Appalachian Mountain Club

January 5, 2009

Thomas Burack, Chairman
Site Evaluation Committee
Department of Environmental Services
29 Hazen Drive, Box 95
Concord, NH 03302-0095

Re: Pre-filed testimony of Appalachian Mountain Club
Granite Reliable Power, Docket No. 2008-04

Commissioner Burack:

Enclosed please find nine (9) copies of AMC's pre-filed testimony in the above-referenced matter. An electronic version of this testimony was filed by email on this date. This testimony has been circulated to all parties on the service list provided on December 5, 2008.

Thank you for the opportunity to present this testimony.

Sincerely,

Dr. David Publicover
Senior Staff Scientist

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

DOCKET NO. 2008-04

APPLICATION OF GRANITE RELIABLE POWER, LLC
FOR CERTIFICATE OF SITE AND FACILITY
FOR GRANITE RELIABLE POWER WINDPARK
IN COOS COUNTY

TESTIMONY OF DR. DAVID PUBLICOVER
ON BEHALF OF
APPALACHIAN MOUNTAIN CLUB

January 5, 2009

QUALIFICATIONS

State your name and current position.

My name is David Publicover. I am currently employed as a Senior Staff Scientist and Assistant Director of Research with the Appalachian Mountain Club, a non-profit conservation and recreation organization with headquarters in Boston, MA. My business address is P.O. Box 298, Gorham, NH 03581. I have been employed by the AMC since 1992.

What are your background and qualifications?

I have a B.S. in Forestry from the University of New Hampshire (1978), an M.S. in Botany from the University of Vermont (1986), and a D.F. in Forest Ecology from the Yale University School of Forestry and Environmental Studies (1992). I have been employed as a staff scientist by AMC since 1992. My general responsibility is to provide scientific information and analyses to AMC and its partners in the areas of terrestrial ecology, landscape analysis, land use and conservation planning, sustainable forestry and biological conservation.

For most of my tenure at AMC I have been involved with wind power development and siting issues. I have served as AMC's primary representative during interventions in four previous commercial wind power development applications, all before Maine's Land Use Regulation Commission (the Kenetech Boundary Mountains project in the mid-1990s and the more recent Kibby Mountain, Stetson Mountain, and Redington/Black Nubble projects). I served as an alternate member of the Governor's Task Force on Wind power Development in Maine (2007-08) that developed wind power specific permitting policy and regulations that were unanimously enacted into law by the Maine legislature. I co-led a joint effort of AMC and New Hampshire

Audubon to convene a multi-stakeholder group that developed draft wind power siting guidelines that are currently under consideration by the legislatively-established New Hampshire Energy Policy Commission. I have developed a GIS-based analytical approach to assessing conflicts between potential ridgeline wind power development sites and recognized natural resource values (Publicover 2004). I have given numerous talks on AMC's approach to wind power siting to a wide range of audiences, including the American Wind Energy Association's 2006 national conference in Pittsburg, PA and the 2008 New Hampshire Saving Special Places conference in Sutton, NH.

Are you familiar with the application and have you visited the site?

Yes. I have read the application and all appendices relevant to our testimony and concerns (Appendices 2, 3, 11, 15, 16, 17, 18, 23, 24, 25, and 40), as well as the pre-filed testimony of Adam Gravel and Steve Pelletier, Jean Vissering and Raymond Lobdell. I have also reviewed the responses of the Applicant to all additional information requests and attended all technical sessions.

I visited the proposed Mount Kelsey site on October 28, 2008 in the company of Josh Brown of Noble Environmental Power and AMC Director of Research Kenneth Kimball. We traversed the entire ridgeline encompassing the eight turbine locations proposed for this site. After receiving permission from Mr. Brown, I visited the Dixville Mountain site on my own on November 5, 2008, traversing the ridge from the summit of Dixville Mountain (the approximate location of turbine 28) north to a point between the proposed sites of turbines 2 and 3. For most of this length I was able to follow a surveyed line marking the location of the proposed ridgeline access road.

SUMMARY OF AMC'S POSITION

What is AMC's general position on wind power development?

The AMC supports terrestrial wind power development when it is appropriately sited to avoid impacting ridgeline areas with ecological, scenic and/or recreational values of recognized state, regional or national significance. We have conducted extensive research on mountain air quality and alpine ecosystems and clearly recognize the adverse impacts that our society's continued reliance on fossil fuels can have on mountain ecosystems. We strongly support efforts to develop non-polluting sources of energy, and recognize that wind is one of the region's most viable indigenous sources of renewable energy. At the same time, higher-elevation ridgelines (currently the primary sites for commercial wind power development in New England) are generally the least developed parts of our landscape, and may be areas of high ecological, recreational and scenic value. There is strong potential for conflict between the goals of promoting renewable energy and preserving high-value areas of open space. We believe that finding the proper balance between these two worthy goals is difficult but necessary. In pursuit of this balance, we believe that not all areas are suitable for development, and that areas of particularly high value should be protected.

The AMC adopted its General Policy on Wind power (Attachment A) in 1996 and revised it in 2006. This policy sets forth our overall position on wind power development in the region and sets forth specific criteria by which we will evaluate individual projects. To date these criteria have been used to evaluate approximately fifteen projects across the region.

The AMC has internally reviewed all proposed terrestrial commerical wind power projects in Maine, New Hampshire, Vermont and Massachusetts and was an active intervenor in four commercial wind power project applications in Maine. Three of these we supported (the earlier Kenetech Boundary Mountains project in the mid-1990s and the more recent Kibby Mountain and Stetson Mountain projects) and one we opposed (the Redington/Black Nubble project). In each case the regulatory agency reached a decision in agreement with AMC's position. We did not take official positions on other projects that have reached the permitting stage (including Lempster Mountain in New Hampshire, Mars Hill in Maine, and several projects in Massachusetts and Vermont). We felt that these projects did not raise issues of sufficient concern relative to the interests and expertise of AMC.

What is AMC's specific position on this project?

Based on our review of the application, reports submitted by state agencies, and our site visit, our position on this project is:

- We support construction of the Fish Brook and Owlhead Mountain turbine strings (turbines 16 to 33). We believe that these strings are appropriately sited and will not create unreasonable adverse impacts.
- We strongly oppose construction of the Mount Kelsey turbine string under any circumstances (turbines 8 to 15). We believe that the impacts of this development on undisturbed old growth forest and critical wildlife habitat for several rare species constitute an unreasonable adverse impact on the natural environment.
- We oppose the construction of the Dixville Peak turbine string (turbines 1 to 7) as proposed. This site possesses similar ecological values to Mount Kelsey, and development of this string would also constitute an unreasonable adverse impact on the natural environment. The Applicant's proposed mitigation package fails to adequately mitigate for the impacts on high value ecological resources at this site. We would consider supporting construction of this string if it was balanced by a significantly improved mitigation package.
- We believe that the high-elevation mitigation package as proposed is grossly inadequate and needs to be strengthened, even if the turbines on Mount Kelsey are eliminated.

DESCRIPTION OF SPECIFIC CONCERNS ABOUT MOUNT KELSEY AND DIXVILLE PEAK

Describe the ecological value of Mount Kelsey.

A rare pristine old-growth subalpine forest. The upper elevations of Mount Kelsey encompass an expansive area of mature spruce-fir forest. During our field visit we saw no evidence of recent human disturbance along the ridgeline other than the two small recent clearings for meteorological towers. While some of the lower portion of this area may have undergone past harvesting (most likely prior to World War II, based on the lack of any noticeable stump remnants), the entire ridgeline where turbines would be located appears to be "pristine" or "primary" forest. The New Hampshire Natural Heritage Bureau assessment[1] also reached this conclusion and stated "Much of the forest, as previously described, is an intact forest community with no evidence of past management history." New Hampshire Audubon's assessment states[2], "There is no obvious evidence of forest management along this proposed string…Old growth spruce and fir dominate the overstory, with diameters of 15-18 inches in some areas."

The balsam fir-dominated forests along the Kelsey ridgeline meet widely accepted definitions of old growth. Subalpine forests are often overlooked as old growth because the harsh conditions and ecological characteristics of the dominant balsam fir prevent the development of forests of the stature commonly associated with old growth. However, old growth status must be evaluated in the context of the particular forest type. Lower-elevation spruce-fir or northern hardwood forests are not disqualified as old growth because they do not reach the age or stature of those in the Pacific Northwest or Great Smoky Mountains. Similarly, high-elevation spruce-fir forests in our region are not disqualified as old growth because they do not reach the age or stature of those at lower elevations.

Robert Leverett, one of the Northeast's most widely recognized experts on old-growth forests, sets forth the following characteristics that "have traditionally been considered indicative of the old growth phase" (Leverett (1996). He notes that these features are not universal; not all old growth stands will possess all of these characteristics and they must be assessed in the context of the local forest type. We note that the Applicant's natural community characterization survey was undertaken when there were several feet of snow on the ground, which would have obscured many of these characteristics.

- *An abundance of old trees*. Three stumps in the meteorological tower clearings were aged at 93 to 97 years old. New Hampshire Fish and Game's progress report indicated that stumps were aged at 80 to 100 years. One commonly used indicator is presence of trees that are half the age of the maximum life span for the species (Cogbill 1996), which for balsam fir is about 200 years (Burns and Honkala 1990). Leverett (1996) notes in describing the variability of old growth in different forest types that "High-altitude spruce-fir stands may have few truly old trees."
- *Fallen logs in all stages of decomposition, covered by mosses and lichens*. These are present throughout the area (Attachment B, photos 1, 4, 5, 6 and 11).
- *Plentiful snags (standing dead trees)*. These are also present throughout the area (photos 2, 7 and 8).
- *Large and small canopy gaps*. The area contains openings of a range of sizes (photos 2, 4, 7 and 8).
- *Undulating forest floor (pit and mound topography).*
- *Multiple growth layers.* (Photos 2, 3, 4, 7 and 8).
- *Undisturbed forest floor with relatively thick humus layers.*

[1] NHNHB 11/12/08 Progress Report.
[2] Application Appendix 23, page 135.

- *Large trees for the growing conditions.* Balsam fir of 14-15" DBH (diameter at breast height) were common in more mature portions of the ridgeline forest. Fir of this size are relatively uncommon in spruce-fir forests in the state (see Attachment C); their stature is even more impressive given the harsh growing conditions at these elevations.
- *Well developed herbaceous layer, especially in neutral soils.* This characteristic is not found in this forest type; balsam fir stands typically have depauperate understory vegetation due to the highly acidic soils and dense growth of mosses, which limits the growth of herbaceous plants (Cogbill 1996).
- *Abundance of lichens and fungi, particularly in acid based soils.* Lichens are common on most stems.
- *Majority of tree species in the late successional class.* At lower elevations these include red spruce, hemlock, sugar maple, beech and yellow birch. However, at these elevations these species do not occur (with the limited exception of some red spruce) and balsam fir is the dominant late-successional species.
- *Absence of signs of human disturbance.* This has been noted above.
- *A mosaic of age groupings left as imprints from many natural disturbances of varying sizes.* The area contains a range of stand conditions, from mature closed-canopy stands (photos 3 and 6), to regenerating disturbed patches (photo 7), to partially open stands with standing live and dead trees (photos 2 and 4), the result of a long and diverse disturbance history (primarily wind, ice, snow and insects).

The ridgeline forest of Mount Kelsey possesses all of the characteristics described above that would be expected in high-elevation spruce-fir forests and clearly meets the definition of old growth for this forest type. The New Hampshire Audubon assessment also describes the likely old-growth status of the Mount Kelsey ridgeline[3]. Adam Gravel, an environmental consultant retained by the Applicant, confirmed the presence of and impacts on "old growth forest" during the October 2, 2008 Public Hearing[4]. We disagree with the Applicant's assertion[5] that "…the forest stands on these ridges are not considered old-growth forest…The phenology and natural conditions of this forest stand type prohibits this natural community from reaching an age that is typically associated with an old-growth forest." The Applicant is inappropriately applying the criteria for lower-elevation old-growth to this high-elevation forest type.

Given the extreme scarcity of primary old-growth forest in the state and region, and the high level of disturbance to surrounding forests from timber harvesting, Mount Kelsey is an inappropriate area for any type of development.

