STATE OF NEW HAMPSHIRE

BEFORE THE SITE EVALUATION COMMITTEE

Docket No. SEC 2015 - 02

APPLICATION OF ANTRIM WIND ENERGY, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF DAVID RAPHAEL ON BEHALF OF ANTRIM WIND ENERGY, LLC

September 10, 2015

Q. Please state your name, title and business address.

A: My name is David Raphael, and I am a Professional Landscape Architect and Planner as well as Lecturer in the School of Natural Resources at the University of Vermont. I am the Principal and owner of LandWorks, a multi-disciplinary planning, design, and communications firm based in Middlebury, Vermont. My business address is 228 Maple Street, Suite 32, Middlebury, Vermont 05753.

Q. Briefly summarize your educational background and work experience.

A: I began my career as a landscape architect and planner working for the State of Massachusetts Department of Environmental Management. I have been associated with LandWorks since its inception in 1986. LandWorks serves both public and private sector clients in Vermont and the Northeast. Our areas of expertise include visual, aesthetic and environmental assessment, site and master planning, graphic communications and GIS mapping, permit planning, participatory and community planning, downtown revitalization, open space and conservation planning, zoning ordinance and design review development, landscape architecture and environmental design. At LandWorks we have worked as advocates for communities, appellants, the State of Vermont and private corporations. I personally have testified before most of the District Commissions in Vermont and the former Environmental Board, as well as the Public Service Board.

LandWorks has extensive experience with regard to visual assessment and environmental impact, as well as the design and installation of utility facilities and structures. We have been a consultant in this capacity for the Vermont Department of Public Service as well as the Maine Department of Environmental Protection. We have evaluated the aesthetic and environmental

impact of transmission lines and corridors; transmission structures; telecommunication facilities; solar farms; biomass facilities; hydropower; and, wind energy development (several in Vermont and Maine). We have prepared feasibility studies for wind energy facility siting for the Lamoille County Development Commission. LandWorks has provided visual assessments for a number of utility scale wind power projects now in operation in Vermont and Maine.

Additional detail regarding my education, background and experience is contained in my curriculum vitae, which is attached hereto as Attachment DR-1.

Q. Have you ever testified before the New Hampshire Site Evaluation Committee ("SEC")?

A. Yes. I testified before the SEC in Docket 2014-05 relative to the SEC's jurisdiction over this Project. I have also testified many times in other state forums and before public utility and land use commissions regarding visual impact assessments.

Q. What is your role in relation to the Antrim Wind Project and AWE's application for a certificate of site and facility (the "Application")?

A. AWE retained LandWorks to conduct a visual assessment of the Antrim Wind Project (the "Project").

Q. What is the purpose of your testimony?

A. My testimony addresses the potential visual effect of the Project and summarizes the Visual Assessment ("VA") prepared by LandWorks, attached as Appendix 9A to AWE's Application.

Q. Please provide a description of the Project proposed by AWE in its Application.

A. The Antrim Wind Project is proposed to include 9 Siemens SWT-3.2-113 turbines, capable of generating up to 28.8 megawatts (MW) of electricity. The turbines will be located in the Town of Antrim, Hillsborough County, New Hampshire, on the Tuttle Hill ridgeline spanning southwestward to the northeastern slope of Willard Mountain. The turbine rotors and towers will be a light or white color, which is recommended by the FAA to provide the maximum daytime visibility for pilots in the air. Turbines 1 through 8 will have a hub height of 92.5 m (303.5 feet), a rotor diameter of 113 m (370.7 feet), with a maximum height of 149 meters (488.8 feet) to the tip of the blade when in an upright, vertical position. Turbine 9, on the northeastern slope of Willard Mountain, will have a hub height of 79.5 m (260.8 feet), a rotor diameter of 113 m (370.7 feet), with a maximum height of 149 meters (446.2 feet). In addition to the turbines, the Project will require the construction of an access road, an electrical substation, collector lines, a meteorological tower (free standing lattice structure), a small operation and maintenance facility (O&M), a temporary 3-acre construction equipment laydown yard, and temporary work trailers.

The new access road will be constructed off of NH State Route 9 approximately 2.3 miles east of the Antrim town line. The O&M facility and substation will be located along the access road approximately 500 feet south of Route 9 in a roughly 3-acre cleared area. To interconnect the generated electrical power to the PSNH 115 kV line, underground 34.5 kV collector lines will run along the ridgeline road between turbines, and then switch to pole-mounted lines down the access road from the collector system bus to the substation. After all post construction restoration is complete, the footprint of the physical facilities will impact an area of approximately 11 acres.

The wind turbines and permanent meteorological tower will be illuminated in accordance with FAA requirements for turbine lighting in order to address aviation safety. The FAA has recently issued its determination of no hazard for the Antrim Project. Based on the FAA ruling, 6 turbines will require night time lighting for aviation safety in accordance with FAA standards for the same. These turbines are 1,3,4,6,7,9. Turbines 2,5,8 will not have lights.

Q. What is the geographic scope of the area studied in the VA?

A. For the purposes of this VA, the geographic scope, or study area, has been delineated as a typical 10-mile radius from each of the wind turbines and encompasses approximately 353.2 square miles and 20 towns.

