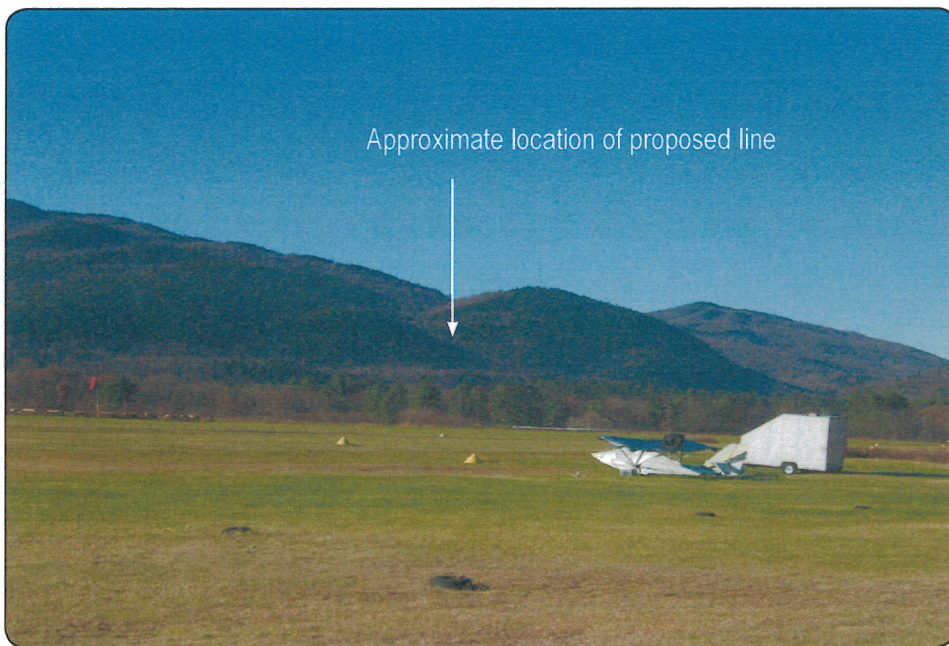


PHOTO 08:

View from Plymouth Municipal Airport.

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Town of Groton - Groton County, New Hampshire

Figure 5: Open Views of Proposed Line/ROW

November 2010