<u>Critical wildlife habitat for several of the state's rarest and most vulnerable wildlife species</u>. As described in the New Hampshire Fish and Game progress report (11/13/08) and the Applicant's studies, Mount Kelsey provides high-quality habitat for three wildlife species of high conservation concern:

- *American marten (State Threatened)*. The New Hampshire Fish and Game progress report notes that "In NH, the high elevation habitats found in the project area are

[3] Application Appendix 23, pages 20-21.
[4] Transcript of October 2, 2008 Public Hearing in Groveton, NH, pages 58-59.
[5] Applicant's Response to AMC's First Set of Data Requests, 10/24/08, response AMC 1-5.

considered core marten habitat." The species profile in the New Hampshire Wildlife Action Plan[6] notes that "ridgelines and areas of high elevation may be particularly important for marten in New Hampshire." The Applicant's winter track survey[7] concluded (page 10), "Of all the ridgeline transects, Mt. Kelsey was considered to have the highest value marten habitat. The combination of cover type, accumulations of downed coarse woody debris, and relatively high elevation provided what has been documented to be valuable winter habitat for marten."

- *Bicknell's thrush (State Special Concern)*. Bicknell's thrush is perhaps the rarest migratory songbird in the northeast and is endemic to and critically dependent on high-elevation spruce-fir stands. New Hampshire Audubon's breeding bird surveys[8] documented the highest occurrence of this species on Mount Kelsey and noted (Appendix 23, page 34), "The restricted breeding range and limited extent of its specialized habitat make the Bicknell's Thrush one of the most vulnerable bird species breeding on the Project Area." As noted by the Applicant[9], Breeding Bird Survey data indicates that this species is clearly declining. The species profile for Bicknell's thrush in the state Wildlife Action Plan states[10], "Bicknell's thrush are most common in areas that undergo frequent natural disturbance from wind, ice storms, fir waves, fire, and insect outbreaks, as well as chronically disturbed high elevation and coastal forests. At high elevations, such areas are most common along exposed ridgelines" – exactly the type of habitat occurring on Mount Kelsey, and exactly the area that would be most impacted by the project.

- *American three-toed woodpecker (State Threatened)*. This species requires mature spruce-fir stands with extensive snags, a habitat that has become greatly limited at lower elevations because of extensive logging. As noted in the New Hampshire Fish and Game progress report, Breeding Bird Survey data suggests a significant decrease in the population. New Hampshire Audubon's breeding bird survey detected 5 possible occurrences, four of which occurred on Mount Kelsey. They recommended additional surveys to confirm the presence of this species, which were not performed. However, the applicant confirmed that the species was present during migratory bird surveys[11]. During our site visit of October 28, 2008, and again during the technical session in Berlin on December 19, 2008, Josh Brown indicated that the Applicant was acting on the assumption that suitable habitat for this species was present.

Bicknell's thrush and three-toed woodpecker are two of the three bird species determined to be at highest risk from project development by New Hampshire Audubon[12], and the occurrence of these species is most heavily concentrated on Mount Kelsey[13].

[6] New Hampshire Wildlife Action Plan, Appendix A, page A-253.
[7] Application Appendix 25.
[8] Application Appendices 23 and 24.
[9] Applicant Response to Public Counsel Third Set of Data Requests, response PC 3-68.
[10] New Hampshire Wildlife Action Plan, Appendix A, page A-370.
[11] Application page 83.
[12] Application Appendix 23, Table 5, page 14.
[13] Application Appendix 23, Figure 3, page 17.

The value of high-elevation spruce fir habitat is recognized in the State Wildlife Action Plan, which states[14], "High elevation spruce-fir provides some of the last areas relatively free of human disturbance. Furthermore, due to conservation efforts and poor accessibility, the high elevation areas represent some of the last large, remote, contiguous blocks of spruce-fir habitat. Silviculture practices resulting from budworm harvests and the historic high value of spruce-fir and/or mill demands that have been placed on spruce-fir have dramatically affected spruce-fir distribution at lower elevations, thus making high elevation habitat that much more important." New Hampshire Fish and Game acted to conserve the important values of this habitat through the development of a voluntary Memorandum of Understanding with landowners in the mid-1990s[15]. (The AMC assisted with negotiating this MOU.) The continued loss of mature high-elevation forest through harvesting has been documented by the Society for the Protection of New Hampshire Forests study (Sundquist and Birnie 2008) referred to in the New Hampshire Fish and Game progress report.

Partners in Flight, a multi-party cooperative bird conservation effort[16] lists Mountaintop Stunted Conifer Woodland as one of five priority habitats in the Eastern Spruce-Hardwood physiographic region, and Bicknell's thrush as the primary priority species in this habitat[17]. The conservation goal for this habitat is to "Ensure the protection of all sites that support populations of Bicknell's Thrush 'large enough to be considered source populations for other sites,' and as many additional high-elevation habitat patches with smaller populations as possible." The Atlantic Coast Joint Venture, another multi-party bird conservation effort, lists Bicknell's thrush as one of 17 Highest Priority species in the Atlantic Northern Forest region (Dettmers 2006).

We recognize that not all high-elevation areas are of equal value or sensitivity. Within the project area Mount Kelsey is clearly the high-elevation area of greatest habitat value. The value of this undisturbed mature spruce-fir habitat is enhanced by the extensive harvesting that has taken place at lower elevations and in other high elevation areas. As stated in the New Hampshire Fish and Game progress report, "The remaining lightly disturbed patches on the project area represents some of the best remaining habitat capable of supporting viable populations of marten, three toed woodpecker and Bicknell's thrush." The documented exceptional habitat value of the area, as well as the scarcity of this type of habitat, makes it unsuitable for development.

<u>Value of high-elevation areas as a refugia during changing climates</u>. We recognize that human-accelerated climate change is an extremely important issue for society. There are three major policy considerations in dealing with climate change – energy efficiency, renewable energy development and adaptation. Replacing greenhouse gas emitting energy facilities with renewable energy sources, including wind power, is an important tool. However, protecting habitats that historically have served as ecological refugia during periods of climatic variability is also an extremely important aspect to any comprehensive public policy solution to climate change, which must include consideration of adapting to the inevitable changes in climate that

[14] New Hampshire Wildlife Action Plan, Appendix B, page B-84.
[15] We understand that current landowners who are involved in this project have not continued the involvement of previous landowners in the MOU.
[16] See http://www.partnersinflight.org/description.cfm.
[17] See http://www.partnersinflight.org/bcps/pl_28sum.htm.

will occur. (Of the six working groups created by the New Hampshire Climate Change Task Force, one is charged with dealing with adaptation[18].)

Developing wind power projects on mountain ridges with undisturbed spruce-fir or alpine habitats, sometimes referred to as "islands in the sky", is counterproductive to efforts to adapt to climate change. The climate has always and will continue to change over time. Climate change since the last glacial period provides insight into which habitat types have had adaptive ecological value. Since the receding of the last glacier New England some 13,000 years ago, there have been major warming and cooling periods that resulted in changes to forest composition at lower elevations in northern New Hampshire. During a major warmer period over 4,000 years ago, spruce-fir forests at lower elevations were displaced by a mixed forest with species more closely resembling those of the mid-Atlantic region today. However, at middle to high elevations in northern New England the available record suggests that temperature does not change as dramatically compared to lower elevations and other factors like cloud immersion are as or more important than temperature. This has resulted in stable, long-term refugia at higher elevations for the region's spruce-fir forest. These refugia recolonized the lower elevations of northern New Hampshire with spruce-fir forest following the last warm period (Davis and Jacobsen 1985, Spear 1989, Pielou 1991, Seidel et al. undated)[19]. Today, the lower elevation spruce-fir forest of northern New Hampshire is of major economic importance to the forest industry and region's ecology.

Lower elevation spruce-fir forests in New Hampshire are likely to be stressed by ongoing climate warming as they were in the geologic past. The undisturbed high-quality spruce-fir habitat on Mount Kelsey and Dixville Peak will serve an important evolutionary and ecological role as refugia for this forest type during future warming. The Applicant's proposed development in these high-elevation areas would seriously degrade the ability of these habitats to provide this critical ecological function, and would contradict the New Hampshire Climate Change Task Force's recommendations on adaptation for 'Ecosystems and Wildlife' by compromising some of the better surviving areas that historically have provided natural adaptation to climate change for this important forest type in northern New Hampshire[20].

Why do you conclude that the project would have an unreasonable adverse impact on the natural environment, specifically Mount Kelsey?

The New Hampshire Energy Facility Evaluation, Siting, Construction and Operation Act (NH RSA 162-16:H.IV) sets forth four criteria for the permitting of energy facilities under the jurisdiction of the state's Site Evaluation Committee (SEC). The third of these is that the Committee must find that the proposed site and facility "Will not have an unreasonable adverse effect on aesthetics, historic sites, air and water quality, the natural environment, and public health and safety." We believe that the construction of turbines on Mount Kelsey would constitute an unreasonable adverse impact on the natural environment and thus should be denied a permit.

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[18] See http://des.nh.gov/organization/divisions/air/tsb/tps/climate/action_plan/index.htm.
[19] Abstracts for Seidel et al. (undated) and Spear (1989) are included as Attachment D.
[20] These recommendations are currently in draft form.

The Applicant contends that the project will not have an unreasonable adverse impact. We believe this conclusion is incorrect for two reasons:

- The Applicant contents that the project footprint is small relative to available habitat in the region. For example, the Applicant states[21], "While development of the Project would result in habitat loss and clearing along the ridgeline of the mountain, these types of impacts currently exist throughout the project area in the form of timber clearing and open corridors for existing transmission lines and roads. Development of the Project is therefore not expected to cause dramatic shifts in the abundance, diversity or distribution of the breeding bird population." However, the impact in the context of the broad landscape is an inappropriate basis for assessing the project. We agree that common species that utilize widely available habitat (which are the majority of species in the area) will not be significantly affected. The concern is for a few rare species which utilize the uncommon habitat that will be directly impacted by the project.

  The great majority of habitat in the region, even habitat above 2700', does not provide the habitat value for the species of primary concern as does Mount Kelsey. The applicant's own studies have documented the value of this habitat, even when compared to other high-elevation ridgelines in the project area. The proper question is "How much high-quality high-elevation spruce-fir habitat will be impacted by this project?" The impact of the project is much greater when considered in this way.

- The Applicant understates the project impact by considering only the area to be directly cleared. As described in the progress reports from both New Hampshire Fish and Game and New Hampshire Natural Heritage Bureau, the project's impacts will extend well beyond the actual cleared area, to which the Applicant's consultants Adam Gravel and Steven LaFrance indicated agreement at the technical session on December 19, 2008. In addition, the linear nature of the project creates impacts that greatly exceed those of a more compact area of comparable size. The construction of a major road (equivalent in width to a two-lane highway) will fragment this large contiguous block of mature spruce-fir habitat. The project will create an extensive unnatural edge through the core of an unfragmented high-quality block of high-elevation habitat. The effects of this edge will be increased blowdown (reducing the ability of these edge areas to develop mature conditions) and altered microclimate (including increased wind within the stand, reduced humidity, and greater temperature extremes). The alteration of terrain and drainage associated with the large ridgeline road will interrupt and alter the hydrology of the ridgeline, potentially affecting affected wetlands both upstream and downstream of the road. All of these impacts will affect and degrade natural ecosystem function well beyond the actual impact area.

  A recent study by the National Academy of Sciences (NAS 2007), in its summary of the ecological effects of wind-energy projects, concluded (page 91):

[21] Pre-filed testimony of Adam Gravel and Steven Pelletier, page 19.

- "The construction and maintenance of wind turbines and associated infrastructure (e.g., roads) alters ecosystem structure through vegetation clearing, soil disruption, and potential for erosion and noise.
- Based on similar types of construction and development, it is likely that wind-energy facilities will adversely alter ecosystems indirectly, especially through the following cumulative impacts:
  1. Forest clearing resulting from road construction, transmission lines leading to the grid, and turbine placements represents perhaps the most significant potential change through habitat loss and fragmentation for forest-dependent species. This impact is particularly important in the Mid-Atlantic Highlands, because wind-energy projects there all have been constructed or proposed in forested areas[22].
  2. Changes in forest structure and the creation of openings may alter microclimate and increase the amount of forest edge.
  3. Plants and animals throughout the ecosystem respond differently to these changes, and particular attention should be paid to species listed under the ESA and *species of concern that are known to have narrow habitat requirements and whose niches are disproportionately altered*." (italics added)

The report also notes (page 75) that "assessments of the effects of wind-energy facilities on bird habitat should not be confined to simple measurement of the area of vegetation removed, but also should include analysis of habitat fragmentation and edge effects."