Q. Please describe the character of the Project area and the surrounding landscape and viewshed.

A. The landscape of the Project area is comprised of several characteristics common to the ecological regions it is located in: the Monadnock Sunapee Highlands and the Southwest New Hampshire lowlands. This area has both lower elevation landscapes with higher ridges and summits, but is predominantly a rolling, hilly-forested area interspersed with rivers, lakes, and ponds. It has typically wooded road corridors and state highways that support commuting and commercial traffic, and well-settled villages. Characterized with a rural residential land use pattern, the region today reflects the history of a working landscape with old farms, woodlots, logging, and hydroelectric power.

Due to topography, road corridors rise and fall and wind around hills and along drainages, limiting long distance views (and views of the Project itself). Additionally, the highly

wooded character with many areas of mature woodlands is able to visually absorb views of the Project, when visibility is possible.

This is a typical Central/Northern New England landscape with some unique features (e.g. Mount Monadnock) that stand out. Otherwise the landscape quality is consistent and predictable, not unique, and no more scenic than typical wooded, hilly, settled landscapes seen throughout New England. A detailed discussion of the regional landscape that characterizes the Project area is found in the LandWorks VA attached to the Application as Appendix 9A, in the section entitled Project Area/Landscape Character. This section contains maps and narratives, which describe both the Natural and "Human-Altered" Environment.

Q. Please summarize the methodology used by LandWorks in developing the VA.

A. LandWorks has employed a comprehensive, systematic and detailed methodology developed specifically for wind energy projects and has refined this methodology over our 20 years of experience in assessing the aesthetics of wind energy projects in the Northeast. This methodology, which is responsive to the criteria set forth in NH RSA 162-H, is an amalgamation of a number of established processes, which include but are not limited to the Bureau of Land Management's (BLM) *Visual Resource Management* (VRM), the United States Forest Service's (USFS) Scenery Management System (SMS) outlined in *Landscape Aesthetics*, and the Federal Highway Administration's (FHWA) *Visual Impact Assessment for Highway Projects* (FHWA-VIA). We have also incorporated guidelines outlined in several publications such as *Environmental Impacts of Wind-Energy Projects*, published by the National Research Council, and *A Visual Impact Assessment Process for Wind Energy Projects*, published by the Clean

Energy States Alliance, as well as methodologies established in other states' wind energy review processes (i.e. Maine Wind Energy Act). A complete description of the methodology developed and applied by LandWorks in connection with the Antrim Wind Project is set forth in the LandWorks Visual Assessment document attached as Exhibit 9A to Antrim Wind's Application.

Q. Please describe the specific components of the LandWorks VA.

A. Consistent with the methodology described above, the LandWorks VA outlines a comprehensive approach with unambiguous definitions, explicit thresholds and measurable results that are easy to understand and follow. It provides a consistent, well-defined, step-by-step process by which to distinctly 1) determine the level of sensitivity of a resource, 2) the degree of visual change the project may have to that sensitive resource, 3) the effect the visibility may have on the reasonable person, and 4) an overall conclusion on whether the project has an unreasonable adverse effect on aesthetics given the visual change and other mitigating factors. The LandWorks VA includes the following components:

- A description of the Project, including the size, number of turbines, Project components and associated facilities, and site clearing and landscaping; the Geographic Scope of the Project, in this case a 10-mile radius from each of the wind turbines; and the Existing Landscape Character, describing the natural and cultural landscape within the 10-mile study area.

- An inventory of all public viewpoints. This includes extensive research to identify scenic resources as well as field visits and site photography, and provides the basis for determining visual sensitivity and evaluating extent of visibility.

- A determination of Project visibility utilizing industry standard tools and techniques including viewshed mapping and analysis, 3D modeling, and visual simulations.

- The identification of sensitive scenic resources, in which each resource's visual sensitivity is evaluated based upon cultural designation and scenic quality.

- A determination of the visual effect from sensitive scenic resources, based on an evaluation of categories including the number of turbines visible from the resource;

percent of visibility; proximity or distance; angle of view; visual dominance; and visual clutter / landscape coherence.

- A determination of the effect on a viewer from sensitive scenic resources, in which a range of possible factors are weighed to determine how a reasonable person may be affected by the visibility of the Project.

Each of these components is described in significant detail in the LandWorks VA attached as Exhibit 9A to the Application.

Based on the approach outlined in the LandWorks VA, 290 scenic resources were identified within the Project area, of which only 30 have the potential to see the Project. Every one of these 30 sites (as well as many more that were determined to not have visibility) was visited and photographed, and several sites were visited on more than one occasion (such as Gregg Lake, Willard Pond, the DePierrefeu Sanctuary and Pitcher Mountain). The sites were fully field checked, explored, and investigated to review their scenic quality, understand their cultural value, and appraise their extent of visibility (using viewshed mapping and 3D analysis as a basis). Lakes and ponds were kayaked, trails were hiked, and scenic viewsheds were observed. Our analysis determined that of these 30 scenic resources with potential visibility, only 10 would be sensitive to visual change given their level of scenic quality and cultural designation.