As noted in the New Hampshire Fish and Game progress report, "Marten are exceptionally sensitive to low levels of fragmentation." Chapin (1998) documented the importance of large contiguous blocks of habitat to marten in an industrial forest landscape. We concur with the opinion in New Hampshire Fish and Game's progress report that, "[the project] severely compromises the integrity and value of all the high elevation management areas in the project."

We question two specific points made by the Applicant in support of their conclusion that development will not have an adverse impact on Bicknell's thrush:

- The Applicant cites Rimmer et al. (2004), a study of Bicknell's thrush habitat use in a downhill ski area, as evidence that Bicknell's utilize and even selectively favor edge habitat such as is found along the edge of ski trails (and presumably turbine corridors)[23]. However, there are two problems with their interpretation of this information.

  First, Rimmer et al. (2004) present the following caveat: "We emphasize that our scientific data do not enable us to predict the impacts that creation of ski trails may have on Bicknell's Thrush habitat. The data presented in this report pertain only to existing ski areas that have been in operation for > 40 years and can not be directly applied to areas

[22] The committee drew on information from throughout the United States and abroad, but focused on terrestrial ridgelines in the Mid-Atlantic Highlands. However, these conclusions are equally applicable to other forested areas in the East.

[23] Applicant Response to Public Counsel Third Set of Data Requests, response PC 3-72.

like the proposed Tree Island Pod that are currently undeveloped for skiing." At a minimum, this paper is not applicable to the situation at hand.

However, this paper (as well as Rimmer et al. [2005], which the Applicant also cites), both explicitly state in their recommendations, "**avoiding trail construction and widening in areas where natural disturbance is most likely to maintain suitable habitat for Bicknell's Thrushes (e.g., west-facing slopes, ridgelines, fir waves, and areas adjacent to fir waves).**" They also recommend, "siting new trails in sheltered areas, where natural disturbances tend to be minimal and Bicknell's Thrush densities lowest."

These papers do not support the Applicant's position that the construction of this project would have no impact (and might even be beneficial) to Bicknell's thrush. Rather they clearly recommend against disturbing areas of high-quality habitat such as the Mount Kelsey ridgeline.

- The Applicant lists Bicknell's thrush as among the species that are "unlikely to fly above the forest canopy during the course of daily activities"[24]. However, the *Birds of North America* (Rimmer et al. 2001) describes the mating flight of this species, which most commonly occurs at dusk, as consisting of 10- to 15-second flights 25 to 75 meters above the ground, often in large circles greater than 100 meters in diameter. Birds tend to rise rapidly from perches before circling and to drop abruptly back after completing flight songs. This would put these birds well within the rotor-swept zone, which extends from 35 to 125 meters above the ground. The applicant understates the risk of collision mortality by excluding any mention of this mating flight behavior. If the species selectively favors nesting near the edge of cleared areas, as the applicant contents, this risk would be even greater.

Wind power development (as part of the larger issue of energy and communication infrastructure) is specifically listed as a threat to high-elevation spruce-fir habitat in the New Hampshire Wildlife Action Plan, which states[25], "The direct threat is to the unique and fragile habitats of wind farm sites, as well as to the wildlife species associated with high elevation spruce-fir habitats. The development of wind farms results in a direct loss of habitat through road and facility construction and maintenance. Species such as spruce grouse, bay-breasted warbler, marten, Canada lynx, and Bicknell's thrush experience a direct loss of habitat as well as habitat fragmentation."

Wind energy development as well as habitat loss and degradation from development of permanent roads are also listed as threats to mountaintop forest in Maine's Comprehensive Wildlife Conservation Strategy[26]. It is also listed as a threat in the Partners in Flight Bird Conservation Plan for Eastern Spruce-Hardwood Forest (Rosenberg and Hodgman 2000), which states, "Perhaps the most immediate threat to important bird populations in the planning unit is the loss of boreal-mountaintop habitats that are critical for Bicknell's Thrush. Recent expansion

[24] Applicant Response to Public Counsel Third Set of Data Requests, response PC 3-45.
[25] New Hampshire Wildlife Action Plan, Appendix B, page B-87.
[26] Maine Comprehensive Wildlife Conservation Strategy, Table 36, page 245.

of ski resort developments in northern New England and New York, plus the potential development of wind-power stations, threaten several known Bicknell's sites." Wind power is also listed as a threat to Bicknell's thrush in the Atlantic Coast Joint Venture Atlantic Northern Forest bird conservation blueprint (Dettmers 2006).

The New Hampshire Fish and Game progress report stated, "forest fragmentation, habitat loss and disturbance could contribute to an exponential decline of marten in the project area. This would likely create a hole in the heart of primary marten habitat in NH." New Hampshire Audubon stated, "reduction and fragmentation of the limited available habitat may have long-term negative impacts on local and regional populations of this species [Bicknell's thrush]." We believe that these risks are unacceptable, and that project construction on Mount Kelsey would thus constitute an unreasonable undue adverse impact on the natural environment.

What are your concerns regarding Dixville Peak?

Dixville Peak exhibits similar ecological characteristics and values to Mount Kelsey. Based on our November 5, 2008 site visit, as well as the assessments of New Hampshire Audubon[27] and the Applicant[28], the Dixville Peak turbine string north of the summit of Dixville Peak shows no evidence of recent or historical disturbance and may well consist of primary forest. The occurrence of Bicknell's thrush was second only to Mount Kelsey[29], and the area is described as high quality marten habitat in the New Hampshire Fish and Game progress report. The project would bisect a large area of high-elevation spruce-fir habitat that is currently unfragmented except for a snowmobile/ATV trail corridor over the summit.

Based on the undisturbed nature of much of the Dixville Peak ridgeline and the impact that development would have on habitat for pine marten and Bicknell's thrush, we believe that as proposed the development of the Dixville Peak turbine string would also constitute an unreasonable adverse impact on the natural environment.

However, we do not believe that the habitat value of Dixville Peak is as high as that of Mount Kelsey. The area I surveyed (which included only turbines 27 through 30) was more even-aged, less mature and more structurally uniform than Mount Kelsey. I did not observe the level of standing or dead wood, or the extent of disturbance-created patches of different sizes and ages, as I did on Mount Kelsey. (However, the action of natural disturbance over time is likely to create greater habitat complexity in the future.) In addition, the area does have some existing disturbance, including a primary snowmobile/ATV corridor over the summit and extensive recent harvesting to the southwest of (and in close proximity to) the summit.

Because of the overall lower habitat value and greater existing disturbance, we could support development of the Dixville Peak turbine string under certain conditions. However, because the site does possess considerable habitat value for both marten and Bicknell's thrush, and because development would cause considerable degradation of the habitat for these species, we believe that development must be accompanied by significant compensatory mitigation. As described

[27] Application Appendix 24, page 24.
[28] Application Appendix 16, page 2.
[29] Application Appendix 24.

below, we do not believe that the current mitigation plan proposed by the applicant comes close to what should be required.

DESCRIPTION OF CONCERNS REGARDING PROPOSED MITIGATION

Why do you believe the proposed mitigation is inadequate?

The mitigation plan proposed by the Applicant provides little benefit and is totally inadequate to compensate for the impacts of development. The plan falls short in the following ways:

- The mitigation corridor along Mount Kelsey would not protect intact core habitat. As noted in the New Hampshire Natural Heritage Bureau progress report, much of the mitigation area would be impacted by edge effects from project development, and would protect only a narrow strip with project impacts on one side and subject to edge effect from harvesting on the other side.
- The mitigation corridor along the Owlhead string consists of second-growth mixed forest that does not currently provide high-quality habitat for the species of concern. While it is included in the area designated as high-elevation spruce-fir forest in the New Hampshire Wildlife Action Plan, the Applicant's community characterization[30] shows extensive recent harvesting impacts. While it may provide such habitat in the future, the development of this habitat will take many decades, long beyond the project's planned life span.
- The mitigation corridor along the Owlhead/Kelsey access road consists of second-growth mixed and hardwood forest that does not provide habitat for the species of concern. A narrow buffer along a major access road, subject to edge effect from both sides, provides no mitigation value for impacts to high-elevation forest.
- The limitation on additional future impact provides little added benefit, as once the project is installed there would be little likelihood of it expanding even without this protection.

In short, the mitigation plan does not in any way replace the habitat that would be eliminated or affected, provide strong protection for high-quality core habitat, or compensate for the impacts that the project would create. We agree with the Natural Heritage Bureau that in order to be considered adequate, mitigation should provide permanent protection to intact core habitat of equal or greater value to that being impacted.

What do you believe would be an acceptable mitigation package?

Assuming the Mount Kelsey turbine string is eliminated, we believe that the *minimum* mitigation for the impacts to the pristine high-elevation habitat on Dixville Peak should include permanent protection from future development and harvesting of all large blocks within the project area mapped as high-elevation spruce-fir habitat in the New Hampshire Wildlife Action Plan (minus areas that have been harvested since they were designated), including Mount Kelsey, Dixville Peak, and all areas extending from and contiguous with the Nash Stream State Forest.

[30] Application Appendix 16, Map 6.

As a comparison, the mitigation plan negotiated by AMC (in cooperation with Maine Audubon and the Natural Resources Council of Maine) with TransCanada for the Kibby Mountain project in western Maine included permanent protection from wind power development of 1100 acres of high-elevation land in the project area to which the developer had development rights, as well as a contribution of $500,000 toward the conservation of important high-elevation lands outside the project area. This contribution is being used to support protection of the Stowe Mountain property in the Mahoosucs region, and will permanently maintain 750 acres in a natural condition, including much of the land above 2,700' on Sunday River Whitecap, a mountain of significant ecological, recreational and scenic value. We note that the Kibby Mountain project, though larger than the current proposal (132 MW), involved far less significant ecological impacts. It was located exclusively in areas disturbed by previous harvesting, avoided pristine subalpine forest, did not impact high-quality Bicknell's thrush habitat, and created no serious impacts to state-listed rare wildlife species or other wildlife species of concern.

OTHER ISSUES OF CONCERN

Do you have other concerns about this project?

There are two additional areas of concern to us – the sensitivity of high elevation soils, topography and hydrology relative to road and turbine pad construction, and the decommissioning plan.

Describe your concerns regarding high elevation road construction.

Apart from development on Mount Washington, this project will be the most significant construction project ever undertaken at high elevations in New Hampshire, and there are few precedents for evaluating its potential impacts. It will involve construction of major roads (in some cases as wide as a two-lane state highway) on very steep slopes at high elevations. All of the turbines on Mount Kelsey and the majority on Dixville Peak are located above 3,000' in elevation. Soils in high elevation areas present many challenges and limitations to construction of even minor roads, including shallow-to-bedrock soils, excessive ledge, complex hydrology, high levels of precipitation, and short growing seasons. We note that the description of the Glebe-Sisk-Surplus general mapping unit[31] in the Coos County Soil Survey (NRCS 2003) states, "Areas of this unit are limited for commercial timber production because of the steep slopes and very slow tree growth…Climate and accessibility are severe limitations for most other uses. Hiking trails through these areas require careful planning as recovery from soil damage or vegetation is very slow." If even the development of hiking trails is a matter of concern, the risk from construction of major roads must be considered extremely high.

One of the concerns at higher elevation is increased precipitation. The rainfall distribution graphs included in the Alteration of Terrain permit application[32] are based on broad regional averages, with no allowances for precipitation differences with elevation (except for the obvious peak around Mount Washington). However, modeled precipitation estimates that take elevation

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[31] The Saddleback-Glebe-Ricker association that underlies the turbine strings on Mount Kelsey and Dixville Peak is a component of the broader Glebe-Sisk-Surplus mapping unit.
[32] Application Appendix 3a, pages 833-834.

into account available from the Natural Resource Conservation Service[33] (Attachment E) indicate that precipitation at the higher elevations within the project area may reach 55 to 60 inches per year – nearly 50% higher than the 35 to 40 inches found at lower elevations.

Also, a regression model of precipitation in relation to elevation for the northeastern United States developed by Ollinger et al. (1993) predicts that above 400 meters (about 1300') in elevation annual precipitation increases by 90 centimeters for every 1000 meters in elevation. This model predicts that annual precipitation on the summit of Mount Kelsey (3472') would be nearly 23 inches greater than at Dummer Pond (1359').

We do not have the technical expertise to evaluate the sufficiency of the Applicant's calculations in the Alteration of Terrain permit application. However, failure to account for the increased precipitation at high elevations could lead to undersizing of culverts, with increased risk of washouts and significant erosion.

The project will involve considerable construction on very steep slopes, in some cases exceeding 33%. Among the areas of greatest concern are:

- An extensive stretch (nearly two-thirds of a mile) along the summit road between the Owlhead and Kelsey turbine strings, extending to the location of turbine 15 (Attachment F, sheets 6 and 7[34]). This entire stretch lies on slopes in excess of 15% with much of it greater than 25%.
- Numerous interspersed steep slopes along the length of the Mount Kelsey turbine string (sheets 7 and 8), most notably between turbines 13 and 15.
- The Dixville Peak access road, which lies almost entirely on slopes of 15 to 25% and involves multiple wetland and stream crossings (sheet 9).
- The stretch between Dixville Peak turbines 4 and 6 (sheet 9). The summit cone of Dixville Peak contains extensive bedrock ledge (Attachment B, photo 12).

The project will also involve significant impacts to high elevation wetlands (see delineation of wetland boundaries in Attachment F). The Dixville Peak access road involves multiple wetland and stream crossing on steep slopes. The Kelsey and Dixville summit roads also involve numerous wetland crossings. Many of these wetlands may be classified as a distinct natural community (Acidic Sphagnum Forest Seep, rank S3S4) by the New Hampshire Natural Heritage Bureau (Sperduto and Nichols 2004) (Attachment B, photos 9, 10 and 11). The impact of road and turbine pad construction may extend beyond the actual impact area due to changes in topography as well as channelization of broad subsurface flows through culverts, both of which may alter water levels that maintain these wetlands.

Developing the project while minimizing impacts requires a high level of expertise and an understanding of the particular challenges of high elevation environments. However, in response to questions about their experience in these environments, the Applicant stated[35] "there is not an exceptional difference between designing roads on steep slopes above 2,800 feet in elevation and

[33] See http://www.wcc.nrcs.usda.gov/climate/prism.html.
[34] Note that as provided by the Applicant these maps are oriented with north at the bottom of the sheet.
[35] Applicant Response to Industrial Wind Action Group First Set of Data Requests, question IWAG 1-27.

designing roads on steep slopes at lower elevations." In response to questioning at the December 19, 2008 Technical Session, Steve LaFrance described the short growing season as the primary issue with constructing roads at high elevations but to my memory made no mention of other issues.

In comments filed with Maine's Land Use Regulation Commission on the proposed Redington Mountain wind power project (a project located in similar topographic and soil conditions to the current proposal) (Attachment G), Maine State Soil Scientist David Rocque described the unique challenges of high elevation road construction:

> "My primary concern with this proposed project is with the construction of roads in such a fragile area with multiple limitations (some severe) including unique soils, boulder covered surface areas, very steep slopes, depth to bedrock, number and type of drainage ways, climate, shallow seasonal water tables and type of road needed. It will be almost impossible to construct the type of (stable) roads needed without significant alteration to the mountains and in particular to the hydrology that supports streams, wetlands and groundwater systems below. Many of the soils to be disturbed have very low development potential including road construction potential. Also, high mountain soils often have a higher seasonal water table than indicated by the soil morphology because of the cool climate and steep slopes (warm, stagnant groundwater is needed for the development of soils drainage mottling)."

Mr. Rocque makes particular mention of the need to minimize alterations to high mountain hydrology through the use of techniques such as "rock sandwich" roadbeds rather than ditching with culverts. In response to a question at the December 19, 2008 technical session, Steven LaFrance indicated that they had not planned to use this technique but would be open to considering it.

The unique challenges of construction in this environment and the potential for significant adverse impacts are an important additional consideration in our evaluation of the suitability of Mount Kelsey and Dixville Peak for development, as described later in this testimony. It is incumbent upon the SEC (and particularly on the Department of Environmental Services) to exercise the highest level of oversight during the review of this aspect of the project, and not to treat it as just another road project that can be assessed using the normal consideration given to projects at lower elevations.

Please describe your position on the decommissioning plan.

We share the hope of all parties that should the project be permitted (in whole or in part) that it continues to generate renewable energy for many years. However, a robust decommissioning plan is necessary to deal with the consequences of possible unforeseen events that lead to a cessation of project operation.

The draft Decommissioning Plan presented by the Applicant[36] provides an appropriate outline for developing a final plan, but does not contain enough specific detail in certain areas. In

[36] Received from the Applicant following a request from the Counsel for the Public at the December 19, 2008 Technical Session.

particular, the method of funding assurance and the specific scope of decommissioning work remains to be determined. For these matters, we believe an appropriate decommissioning plan should meet the following criteria:

- It must be robust enough to provide sufficient funding for decommissioning in the event of a worst-case scenario such as bankruptcy of the project owner.
- It must provide sufficient funds to allow for complete removal of all above- and belowground project materials and stabilization and revegetation of all disturbed areas.
- Funds sufficient to accomplish these goals should be in hand prior to the commencement of any construction activity.
- The fund should be regularly reviewed and augmented as necessary to reflect changes in the estimated cost of decommissioning.

In addition, we believe the fund should be based on the gross cost of decommissioning, and should not be reduced by the estimated value of the anticipated sale of removed materials for scrap or reuse as proposed by the Applicant. The market value of used wind turbine components at some future date is subject to a high degree of uncertainty, and prices for scrap metal may fluctuate considerably over short periods of time[37]. The Applicant proposes updating the estimated cost of decommissioning only every five years. Relying on value of these materials (which could be set at a high point in the market, and which may become grossly outdated over a five year period) to offset the cost of decommissioning may provide insufficient funds to carry out decommissioning. The state should not have to bear this risk, the sole purpose of which is to reduce the up-front cost of the decommissioning fund to the Applicant. Instead, any funds received from the sale of these materials would be returned to the project owner at the time of decommissioning.

EVALUATION OF PROPOSED PROJECT RELATIVE TO AMC'S SITING CRITERIA

How do the various turbine strings rate according to AMC's siting criteria?

AMC's siting criteria (Attachment A) provide project evaluation criteria in seven areas, each of which is rated as to four possible levels of suitability. We evaluated each turbine string separately (Table 1 and discussion below). It is important to note that this evaluation is based on the potential impact to resources of recognized state, regional or national significance; issues of primarily local concern are not considered.

[37] We reviewed scrap metal prices provided by American Metal Markets (www.amm.com). This is a commercial subscription-only site that was accessed through a free trial subscription. Because the material on this site is copyrighted in cannot be reproduced in this testimony. During 2008 scrap iron prices (No. 1 heavy melting steel at Pittsburg, Chicago and Philadelphia) ranged from approximately \$100 to \$550/gross ton, at one point declining about 80% over a three month period. During 2006 and 2007 prices were generally more stable, but in both years price declines of about 20% occurred over the course of two months. Other information indicated that cuurent prices for a range of scrap steel products are about one-third lower than they were one year ago.

Table 1. Evaluation of proposed turbine strings based on AMC siting criteria.

Category	Dixville	Kelsey	Owlhead	Fishbrook
Ownership and Land Use	Moderately unsuitable	Moderately unsuitable	Moderately suitable	Moderately suitable
Soils and Topography	Least suitable	Least suitable	Moderately unsuitable	Moderately suitable
Roads and Access	Moderately suitable	Moderately suitable	Moderately suitable	Moderately suitable
Vegetation/Natural Communities	Least suitable	Least suitable	Most suitable	Most suitable
Wildlife	Least suitable	Least suitable	Most suitable	Most suitable
Scenic	Moderately suitable	Moderately suitable	Moderately suitable	Moderately suitable
Recreation	Moderately suitable	Moderately suitable	Moderately suitable	Moderately suitable

Ownership and Land Use – The Dixville and Kelsey strings, as well as the northern portion of the road connecting the Owlhead and Kelsey strings, comprise high-elevation subalpine forest that is of low productivity and generally unsuitable for commercial timber management (as evidenced by the fact that these areas have not been harvested in the past). The Owlhead and Fishbrook strings lies within recently harvested commercial forest.

Soils and Topography – As described previously, the Kelsey and Dixville turbine strings involve extensive construction on steep slopes with numerous wetland crossings. The southern portion of the Owlhead string encompasses many slopes in excess of 25%. The Fishbrook string is much more even, although with a few steeper areas.

Roads and access – All strings are similar, with existing roads at the base of the ridgelines but no existing access within the turbine strings themselves.

Vegetation and natural communities – The Dixville and Kelsey strings, as well as the northern portion of the road connecting the Owlhead and Kelsey strings, would be located in currently unfragmented blocks of primary forest. The Owlhead and Fishbrook strings consist of relatively common second-growth forest.

Wildlife – The Dixville and Kelsey strings, as well as the northern portion of the road connecting the Owlhead and Kelsey strings, would create significant disturbance to high-quality habitat for several species of high conservation concern (definitely marten and Bicknell's thrush and potentially three-toed woodpecker and Canada lynx). The Owlhead and Fishbrook strings would have limited impact on habitat for these species.

Scenic; Recreation – None of the strings involve significant issues in these two categories.

Both the Dixville and Kelsey strings rate as "least suitable" in three of the seven categories and "moderately unsuitable" in one other, though as described earlier we consider Mount Kelsey to be of greater overall concern than Dixville because of distinctions not reflected in these relatively broad ratings. The Owlhead string rates as "moderately unsuitable" in the Soils and Topography category because of the inclusion of steep slopes, though otherwise we consider it to be generally acceptable for development. Fishbrook rates as "most suitable" or "moderately suitable" in all categories, which is as highly as an undeveloped forested ridgeline can rate under our criteria.

SUMMARY

As a general principle, the AMC supports the commercial development of wind power on terrestrial ridgelines in New England, as it uses an indigenous renewable energy resource to reduce the region's dependence on fossil fuels for energy generation. We have a demonstrated track record of supporting wind power projects that we believe are appropriately sited. However, we believe that the development of this resource must be carefully balanced with protection of undeveloped lands with particularly high ecological, recreational or scenic value.

Based on our review of the application, we support the development of the Fishbrook and Owlhead turbine strings. These sites have been impacted by previous human activity and do not possess natural resource values of recognized state, regional or national significance.

However, we do not support development of the Kelsey and Dixville turbine strings as proposed. We believe that this development would constitute an unreasonable adverse impact on the natural environment under the provisions of NH RSA 162-16:H.IV. This development would also conflict with the goals of other existing state policies, most notably the State Wildlife Action Plan and potentially the adaptation goals of the New Hampshire Climate Change Action Task Force (currently under development).

The Mount Kelsey ridgeline contains an old-growth subalpine forest that provides high quality habitat for several wildlife species of high conservation concern in the state (the state-listed American marten and three-toed woodpecker as well as Bicknell's thrush). Development of this ridgeline would fragment and degrade a significant block of critical high-elevation spruce-fir habitat and create an unacceptable risk to these species. It would also adversely affect the ability of this block to serve as a refugia for spruce-fir-dependent species during future climatic warming. We do not believe that Mount Kelsey should be developed under any circumstances.

Dixville Peak possesses similar characteristics as Mount Kelsey, though we judge it to be of somewhat lower overall ecological value. While we believe that development of this site would constitute an unreasonable adverse impact on the natural environment as proposed, we would consider supporting development of this string if it were balanced by appropriate mitigation. However, the current high-elevation mitigation plan proposed by the Applicant provides little to no mitigation value and falls far short of what is needed to compensate for the impacts of this development.

We thank you for the opportunity to provide this testimony.

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<u>List of Attachments</u>

A. Appalachian Mountain Club General Policy on Wind power

B. Photographs of project site. (All photos taken by David Publicover during site visits of October 26 and November 5, 2008.)

C. Size distribution of balsam fir in New Hampshire spruce-fir stands.

D. Abstracts for Seidel et al. (undated) and Spear (1989).

E. Map of modeled precipitation in northern New Hampshire and western Maine, derived from USDA Natural Resource Conservation Service PRISM model data.