The visual change to each of these 10 resources was then fully examined based on six specific categories with well-defined thresholds for low, moderate, and high. The criteria for visual effect in LandWorks' VA include measurable, consistent, and established techniques for determining if a project will be highly visible or dominant. The majority of resources resulted in an overall low (3 of 10 resources) to low-moderate (6 of 10 resources) rating, and only 1 resource, Willard Pond, was determined to have an overall moderate-high visual effect.

The LandWorks VA also includes a detailed assessment for determining what the Project's effect will be to the reasonable person from a sensitive scenic resource with higher visual effect. The considerations used in the analysis are well established in both the BLM VRM and the USFS SMS, as well as the USFS Recreation Opportunity Spectrum ("ROS"). This last piece of the screening process indicates that the effect to a reasonable person recreating at Willard Pond would be moderate.

The final piece of the LandWorks' VA provides an overall conclusion on whether the Project has an unreasonable adverse effect on aesthetics given the visual change and other mitigating factors. It considers the suitability of the proposed project site; the landscape character of the region and the project's place in that landscape; the effects of night lighting; local conditions in the immediate vicinity of the project and the potential visual effects of the project within that context; and the efficacy of the applicant's mitigation measures.

Q. What are your conclusions regarding the potential visual effect of the Project?

A. The Project will not be highly or extensively visible in the overall project landscape. As stated, the geomorphology and highly wooded nature of the Project area greatly limits the typical view horizons. This is a "small sky" – not "big sky" – landscape. For those resources where visibility will be possible, the nature and extent of the visibility will not be so extensive or objectionable as to undermine the typical user's appreciation and experience of that resource. This conclusion is based on extensive observation, typical user interests and activities identified on a site-by-site basis, and a wealth of experience with recreational environments and scenic landscapes.

Wind projects are located on ridgelines and higher terrain due to the need to effectively access the resource – thus there is a presumption that wind energy projects, by their very nature will be visible. The question that must be answered is: Will the project visibility be readily or generally accommodated by the landscape and development context of the project area? The answer for this Project is yes.

The viewshed calculations demonstrate that the Project is not visible from a large percentage of the Project area. Within the 353.2 square mile study area, only 8.8 square miles or 2.5% has potential visibility of the Project.[1] Of the 290 identified scenic resources, only 30 have the potential for visibility, and only 10 of those are considered sensitive (3.4% of all resources). Additionally, the average viewing distance of all resources with potential visibility will be 5 or more miles, and 6 or more miles for sensitive resources, which is considered background view.

The scope and scale of the region absorb potential impacts from the new Project very well. In the region there are numerous other resources – lakes, ponds, summits – that offer surprisingly similar opportunities. So, the low overall visibility of the Project in the region truly translates into a low overall impact.

Even the view from Pitcher Mountain, as discussed in the report's conclusion, yields the sense that this Project will only be one element in a broad view filled with interesting landmarks, including the Lempster Wind project, and will not detract from the summit experience in any substantial manner. Even with Lempster Wind in view, this panoramic, 360-degree view can

[1] Visibility based on Exhibit 4: Viewshed Map [topography and vegetation/from the turbine hub]. An additional 2.6 square miles or 0.7% has visibility of the turbine tips.

"accept" (visually accommodate) the proposed Project without undermining the scale, breadth and enjoyment of the summit and the appreciation of the regional viewshed.

Q. What mitigation measures have been proposed to reduce the overall visual effect of the Project?

A. A critical mitigation measure that improves the Project from a visual and environmental perspective is the removal of the tenth turbine and the reduction in height of turbine #9. By reducing the height of turbine #9 to 446.2 feet, and by eliminating the original turbine #10, AWE has significantly altered the overall scale of the Project and has dramatically reduced the visual impact to Willard Pond, as well as other resources. AWE has also undertaken significant on-site and off-site mitigation measures, including the dedication of approximately 908 acres of conservation land within and surrounding the Project to remain undeveloped in perpetuity, and the burial of the collector lines between the turbines. AWE will also employ a radar-detecting night lighting system, when it receives final approval from the FAA, which only activates lights when aircraft are within a certain range of the Project.

Another important aspect of the Project is the site itself, which allows for limited clearing and reduced length of access roads, and requires no transmission facilities to be constructed to serve the Project. Siting the Project elements sensitively and in locations that require less clearing and land manipulation, and that do not have widespread visibility with turbine sites or nearby impacts is indeed in and of itself a critical mitigation measure. AWE will also revegetate all disturbed areas consistent with established protocols.

AWE has committed to provide a one-time payment of $40,000 to the Town of Antrim to be used for the enhancement of recreational activities and the aesthetic experience at the Gregg

Lake Recreational area, which the Town of Antrim has agreed to for "full and acceptable compensation for any perceived visual impacts" to that area. AWE has also reached an agreement with the New England Forestry Foundation ("NEFF") to fund $100,000 to acquire new permanent conservation lands in the general region of the Project for the enhancement and maintenance of the region's aesthetic character, wildlife habitat, working landscape, and public use and enjoyment.

Q. Are you familiar with the previous configuration of the Project as it was proposed in SEC Docket 2012-01?

A. Yes. LandWorks reviewed AWE's previous application materials relative to a wind energy facility in Antrim, including the visual assessment and testimony in that docket.