F. Slope maps of Kelsey/Owlhead and Dixville turbine strings, including wetland boundaries. (Received from Applicant in response to AMC additional data requests AMC 1-8 and TS 3-17.) (Provided as separate files in digital copies of this testimony.)

   - Sheet 6: Owlhead North
   - Sheet 7: Kelsey South
   - Sheet 8: Kelsey North
   - Sheet 9: Dixville South
   - Sheet 10: Dixville North

G. Comments regarding high-elevation road construction submitted by Maine State Soil Scientist David Rocque to the Maine Land Use Regulation during consideration of application for the Redington Mountain wind project by Maine Mountain Power.

Appalachian Mountain Club
GENERAL POLICY ON WINDPOWER
(Approved by Conservation Programs Committee 6/13/96, Revised 12/07/06)

AMC's position on wind power has been developed in light of our mission statement:

> "*The AMC supports the protection, enjoyment, and wise use of the mountains, rivers, and trails of the Northeast."*

AMC's position has also been developed in coordination with other approved AMC policies. Since many potential sites for large commercial wind power facilities are located in the Northern Forest, the siting of wind power facilities should avoid or minimize compromising the first two goals outlined in AMC's "Summary of Northern Forest Lands Policy and Strategy" (April 7, 1991):

- "*Conserve the integrity of the Northern Forest Lands as a vast, unfragmented natural resource*."
- "*Sustain and protect ecologically vigorous, healthy, and diverse ecosystems*."

AMC's Energy Policy (adopted November 30, 2005) directs the organization to:

- "*selectively engage in those components of the energy issue where the nexus is strong with AMC's mission and strengths, and where AMC can make a meaningful contribution*."
- "*support significant increases in renewable energy that results in actual greenhouse gas and air pollutant reductions and is balanced with strong protection of natural and recreational resources of statewide, regional or national significance*."
- "*develop wind power siting policies at the state level, based on landscape constraint analysis that locates wind power development to sites that contain few to no recognized natural and recreational resources of statewide, regional or national significance*."

The following general principles will guide AMC's decisions about future wind power projects:

1) The AMC believes that human actions are accelerating the rate of climate change, and this change poses a serious risk to society and the region's ecosystems. AMC recognizes that wind power and other renewable energy sources must have a substantive role in reducing greenhouse gas and air pollution emissions in our region.

2) The AMC posits that state policies or regulations specific to wind power are needed. Unlike most other technologies, siting of wind power is constrained by the need for an adequate wind resource, much of which is located in undeveloped areas of potentially high ecological, recreational and/or scenic value. State wind power policies or regulations should provide for an assessment of cumulative impacts, mitigation for impacts, set specific criteria for determining suitable sites, and implement appropriate regulations for wind power development, permitting, operation and decommissioning. They should assure that an appropriate balance between the development of wind power and protection of higher-elevation areas and associated resource values is maintained, and provide strong direction as

to which sites will be considered suitable or less suitable for wind power development. Effective state policies or regulations should also reduce project siting conflicts and permitting delays and provide more certainty to wind power developers in the regulatory process. The AMC reserves the right to decline to support any project that does not take place in the context of an adequate and official state wind power siting policy, or where proposed mitigation does not include provisions for the protection of mountainous areas of equal or greater value as a condition for permitting.

3) Wind power projects should lead to a verifiable replacement of electrical generation from dirtier fossil fuel power sources within the project's service region. They should not just provide for cheaper power or replace other renewables or pollution reductions derived from conservation or demand side management programs.

4) Projects should include provisions to provide for decommissioning if the project is no longer producing power (including rehabilitation of roads and revegetation of cleared areas). Project permitting should be conditioned on payment into a decommissioning fund, or some other mechanism, to ensure that rehabilitation of abandoned sites will take place.

5) Project permits should contain adaptive management provisions, such that if an unanticipated impact occurs, project operations would be modified to reduce or eliminate such impacts (i.e. unanticipated bird migration mortality that could be eliminated with temporary turbine shut downs during the migration period).

The AMC believes that appropriate state-initiated wind power siting guidelines can reduce siting conflicts and will assist with the efficient development of wind power. AMC will work cooperatively with states, the wind industry, conservation organizations, and other interested parties to develop balanced and realistic state wind power siting policies, regulations and statutes.

SPECIFIC SITING GUIDELINES

This section sets forth guidelines that address issues associated with the siting of commercial wind power facilities in Northeastern mountain environments. (Issues associated with other areas, such as the seacoast and offshore are not addressed because they are outside the AMC's current area of expertise.) The AMC intends to use these guidelines as a framework for evaluating large-scale wind power project proposals; smaller individual or local-use wind power facilities may involve different considerations. These guidelines are intended to address those issues that are generally associated with wind power projects, but we recognize that additional site-specific factors or concerns may arise. These more site-specific issues will also be taken into consideration in evaluating any project.

In evaluating proposed wind power projects, AMC will consider the extent and nature of any conflicts with natural resource values of recognized state, regional or national significance, as well as any proposed mitigation for such impacts. The guidelines seek to make distinctions based on objective standards where possible. In practice any decision by the AMC to support, oppose or remain neutral with respect to any proposed project will be based on all of the factors addressed by the guidelines and any important site-specific factors. In some cases a single severe conflict may render a site unsuitable for development; in other cases a combination of less severe resource conflicts may, in the aggregate, render the site unsuitable. In other cases, the type, scale or number of conflicts may not render the site unsuitable, after considering proposed mitigation for impacts or changes to an applicant's design plans.

The AMC recognizes that there has been relatively limited experience with wind power facilities in the Northeast, and expects that the guidelines set forth here will be reviewed and revised based on future experience and on the development of state siting guidelines or regulations for wind power projects.

OWNERSHIP AND LAND USE

Commercial wind power facilities should be located on private or already developed public lands. When additional infrastructure is required, impacts should be minimized. Most appropriate are sites that already contain the necessary infrastructure (roads, transmission lines, etc.). Public lands set aside for natural resource protection, scenic attributes and/or backcountry recreation should not generally be considered for wind power development, particularly if the construction of commercial windfarms would be incompatible with the purposes for which public land was set aside.

Wind power development should be restricted to areas that have seen major commercial activities (e.g. agriculture, timber harvesting, etc.) and associated road building in the past or are likely to in the near future. Higher elevation areas where future timber harvesting is unlikely ("non-commercial timberland") should not be developed for wind power, since these areas will most likely remain relatively undisturbed in the future. AMC encourages wind power siting in areas where human development already dominates (e.g. agricultural and urban areas).

Most suitable: Private land with existing infrastructure and agricultural land. Developed public lands (e.g. municipal waste treatment facilities, school or hospital campuses, etc.), assuming that projects are at an appropriate scale for the site and do not seriously impact other major public values.
Moderately suitable: Private commercial timberland with infrastructure in relatively close proximity.).
Moderately unsuitable: Private non-commercial timberland.
Least suitable: Undeveloped public land.

SOILS AND TOPOGRAPHY

Soils in potential mountain wind power areas are generally cryic (cold regime) and thus inherently more fragile than soils at lower elevation. Disruption of these soils will be a likely consequence of wind power development in high-elevation areas. Therefore siting criteria should aim to minimize soil disruption by siting these facilities in topographically suitable locations.

Suitable: Sites with relatively even ridgelines and gradual approach slopes. Access routes and turbine strings should be able to avoid steep slopes (in excess of 15-20%) in order to prevent excessive sidecuts and fill areas. Potential for sedimentation of streams and ponds must be low.

Moderately suitable: Suitable sites (as defined above) but with small and unavoidable wet soil or steep slope areas where the impacts can be mitigated. Construction must avoid extensive cut and fill for individual turbine pads or road sections.

Moderately unsuitable: Sites with some inclusion of steeper slopes requiring significant terrain alteration on access roads and turbine strings.

Least suitable: Ridgelines with steep slopes, extensive areas of wet or seepy soils or subsurface drainage patterns, uneven topography or large bedrock outcrops requiring extensive terrain alteration along turbine strings and access roads.

ROADS AND ACCESS

High-elevation areas may be the least accessible parts of an otherwise accessible landscape. Wind power facilities located in more remote areas may compromise the remote character of the site.

Most suitable: Areas with existing permanent and secondary access, including roads into and through the proposed site.

Moderately suitable: Areas with well-developed, permanent and secondary access in the vicinity of the site (i.e., lower elevations) but limited access within the site.

Moderately unsuitable: Areas with limited existing access in the vicinity of the site (i.e., few permanent roads or very low road density even in adjacent low-elevation areas).

Least suitable: Areas in which construction of the facility would have a significant impact on large areas that are essentially roadless.

VEGETATION AND NATURAL COMMUNITIES

Commercial wind power facilities will generally be located in montane boreal forest or upper-slope northern hardwood forest. Potential sites could also encompass subalpine boreal forest, krummholz, alpine areas, or bare rock. In addition, these areas may include areas of high-elevation wetlands or unusual natural communities.

Most suitable: Agricultural lands and areas dominated by relatively common second-growth northern hardwood or spruce-fir forest types. Most preferable would be areas of younger hardwood forest showing obvious evidence of past harvesting.

Moderately suitable: Areas similar to the above but with some inclusions of wetlands, rare communities, or rare plant populations; construction must be able to be located so as to avoid disrupting these sites.

Moderately unsuitable: Mature second-growth spruce-fir forests as this habitat is in short supply across the northern New England landscape. Subalpine boreal forest with little or no commercial timber potential.

Least suitable: Krummholz and alpine areas or sites with extensive inclusions of wetlands or rare communities. Areas where no evidence of previous harvesting is present. Areas containing populations of rare plants where construction would threaten the viability of these populations.

WILDLIFE

Wildlife impacts must be addressed including the site-specific impact on species resident at the site (including small mammals, herps, and birds), the cumulative effect on wide-ranging species (e.g. lynx) and migratory birds and bats, and the potential for the onsite-project habitat modifications to attract species and put them at risk.

Most suitable: Areas away from major bird and bat migration routes and containing little or no known habitat for species of concern. Areas where local habitat has already been altered or disturbed by past activity.

Moderately suitable: Areas away from major bird and bat migration routes but containing known small-scale habitats for species of concern (such as certain small mammals or birds); construction must be able to be located so as to avoid disrupting these sites.

Moderately unsuitable: Areas with significantly higher-than-average passage rates for migratory birds and bats. Areas containing potential habitat for species of concern. Areas that have a high potential, due to habitat manipulation from project construction, to attract wildlife and put them at risk.

Least suitable: Areas containing extensive or critical habitat for species of concern that is known to be currently occupied, such that construction could not avoid impacting these sites or the species that utilize them. Areas identified as priority focus areas in state Wildlife Action Plans where development would degrade the habitat that was the rationale for delineation of the area. Large areas of mature, unfragmented habitat where this habitat is absent or uncommon in the surrounding landscape. Areas located along major bird and/or bat migration routes, which have a relatively narrow funnel across the landscape that intersects with a site.

SCENIC

Any wind power development will have unavoidable scenic impacts. Assessment of impacts must consider not only impact on existing recreational areas but also the potential impact on areas with high potential for expanded recreational use in the future. Considering only current scenic impact may lead to a conflict with the goal of protecting remote areas by promoting siting in remote areas with high potential for expanded recreational use.

Scenic impacts should be evaluated according to their effect on actual or potential impact in areas where a natural-appearing landscape is important. Thus the impact in areas that already show extensive development (such as in the vicinity of towns or highways) should not be AMC's primary concern, though it may be important to the residents of these areas.

Most suitable: Areas where evidence of permanent human development is already a noticeable component of the landscape, e.g. agriculture, highly developed recreational areas like ski areas, etc.

Moderately suitable: Areas where the primary scenic impact is to the view from developed areas (roads, settlements); areas beyond the midground (approximately 5 miles) of current or potential public recreational areas that depend on a natural landscape for their appeal.

Moderately unsuitable: Areas within the foreground (less than ½ mile) of less intensively used public recreation areas (such as minor hiking trails).

Least suitable: Areas within the fore- and midground (approximately 0-5 miles) of major recreational use areas (such as the Appalachian Trail, state and national parks, Wild and Scenic Rivers, etc.), exceptions being where there is already evidence of extensive human development within the viewshed.