Q. In the SEC Docket 2012-01, the Committee made a finding that "the Facility, as proposed…is simply out of scale in context of its setting." Describe how the new Project addresses these concerns and how the VA considers the scale of the Project in the region.

A. Scale in design and landscape is considered to be a proportional concept - and this application of scale is used in determining the relationship of the overall project to the context of the setting. This scale relationship depends on a broad analysis that encompasses many factors. It is important to understand the proportionality of the overall project within the context of the landscape. Sometimes the whole structures (tower, nacelle and blades) are visible, fully or predominantly, above the horizon. Sometimes the view includes only the upper part of the tower or the extreme tips of rotors of others. In a recent (2013) publication by the Landscape Institute and Institute of Environmental Management & Assessment entitled *Guidelines for Landscape*

and Visual Impact Assessment (pg. 115), it states that the magnitude of visual effect with regard to scale is measured by:

- "The scale of the change in the view with respect to the loss or addition of features in the view and changes in its composition, including the proportion of the view occupied by the proposed developments;
- The degree of contrast or integration of any new features or changes in the landscape with the existing or remaining landscape elements and characteristics in terms of form, scale and mass, line, height, colour and texture;
- The nature of the view of the proposed development, in terms of the relative amount of time over which it will be experience and whether views will be full, partial or glimpses."

Scale is both relative and contextual when considering wind energy projects. It is relative insofar as even as turbine sizes increase to over 500 feet to blade tip, the siting of the project and the distance from a viewpoint from which the overall project is seen determines the sense of scale. From a distance of 10 miles or more 500 foot turbines will not seem out of scale or create a scale relationship within the view that is overwhelming or dominant. However, if one is standing next to a turbine of this size, the scale will indeed seem quite large. Scale is also contextual because it must be considered with regard to the scope or breadth of the project within the landscape, i.e. in relation to the landscape form, pattern, proportion, horizon, contrast, and other characteristics.

The Visual Assessment prepared by LandWorks looks at scale in both a regional context and a local/proximate context. Two resources with potential project visibility that best exemplify these perspectives are the views from Pitcher Mountain and Willard Pond. Indeed, in the publication *Environmental Impacts of Wind Energy Projects*, guidance provided by Ms. Vissering in the Appendix (on pages 366 and 367), it is stated under the heading of "Scale" that "We perceive the size of an object in relation to its surroundings. The actual size of the turbine is less relevant than its perceived size in relation to its surroundings."

From Pitcher Mountain the new Project is over 6.35 miles distant and occupies a limited portion of the overall 360-degree view – approximately 4.4% of that view. The context of the view is indeed a full 360-degree panorama, and within that view are many landscape elements of forestland, clearings, ridges, hill tops and summits, as well as another wind energy project in Lempster. This breadth of view reduces the scale relationship of the Project to its surroundings in the region, and the view from Pitcher Mountain will not be dominated by this Project, nor will the Project appear out of scale; it will be one of many elements that are in the view, with more striking elements such as Mount Monadnock drawing the eye, along with the overall extent and sweep of the view in its entirety.

In the view and experience from Willard Pond, the elimination of proposed turbine #10 from the original project application and the reduction in overall height of turbine #9 combine to also reduce the Project's visual presence on the lake, the extent of the view and the duration of view that paddlers and boaters will have of the project. In turn, the scale of the new Project in relation to Willard Pond has been reduced appreciably. Having spent time on Willard Pond on several different occasions, including a morning paddling the entire shoreline and spending time in various locations floating and analyzing before and after conditions using visual simulations, I came to the conclusion that the Project will not be out of scale with this setting. The basis for this conclusion relies on three factors: 1) The immediacy of the pond experience; paddling and fishing does not typically focus on or revolve around one distinct view or focal point - the nature of the activity typically precludes that; 2) The predominant sights (the slopes of Bald Mountain, the coves at the northern end, the qualities of the shoreline), the sounds and smells of the lake, and particularly the feel of the water and the shoreline draw the eye and dominate the experience,

not a view off in one direction from a portion of the lake that does not necessarily invite pausing or floating (as reaffirmed from observations of user patterns on the lake). These sights and sounds and sensations will not be affected by the Project whatsoever; and 3) Based on my circumnavigation of the pond, I came to the distinct conclusion that the visibility of the Project and/or exposure to that visibility will be limited. As one follows the pond's shoreline in a boat in a clockwise direction, it is possible that one would not notice or even see the Project - where it is most visible on the pond would be in a location that is behind the paddlers' or boater's back and over their shoulder - not in the direction they would typically be looking. When traveling counter-clockwise around the pond from the boat launch, those in boats may have potential Project visibility for about 35-40% of the time on the water, and the context of that potential visibility would be continually changing.

Taken together, these facts indicate the Project will not seem dominant or overly present in terms of the breadth of its scale and its visual presence. And, as Ms. Vissering points out in the previously cited publication, "size becomes relevant in most cases only when it appears to diminish the size and importance of a nearby natural feature…." In no way will this Project diminish the size and importance of Willard Pond (which is actually, in its present configuration and size, the result of human manipulation via the damming of the water feature). The user's experience of Willard Pond will be basically the same with or without the Project, with the obvious recognition that for a portion of a paddle, or from some areas of the pond, the turbines will be visible.