RECREATION

As with scenic impacts, impact on recreational use must consider the likely closure of the project site to the public for safety and security reasons, and the project's impact on the recreation experience. Existing and future recreational use should be included in the evaluation, as growth in recreational demand may mean the expansion of recreational activity into new areas in the future.

Most suitable: Areas with little current use and limited appeal for increased use in the future, and areas that will not create barriers to recreational trail corridors.

Moderately suitable: Areas where current use is limited to activities that co-exist well with managed forest landscapes (ex. snowmobiling, hunting), where current backcountry use is low, and where there is limited opportunity for increased backcountry recreation in the future.

Moderately unsuitable: Areas that contain scattered features with moderate backcountry recreational use (such as hiking trails to minor peaks), or where the project could pose a barrier to identified recreational trail corridors.

Least suitable: Areas that currently receive a high level of backcountry recreational use, or where the landscape features and location are such that the potential for increased backcountry use is high. Sites traversed by existing regional or long-distance trails.

Photo 1 – Mount Kelsey

Photo 2 – Mount Kelsey

Photo 3 – Mount Kelsey

Photo 4 – Mount Kelsey

Photo 5 – Mount Kelsey

Photo 6 – Mount Kelsey

Photo 7 – Mount Kelsey

Photo 8 – Mount Kelsey

Photo 9 – Mount Kelsey

Photo 10 – Dixville Peak

Photo 11 – Dixville Peak

Photo 12 – Dixville Peak

Attachment C. Size distribution of balsam fir in New Hampshire spruce-fir stands.

The table below shows the size distribution of balsam fir trees in spruce-fir stands in New Hampshire, as determined from sampling done by the US Forest Service's statewide Forest Inventory and Analysis (FIA) program.

The data were obtained from the Forest Service's online Mapmaker 3.0 data retrieval system[38]. The data include 53 plots characterized as the Red Spruce, White Spruce, Balsam Fir or Red Spruce/Balsam Fir forest types, representing a total of slightly over 300,000 acres of New Hampshire timberland.

These data indicate that balsam fir trees of the size of the larger trees found along the Mount Kelsey ridgeline are uncommon in spruce-fir stands in the state and represent the upper limit of trees generally found in these stands. (Balsam fir larger than 14.9" DBH may be present in these stands, but were sufficiently rare that they were not encountered on the FIA sample plots. Larger fir may also be present on more productive soils supporting other forest types.)

Table C-1. Size distribution of balsam fir in spruce-fir stands in New Hampshire.

	Diameter at breast height (DBH) range						
	1.0-2.9	3.0-4.9	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9
Trees/acre	510.1	72.1	54.9	34.3	10.8	4.1	1.2
% of Trees >5" DBH			52%	33%	10%	4%	1%

[38] See http://www.ncrs2.fs.fed.us/4801/fiadb/fim30/wcfim30.asp.

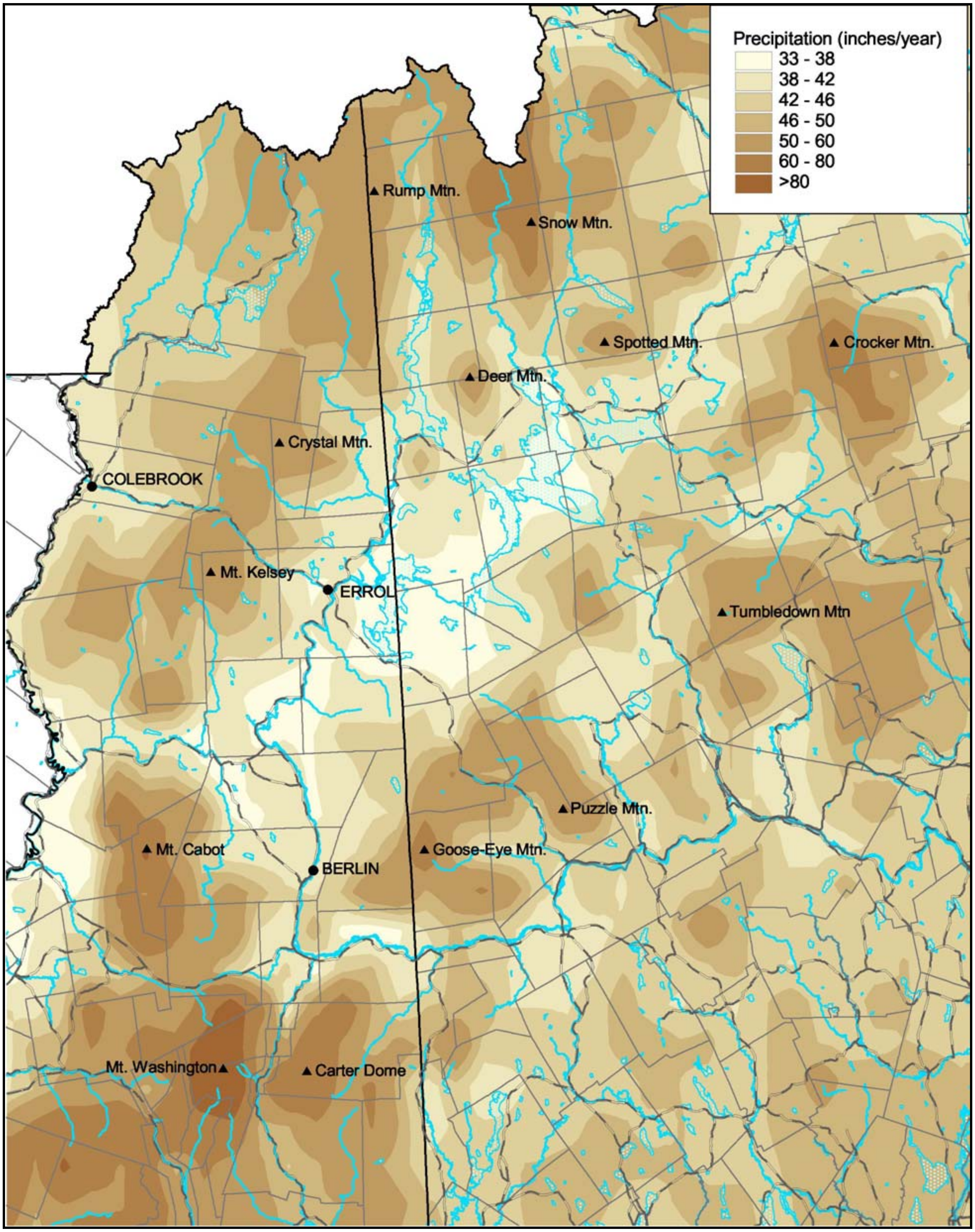
Attachment D. Abstracts for Seidel et al. (undated) and Spear (1989).

Seidel, T.M., D.M. Weihrauch, K.D. Kimball, A.P. Pszenny, R. Soboleski, E. Crete and Murray. Evidence of climate change since the 1930s declines with elevation on Mount Washington, New Hampshire, USA. Arctic, Antarctic, and Alpine Research J. (accepted for publication).

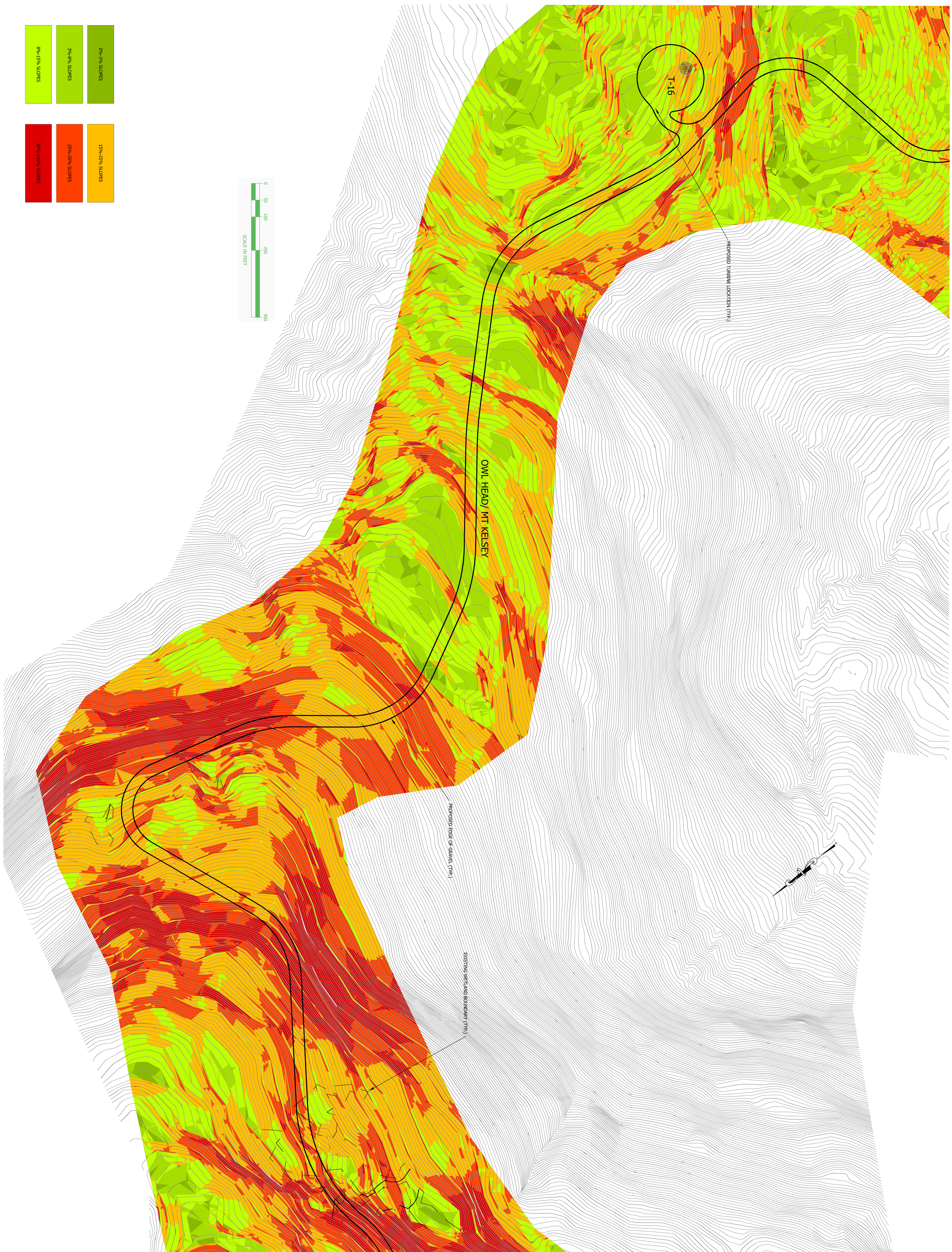
Abstract: Mount Washington, NH has the longest northeastern U.S.A. mountain climatological record (1930s to present), both at the summit (1914 m) and Pinkham Notch (612 m). Pinkham's homogenized daily temperature exhibits annual (mean=+0.07°C/decade, $p=0.07$; min=+0.11°C/decade, $p=0.01$), winter (min=+0.18°C/decade, $p=0.07$), spring (max=+0.13°C/decade, $p=0.10$) and summer (min=+0.11°C/decade, $p=0.01$) warming trends. Though suggesting annual, winter and spring warming (0.05 to 0.12°C/decade), mean summit temperature trends were not significant. Pinkham shows no significant change in date of first and last snow, the summit does but the period of record is shorter. Onset of continuous snow cover has not changed significantly at either site. Thawing degree days trended earlier at the summit (2.8 days/decade; $p=0.01$) and Pinkham Notch (1.6 days/decade, $p<0.01$), but end of continuous snow cover trended significantly earlier (1.6 days/decade; $p=0.02$) only at Pinkham. Growing degree days showed no significant trends at either location. Pinkham exhibits more climatic change than the summit but less than regional lower elevations. The summit's resistance to climate warming has been observed on other mountain ranges. Thermal inversions, high incidence of cloud fog and the summit commonly at or above the regional atmospheric boundary layer may explain its resistance to climate warming.

Spear, R.W. 1989. Late-Quaternary history of high-elevation vegetation in the White Mountains of New Hampshire. Ecological Monographs 59:125-151.