The changes in this Project compared to that which was originally proposed also make a difference in terms of scale. The reduction of 10 to 9 turbines is very significant in terms of

scale, reducing the spread of the Project sufficiently to narrow the view from Willard Pond substantively and entirely removing the closest turbine, which was clearly the most dominant from the Willard Pond view. Additionally, the reduction of tower diameter of approximately 2 feet in girth with the substitution of Siemens design for the Acciona, coupled with reduction of the nacelle length of 7.8 feet, has the effect of reducing the apparent scale of the turbine in terms of its massing and visual presence in the landscape – a proportional change and consequent reduction of the scale that is apparent when comparing the two designs in visual simulations.

These considerations, coupled with other factors such as limited overall visibility of the Project within the defined 10 mile radius of the viewshed, the nature and experience of the landscape in the Project area with its hilly topography, winding roads, and extensive vegetation, will result in a wind energy project that will not seem too "present" – it will not substantively alter the visual qualities and character of that landscape, and thus cannot possibly seem out of scale.

Q. In the Order (page 50) from the prior SEC Docket, the Committee characterized the following resources as "sensitive areas;" Willard Pond, Bald Mountain, Goodhue Hill, Gregg Lake, Robb Reservoir, Island Pond, Highland Lake, Nubanusit Pond, Black Pond, Franklin Pierce Lake, Meadow Marsh, and Pitcher Mountain. Do you agree with the characterization of these resources as sensitive?

A. Yes.

Q. Has the new Project resulted in reduced visual impacts at each of those resources?

A. Yes.

Q. Please explain for each resource, except Willard Pond, how the visual impacts have been reduced.

A. When analyzed through our comprehensive approach, it becomes clear that the changes in the Project have a substantial effect. The overall area with potential visibility of the Project within the 10-mile radius has been reduced by 12%. The change in context and nature of view is more dramatic, particularly in sensitive areas. This includes the reduction of visual effect in such factors as number of turbines visible, proximity or distance, angle of view and percent of visibility. (See attached hereto Attachment DR-2, Change in Resource Visibility) Turbine 10 and turbine 9 in the previous layout appear to be the most dominant structures when viewed from some locations. Turbine 10, the most prominent due to its location directly atop Willard Mountain at an elevation of 1897 feet, has been removed. Turbine 9's height has been reduced so much so that the hub now sits below the treeline, practically eliminating its visual presence from some locations. Furthermore, no turbine sits at an elevation higher than 1750 feet, which is about 150 feet below turbine 10 and the summit of Willard Mountain.

Another significant change is the overall reduction, or shift, in area where total number of turbines would be visible. For some lakes, there will be a significant area of the lake that used to have 9 or 10 turbines potentially visible that will now have 7 or 8 turbines potentially visible, reducing the visual effect under this factor from moderate to low in some cases, as described in the LandWorks VA methodology. There will also no longer be visibility from several ponds like Center Pond in Stoddard, or Spoonwood Pond in Nelson, with the removal of turbine 10 and the reduction in height of turbine 9. In fact, visibility in the lower west quadrant of the 10-mile radius has been essentially eliminated with these changes in layout. This means locations of

higher scenic significance that are found here, such as Dublin Lake or Beech Hill, will have no visibility of the Project. Again, given other factors such as angle of view, proximity, or dominance, the removal of one turbine and significant reduction in height of another can have a dramatic effect on the change of context and nature of view, reducing a potential impact from moderate or high, to low or moderate.

Bald Mountain

The field of view from the vantage point on Bald Mountain Trail has been greatly reduced from 12.31% to 5.92%, lowering its impact under this criterion to low, and the closest turbine visible has also moved 3/10 of a mile further away, reducing the Projects prominence. The number of turbines visible has also been reduced by two, also downgrading the visual effect under this factor to low.

Goodhue Hill

From the successional habitat clearing on Goodhue Hill, the number of turbines potentially visible has been reduced by one. As such, the angle of view from this spot has been reduced from 9% to 7%, and the closest turbine visible has also moved 2/10 of a mile farther away, further lowering the Projects visual impact from this location. In several years as natural tree growth re-establishes in this recent clearcut, the visibility from this location will likely be diminished or eliminated altogether.

Gregg Lake

From the waters of Gregg Lake at a point of highest potential visibility, the field of view will be reduced from 17.28% down to 16.14%. The number of turbines potentially visible has lowered by one across the entire lake and two across much of the lake. In the 10-turbine layout,

113 acres or 56% of the lake had potential visibility of eight or nine turbines (26 and 87 acres respectively). In comparison to the new 9-turbine Project layout, only 83.1 acres or 41% of the lake may see just eight turbines (no part of the lake can see all nine turbines), a change of 26.5%.

Robb Reservoir

Willard Mountain is visible from a small portion in the southwest corner of the reservoir, and thus, turbine 10 was prominently visible. Based on 3D modeling, and factoring in more realistic tree heights for this area of 55 feet or greater, it is likely that Robb Reservoir will have minimal or no visibility of the Project due to the removal of turbine 10 and the reduction in height of turbine 9. Regardless, when comparing viewshed mapping,[2] the overall potential visibility of the Project will be reduced from 34.3 acres to 12.2 acres across the reservoir, a dramatic reduction by more than half at 64%. The angle of view is also nearly eliminated, with a reduction from a 14.75° angle to a 3.84° angle, a substantial decrease of 74%.

Island Pond

Willard Mountain is also visible from Island Pond, where turbine 10 was clearly visible from portions of the pond. With the removal of this prominent turbine, as well as dropping the height of turbine 9, the number of turbines visible has reduced by two (i.e. from eight potentially visible, to six) across much of the lake, reducing the visual effect of this category to low. The area of potential visibility has also decreased greatly from 67.2 acres to 48.6 acres, a change of nearly 28%. The angle of view is similarly diminished, with a reduction of the field of view from 7.4% to 6.5%, also lessening the visual effect down to low under this criterion. The extent

[2] Exhibit 4 Viewshed Map from the LandWorks Visual Assessment

of turbine visibility i.e. how much of the turbine tower is visible, was already low from Island Pond, with only the hubs primarily visible; the further reduction of turbines 1 through 8, even though small, only adds to the overall reduction in visual effect given the tree heights in the area.

Highland Lake

From Highland Lake, Willard Mountain is also visible from limited spots on the water. Turbine 10 would have been visible from these locations, which measure just under 10 acres. With the new Project layout, which removes turbine 10 and reduces turbine 9, there is now no visibility of the Project from the lake, as confirmed by 3D modeling and site visit. This also means that the angle of view has been eliminated, proximity is no longer an issue, and there is no longer a concern for visual dominance.

Nubanusit Pond

Across the 717.7-acre pond, 163.5 acres (23%) had potential visibility of one turbine, turbine 10. Therefore, visibility is eliminated with the new Project layout. As previously mentioned, visibility is determined from the turbine hub, since the hub and rotor have a greater effect than turbine blades and portions thereof. Blades that rise above the treeline are also not readily visible or dominant, particularly at increasing distances. Although the viewshed mapping indicates that up to five turbine blades may be visible from the furthest point on the pond, 3D modeling indicates that only two blade tips have the possibility of being seen at distances of over 6 miles away. When true vegetation heights are factored in the analysis, the visibility of these blades is essentially eliminated.

Black Pond

The area of visibility on Black Pond is limited to a small portion of the lake. With the removal of turbine 10, potential visibility decreases by 7% in this area. The angle of view is also diminished from 4.47% to 3.5%. While viewshed mapping indicates the potential for up to nine turbines potentially visible with the previous layout, and up to seven turbines potentially visible with the new layout, it is more probable that up to two turbines may be visible, given distance and true vegetation heights.

Franklin Pierce Lake

Due to the orientation of the Project from this lake, angle of view and area of potential visibility do not decrease. However, the number of turbines visible within the area of potential visibility has lowered by one and two across much of the lake. In the 10-turbine layout, 226.9 acres or 47% of the lake had potential visibility of eight or nine turbines (21 and 205.9 acres respectively). In comparison to the new 9-turbine Project layout, 199.1 acres or 41% of the lake may see just eight turbines (no part of the lake can see all nine turbines), a change of 12.3%

Meadow Marsh

From a point about 6 feet in front of the bench at Meadow Marsh, the number of turbines potentially visible has dropped by one, and turbine 9 has been further reduced in height diminishing its prominence. Visibility of the turbine pad, clearing and access road to turbine 10 will also be eliminated. The angle of view from this location also drops over 21%, from 19.08° to 14.98°. See Exhibit 23 in the LandWorks Visual Assessment.

Pitcher Mountain

From the lookout tower on Pitcher Mountain, the number of turbines potentially visible has been reduced by one. As such, the angle of view from this spot has diminished from 5% to 4.4%, further lessening the Projects visual impact from this location. Additionally, with the removal of turbine 10 from a high point, and the lowering in height of turbine 9, which is now better "backgrounded" by the mountains beyond, the prominence of the Project is further reduced.

Q. How have the changes to the Project reduced the potential impacts from the Project specifically on Willard Pond?

A. The potential visual effect of the Project from Willard Pond has been reduced dramatically due to the removal of turbine 10 and reduction in height of turbine 9. This change is most noticeable and most meaningful from Willard Pond, since turbine 9, and particularly turbine 10 appear to be the most dominant structures from this location. This change in effect can be measured in a number of ways (including a reduction in Project scale which I discussed previously):

Change in Number of Turbines Visible

The change in number of turbines has obviously dropped by one with the elimination of T10, and up to two from most locations on the pond, since the reduction in height of turbine 9 results in the entire tower and hub now being screened from view by the treeline, practically eliminating its visual presence. The visual effect is considered low when seven or fewer turbines are visible as described in the LandWorks Visual Assessment. With the 10-turbine layout, 22.4% of the pond had eight and nine turbines potentially visible, which is considered a

moderate visual effect. By eliminating the visibility of turbines 9 and 10, the majority of the pond will have seven or fewer turbines potentially visible (95% of the area of potential visibility is of seven turbines or less), so the visual effect has been reduced to low from most locations.