Abstract: The pollen and plant-macrofossil records from four small lakes in the subalpine and alpine zone of the White Mountains, New Hampshire, give a 13 000-yr paleoenvironmental history. The White Mountains were deglaciated before 13 000 yr BP. Downwasting of the continental ice sheet was rapid. The summits projected above the ice as nunataks for only a brief period of time. Residual ice may have existed in Franconia Notch until 11 000 yr BP. From 13 000 to 11 750 yr BP a barren periglacial desert covered the highest altitudes in the White Mountains. Tundra vegetation occupied the lower slopes and valleys. The mean annual temperature was roughly 5° - 10°C colder than today. Sparse tundra vegetation surrounded all four high-elevation sites from 11 750 to 10 300 yr ago and several taxa, particularly Artemisia and Caryophyllaceae, indicate disturbance. The summits were subjected to intense periglacial activity. The mean annual temperature was 4 - 6° lower than present. By 10 300 yr BP shrubs such as willow, juniper, and dwarf birch had invaded the tundra at Lake of the Clouds. Spruce woodland dominated the lower slopes and valleys. At 10 300 yr BP spruce populations arrived at high-elevation sites. Macrofossils of fir, birch, and shrubs also occur in sediments of this age. The temperature increased to or exceeded modern levels. Tree species did not reach the Franconia Notch sites until 9750 yr BP. At these sites the establishment of subalpine forests spanned a much shorter time period. Forest with poplar, spruce, and birch replaced the spruce woodlands of low elevations. Subalpine fir forests became well established by 9000 yr BP. Evidence from the alpine site shows that the fir trees were more abundant and treeline higher than today from 10 300 to 5000 yr BP. After 5000 yr BP, the pollen percentages of alpine indicators increased and the numbers of fir macrofossils dropped. Of the three sites in subalpine fir forest, only the lowest shows any evidence of a warmer interval in the early Holocene. Treeline is apparently a poor temperature indicator because wind and moisture are the major factors determining its position. Taxa of the Northern Hardwood Forest (e.g., white pine, hemlock, yellow birch, sugar maple, and beech) arrived at lower elevations by 6500 yr BP, but the zones of modern vegetation became established only after 2000 yr BP when spruce populations expanded at low elevations between 750 and 1200 m.



Attachment E. Modeled annual precipitation derived from the Natural Resource Conservation Service PRISM model (see http://www.wcc.nrcs.usda.gov/climate/prism.html).



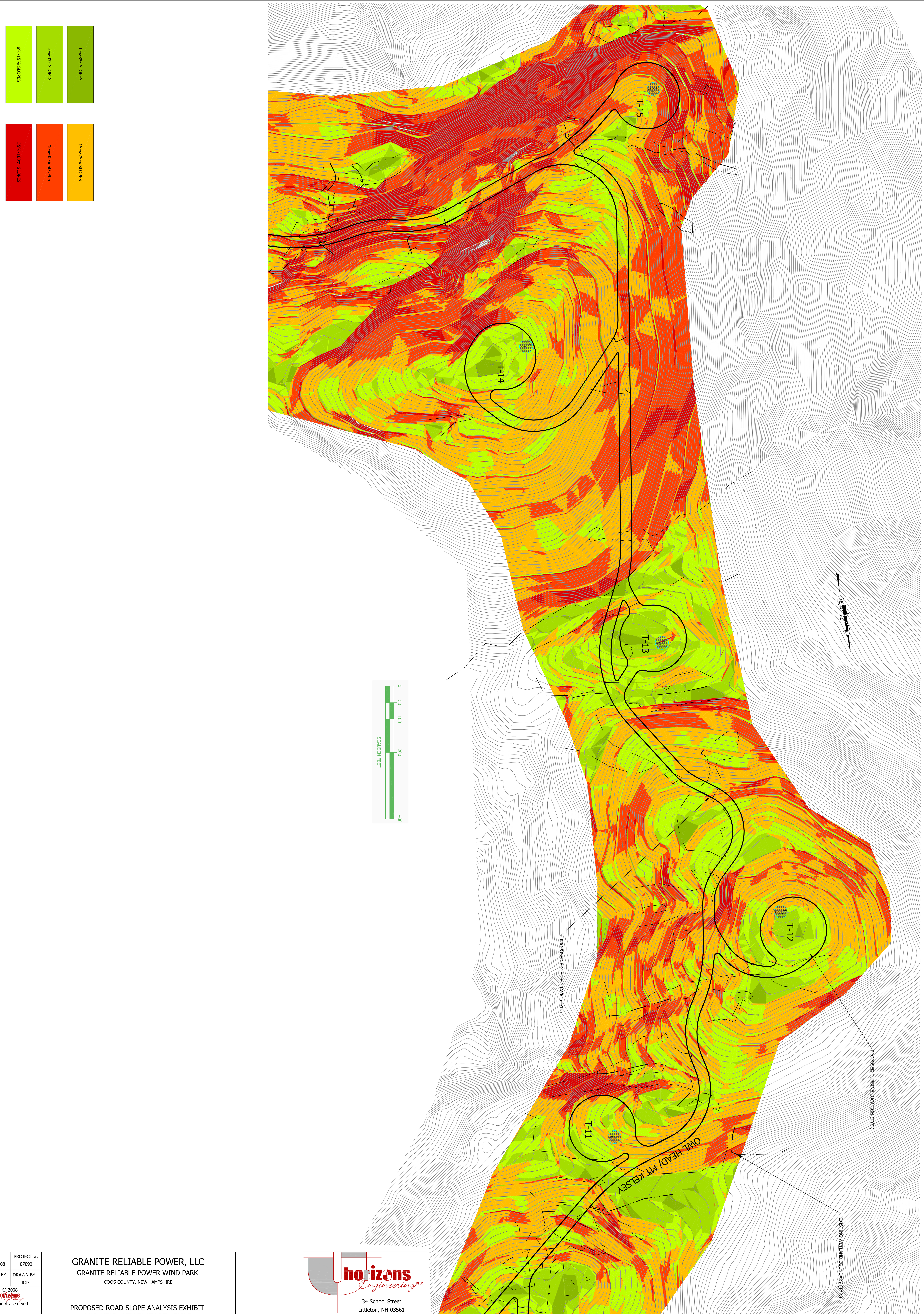
DATE: OCT 2008	PROJECT #: 07090
ENGIN'D BY: PLB	DRAWN BY: JCD

SHEET 2 OF 4

GRANITE RELIABLE POWER, LLC
GRANITE RELIABLE POWER WIND PARK
COOS COUNTY, NEW HAMPSHIRE

PROPOSED ROAD SLOPE ANALYSIS EXHIBIT
OWL HEAD/ MT KELSEY RIDGELINE

horizons Engineering PLLC
34 School Street
Littleton, NH 03561
Phone 603.444.4111 - Fax 603.444.1343



DATE:	PROJECT #:
OCT 2008	07090
ENGIN'D BY:	DRAWN BY:
PLB	JCD

SHEET 3 OF 4

GRANITE RELIABLE POWER, LLC
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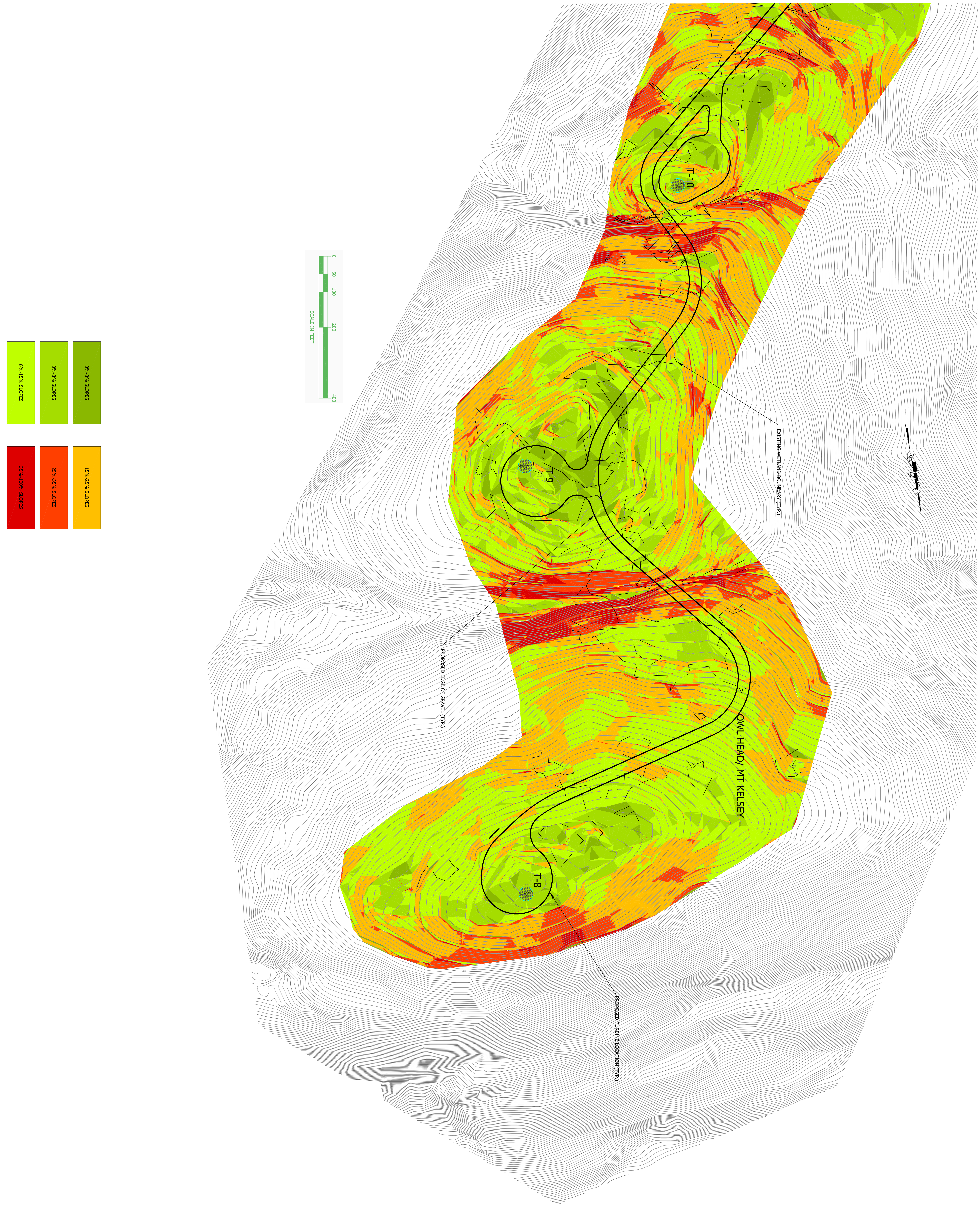