Change in Percent of Visibility

The overall area with potential visibility on Willard Pond has been reduced by approximately 4 acres, with an overall percent change of nearly 5%. This change is more significant when considering how the percent of visibility varies with regard to the number of turbines visible. In the 10-turbine layout, 24.8 acres or 22.5% of the pond had potential visibility of eight or nine turbines (14.7 and 10.1 acres respectively). In comparison to the new 9-turbine Project layout, only 4.7 acres or 4.3% of the pond may see just eight turbines (no part of the lake can see all nine turbines), a significant change of 81%. Similarly, 26% of the area of potential visibility for the 10-turbine layout was of eight and nine turbines. In the 9-turbine layout, only 5% of the area of potential visibility may see eight turbines. The remaining area of potential visibility (95%) may see seven turbines or less, which is considered low.

Change in Proximity

From the northeast corner of the pond, where visibility of the turbines is most prevalent, the change in proximity from the 10-turbine layout is 8.72%, with the closest turbine now at a distance of roughly 1.62 miles. From a location on the southeast corner of the pond, turbine 10 used to be the closest visible at 1.66 miles and turbine 9 at 1.74 miles. Neither of these turbines are visible from this location with the new Project layout, and the nearest potentially visible turbine is at 1.88 miles, a change in distance of 13.25%.

Change in Angle of View

The angle of view, which is a measurement of how much of the total possible field of view the Project occupies, has been substantially reduced. An angle of view of less than 7% is typically considered low, and the removal of turbine 10 and reduction of turbine 9 downgrade the effect on Willard Pond to the low range. From the southeast corner of Willard Pond, overall field of view has been cut nearly in half from 7.9% to 4.5%; from the northeast portion of Willard Pond, overall field of view has been reduced significantly from 10.7% to 6.4%, again dropping the visual effect to low.

Change in Visual Dominance

In the 10-turbine layout, the prominence of turbines 9, and especially turbine 10 that sat at the highest elevation on Willard Mountain, was more evident. With the removal of turbine 10 and the reduction in height of turbine 9 to practically eliminate its impact, the visual dominance of the Project has been dramatically reduced. The remaining visible turbines do not sit on prominent ridgelines, do not interrupt a focal point within the view, and the overall visual ratio of turbine to ridgeline is as low as or similar to other projects in the region, thereby lessening the visual dominance of the Project. Furthermore, when other factors are minimized significantly, including number of turbines visible, percent of visibility, proximity, angle of view, and type of turbine, it results in an aggregate reduction of visual dominance.

Q. In your opinion, will the Project have an unreasonable adverse effect on aesthetics?

A. No. As proposed, it is my opinion that the Project will not have an unreasonable adverse effect on aesthetics. This is an excellent site for a wind project of this size and scale given the limited overall project visibility, the surrounding topography and vegetation and the

access to transmission facilities. The site itself can be developed with minimal landscape impacts.

I have spent the better part of a year traveling in the Project area, visiting resources and potentially sensitive sites with views of the Project and developing a renewed sense for a region that I have been familiar with since the early 1970s. This typical New England landscape has rolling topography and curving roadways traveling up and over hills and along ponds, lakes and stream corridors. It includes mature forests, compact villages, rural residential landscapes and ample evidence of the working landscape tradition. This tradition includes woodlots and timber stands as well as hydroelectric dams. There are areas with linear highway development as well, and utility lines and corridors are not uncommon features of the human environment. This landscape can accommodate this Project without undermining the regional viewshed. This is a "small sky" landscape, not a "big sky" landscape where expectations for striking and memorable scenery are greater.

The Project is not visible from everywhere and every open area. A total of 290 resources evaluated yielded the conclusion that only 30 of these scenic and recreational resources with public access in the project area will have potential visibility. Of the 30 resources identified, only 10 have sufficient sensitivity (moderate-high, or high for potential visual effect) to warrant the next step of our analysis. When subjected to our systematic review, including on-site observations, none of these resources were determined to be unreasonably affected by the visibility of the Project. Users and viewers will continue to visit and appreciate these resources and the landscape after Project construction much in the same way they do today.

Q. Does this conclude your pre-filed testimony?

A. Yes.

CURRICULUM VITAE

David Raphael, B.A., M.L.A. :: Principal/Landscape Architect & Planner

EDUCATION

M.L.A., Harvard University Graduate School of Design, 1977 Cambridge, Massachusetts

B.A. in English, Tufts University, Cum Laude, Minor in Ecology, 1972 Medford, Massachusetts

School of the Museum of Fine Arts, 1971, Boston, Massachusetts

Diploma, Dartmouth College Outward Bound Program, 1970, Hanover, New Hampshire

EMPLOYMENT HISTORY, PROFESSIONAL SKILLS, & DUTIES

1986-present: LandWorks, Middlebury, Vermont
Founder and Principal Landscape Architect, Planner, & Graphic Designer

1984 - 1985: Alexander, Truex, deGroot, Architects, Burlington, Vermont
Consultant and staff, Landscape Architect/Planner

1980 - 1982: Kiley-Walker, Charlotte, Vermont
Associate Landscape Architect

1976 - 1979: Massachusetts Department of Environmental Management
Planner/Landscape Architect

TEACHING/ACADEMIC APPOINTMENTS

2013-2014: University Fellow in Sustainability, Rubenstein School of Environmental & Natural Resources, University of Vermont, Burlington, VT

2010-2011: University Fellow in Service Learning, Rubenstein School of Environmental & Natural Resources, University of Vermont, Burlington, VT

1982-present: Lecturer, Rubenstein School of Environment & Natural Resources, University of Vermont

1992-1994: Visiting Instructor, Middlebury College, Middlebury, VT

1991-1993: Adjunct Faculty Member, Vermont Technical College

1988-1989: Director; "Design Vermont" project of the Vermont Council on the Arts and the Governor's Institute on the Arts, funded by the National Endowment of the Arts & held at Castleton State College, July 1989

1983:Visiting Assistant Professor, School of Architecture, University of Arkansas

1982-1984:Adjunct Associate Professor, Graduate Program in Urban and Environmental Policy, Tufts University

PROFESSIONAL REGISTRATIONS

- Registered/Licensed Landscape Architect - State of Rhode Island, Vermont
- Passed Uniform National Examination: eligible for registration in other states
- Certified with the Professional Ski Instructors of America

MEMBERSHIPS/COMMUNITY SERVICE

- Chair, Vermont Urban and Community Forestry Council (VTUCFC)
- Member, American Society of Landscape Architects (ASLA)
- Member, American Planning Association (APA)
- Member, Society of Environmental Graphic Designers (SEGD)

CURRICULUM VITAE

- Member, Board of Trustees, Lake Champlain Land Trust
- Fellow in Sustainability, University of Vermont
- Former Member, Board of Directors, Vermont State Craft Center at Frog Hollow
- Chairman, Town of Panton Planning Commission and Development Review Board 1985 - present
- Delegate, Addison County Regional Planning Commission (ACRPC)
- Member, Agency of Natural Resources, Design Issues Study Committee
- Former Member, Town of Middlebury, Design Advisory Committee

PARTIAL LISTING OF RESEARCH AND PUBLICATIONS

"Wayfinding Principles & Practice, 2nd Edition", Landscape Architecture Technical Information Series (LATIS). American Society of Landscape Architects. 2013

"I Believe: Green is the Infrastructure of the 21st Century, Let's Begin the Blueprint" Burlington Free Press, Dec. 6, 2009

"Land-Working: David Raphael", SEGD Magazine on Sustainability in *Moses Brown School Cupola*. Spring 2008

"Wayfinding Principles & Practice", Landscape Architecture Technical Information Series (LATIS) Number 2. American Society of Landscape Architects. 2006

“BGOC (Big Graphics on Campus) Signs and Environmental Graphics that Impact Collegiate Environments” Signs of the Times, Oct. 2003

"A New Vision for Vermont," Landscape Architecture Magazine, December 1999

Special Correspondent, Burlington Free Press, Burlington, Vermont, 1994 to 1998

"Brave New Vermont," Vermont Magazine, June 1995, Contributor.

Sign Management: Aesthetics, Economics, Environment - The Vermont Experience, 1992 ("Best of the Conference" award at national conference on sign management, 1992)

"Prospect," Landscape Architecture Magazine, September/October 1985.

"Grounds for Playful Renaissance," Landscape Architecture Magazine, July 1975.

Richard P. White Award, Horticultural Research Institute, Washington, D.C., 1983-1984 Windbreaks and Shelterbelts for the Northeast

Rivers Downtown: Riverfront Revitalization in Vermont, for the Winooski Valley Park District, October 1981; funded with a Housing and Urban Development and Research Grant

"Evolutionary Trends and Essential Themes of Wilderness Preservation" in Public Space, Peter Trowbridge, Ed. and with an Introduction by J.B. Jackson; Harvard University, Cambridge 1975.

INTERESTS

Research and Writing, Mountaineering, Natural History, Landscaping, Carpentry, Kayaking, Soccer (Official Referee VSSA, USSF), Skiing (Professional Instructor, PSIA).

Change in Resource Visibility*

*Based on viewshed mapping

Resource	Area of visibility has decreased	Number of turbines visible has decreased	Angle of view has decreased	Project is no longer visible
Centerwood Pond				**X**
Spoonwood Pond				**X**
Nubanusit Lake				**X**
Deering Reservoir				**X**
Highland Lake				**X**
Otter Lake (Greenfield State Park)				**X**
Robb Reservoir	**X**	**X**	**X**	
Island Pond	**X**	**X**	**X**	
Powder Mill Pond	**X**	**X**	**X**	
Willard Pond	**X**	**X**	**X**	
Gregg Lake	**X**	**X**	**X**	
Black Pond	**X**	**X**	**X**	
Meadow Marsh		**X**	**X**	
Pitcher Mountain (fire tower and state forest)		**X**	**X**	
Summit Trail, Crotched Mt.		**X**	**X**	
Franklin Pierce Lake		**X**		
Bald Mountain Trail		**X**	**X**	
Goodhue Hill Trail		**X**	**X**	