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SHEET 4 OF 4

GRANITE RELIABLE POWER, LLC

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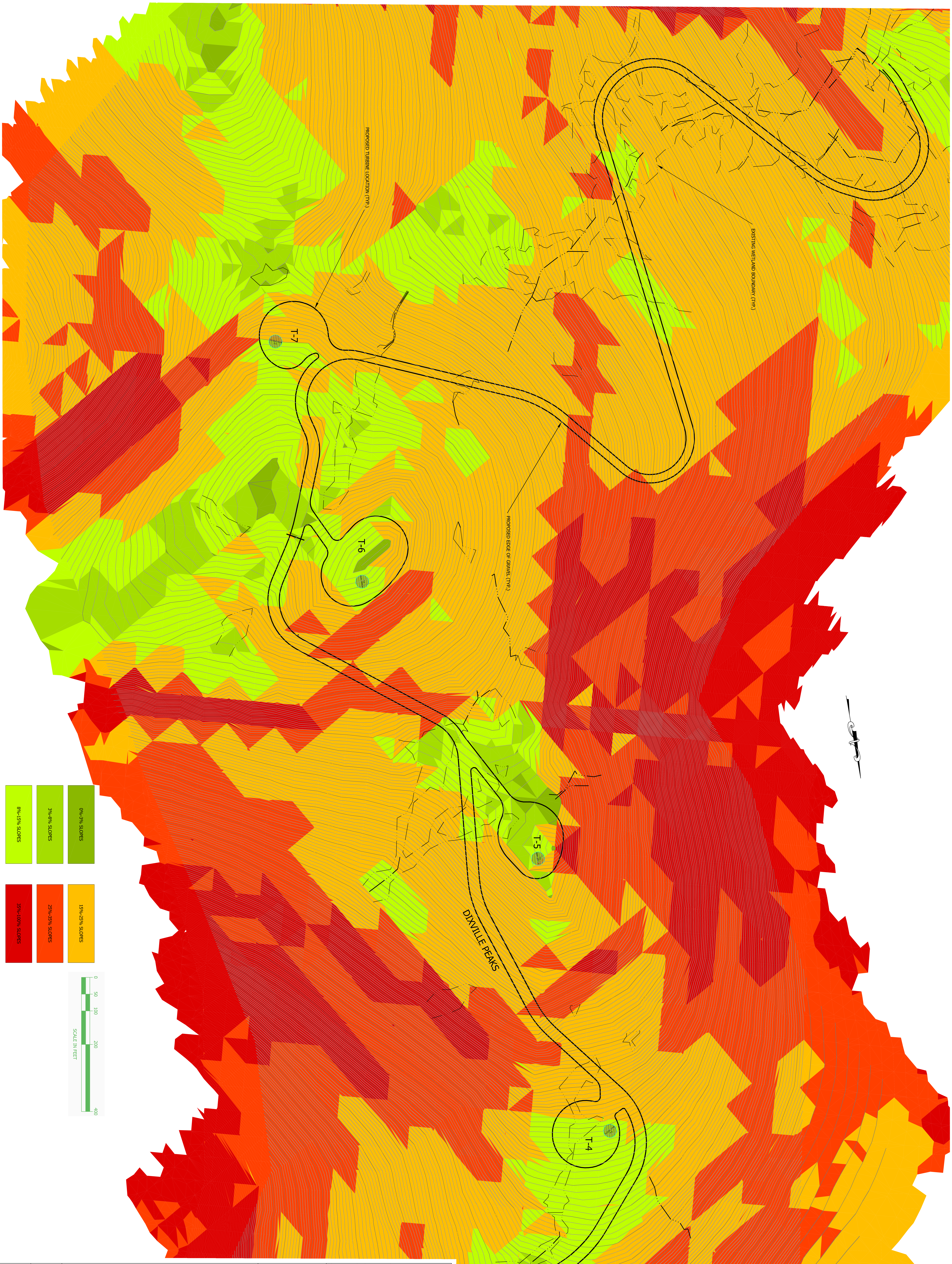

DATE:	PROJECT #:
OCT 2008	07090
ENGIN'D BY:	DRAWN BY:
PLB	JCD

SHEET 1 OF 2

GRANITE RELIABLE POWER, LLC
GRANITE RELIABLE POWER WIND PARK
COOS COUNTY, NEW HAMPSHIRE

PROPOSED ROAD SLOPE ANALYSIS EXHIBIT
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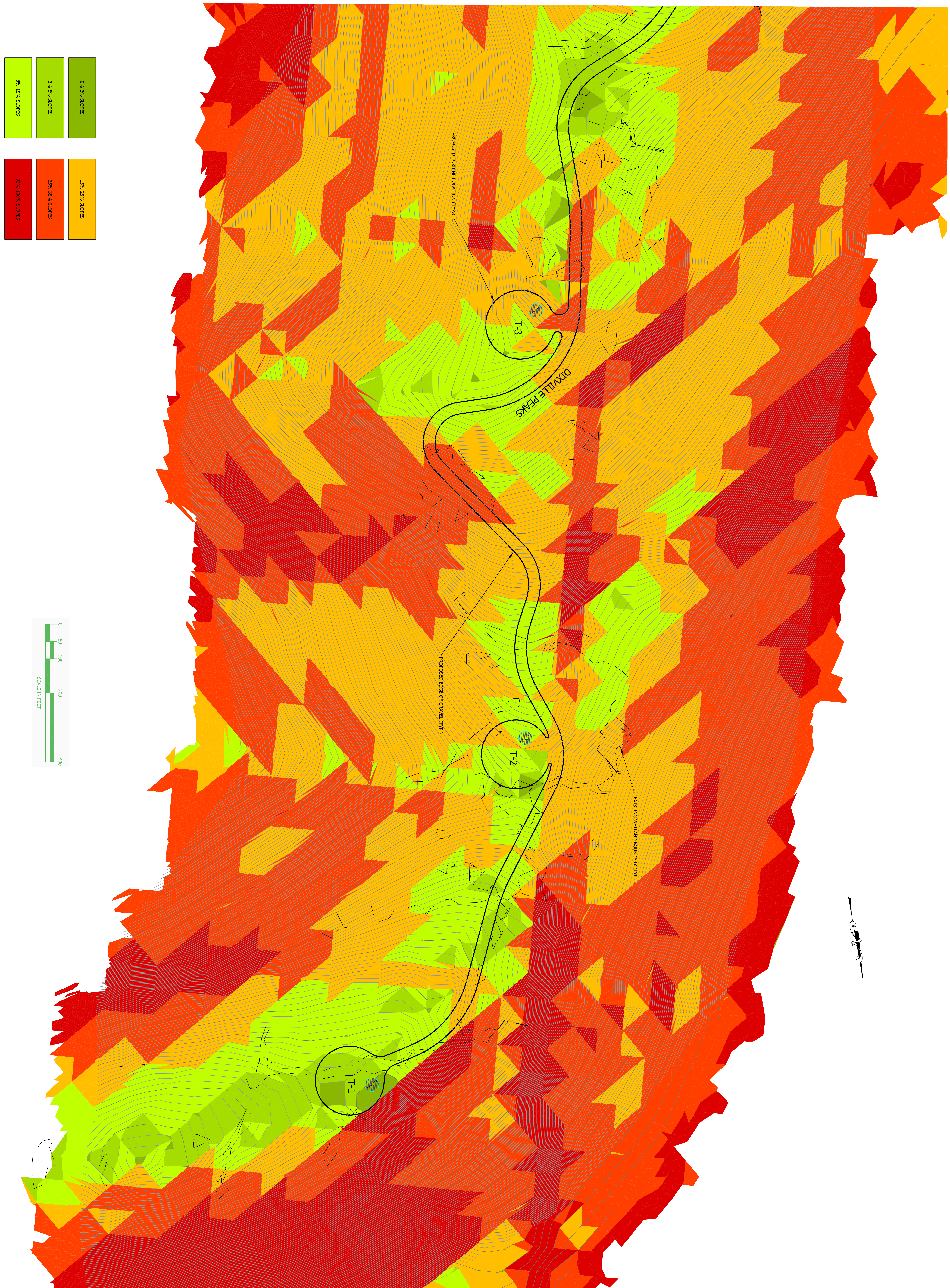

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SHEET 2 OF 2

GRANITE RELIABLE POWER, LLC

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MAINE DEPARTMENT OF AGRICULTURE
FOOD AND RURAL RESOURCES
STATE HOUSE STATION # 28
AUGUSTA, MAINE 04333
PHONE: (207) 287-2666
E-MAIL: DAVID.ROCQUE@MAINE.GOV

To: Marsha Spencer-Famous, LURC
From: David P. Rocque, State Soil Scientist
Re: ZP 702, Redington Wind Farm Project
Date: March 10, 2006

After reviewing the subject application, I offer the following comments:

My primary concern with this proposed project (as was the case with its predecessor) is with the construction of roads in such a fragile area with multiple limitations (some severe) including unique soils, boulder covered surface areas, very steep slopes, depth to bedrock, number and type of drainage ways, climate, shallow seasonal water tables and type of road needed. It will be almost impossible to construct the type of (stable) roads needed without significant alteration to the mountains and in particular to the hydrology that supports streams, wetlands and groundwater systems below. Many of the soils to be disturbed have very low development potential including road construction potential. Also, high mountain soils often have a higher seasonal water table than indicated by the soil morphology because of the cool climate and steep slopes (warm, stagnant groundwater is needed for the development of soil drainage mottling). I therefore would prefer to see another mechanism by which equipment could be transported to the mountain summits including helicopter or skidder hauled toboggan in the winter. However, since road construction is the transport mechanism proposed in this application, I offer the following specific comments on that proposal:

1. As suggested above, I am very concerned that roads be built in a way so as to minimize any hydrologic alterations. These soils often carry a great amount of ground water due to climate, size of watershed, soil texture and depth to hardpan and/or bedrock. Not only will hydrologic modifications affect the mountainsides below the modifications but they will also affect streams, ponds and wetlands below as well as depth to water table in some upland soils. In addition, if groundwater is intercepted in road ditches, it becomes a problem that can cause significant erosion and sedimentation. I expressed this concern to the applicants engineer on a number of occasions including a pre-application meeting and discussed techniques to minimize those effects. Primarily, I suggested minimizing the use of road ditches and not using them when the ditch bottom would be below the depth to seasonal water table. Stone or rock sandwiches should be the preferred mechanism to transport intercepted groundwater from road cuts to the

other side of the road. The applicants engineer and soil scientist appeared to be in agreement with this suggestion but I question whether those techniques will be used exclusively where appropriate, after reviewing the application and noting how much discussion and detail is devoted to ditch construction and cross-culverting (it is not clear to me where the applicant intends to use the various practices). For instance, on detail sheet C-20, detail A shows a typical section with a ditch bottom that is lower than a cross drain beside it. Therefore, the cross-drain only acts as an overflow mechanism. Cross section B shows the correct cross-drain connection, in my opinion. No actual ditch is constructed but one is created between the road fill and cut bank. There are no specifics on the cross-drain to review. Instead, it is left up to the hydro-engineer but I believe some parameters should be included such as requiring 3" or larger stone, so the pores will not plug with sediment and no filter fabric should cover the ends of the drain. The cross-section should also show culvert installation to handle any overflow that might occur. The culverts should have their invert above the elevation of the bottom of the stone cross-drain so they won't circumvent the cross-drain. I would like to see more specifics on where and when cross-drains are to be used and where ditches and cross-culverts should be used. In addition, cuts should be the minimum necessary to minimize fill extensions and should not be used only as a source of fill.

2. The applicant includes details for ditches with vegetation or stone over 6" – 12" of soil which then rests on 1.5' – 3' of stone with an under drain pipe. Where are these to be used? Why not extend the stone layer to the surface? Are these curtain drains?

3. The application leaves it up to the applicant to choose, at some future date, whether to pave the roads or to re-grade them after every rainfall event. Water bars are not required or even suggested for unpaved roads. On such steep slopes and long lengths of road, water bars should be required. Otherwise, significant damage will likely occur to the roads In addition, concentrated runoff can cause significant damage to fill extensions when it finally exits the road. Type and spacing of water bars should be included. I would prefer to see some form of pavement, at least on the steeper section of roads. In the long term, this should be the most cost effective and environmentally sensitive alternative.

4. Roads that intercept drainage swales, seeps or groundwater discharges are proposed to use cross-culverts, which is appropriate. No mention however, is made to re-connect the swale, seep or discharge, probably since it is assumed but I would like to see it as a requirement.

5. Deep cuts into hardpan glacial till soils where there is a shallow seasonal water table will be difficult to stabilize because of the water flowing over the exposed cut soil surface. These cuts should have a stone sandwich (between layers of filter fabric) to transmit the intercepted water down to a roadbed stone sandwich. The sandwich can then be covered with erosion control mix if the slope is 2:1 or less

or a structural measure if the slope is greater than 2:1. For slopes 2:1 or less, the stone sandwich can essentially serve as rip-rap, with a cover of erosion control mix to be more aesthetically pleasing and to allow for native plants to eventually take root.

6. What criteria were used in the location of stump dumps? How will the stump dumps be constructed? Do they take into consideration the groundwater table?

7. The applicant proposes to use wood waste for soil stabilization in some locations but there are concerns with buoyancy so measures are needed to keep the wood waste in place. I do not believe that wood waste alone is generally a suitable erosion control material. Erosion control mix is a much better material since it contains some soil material to add weight and provides for some binding of the wood fragments. The applicant indicates that loam and seed is to be applied before the wood waste so that vegetation can become established as the wood waste is decomposing. From my experience, the erosion control mix is quite durable and is likely to last long enough for natural vegetative stabilization (shrubs, trees and herbaceous plants). If necessary, additional erosion control mix can be applied to areas where needed. Putting loam and seed under a layer of erosion control mix does not make sense since vegetation would have a very difficult time making it through.

8. A mulch, wood waste/bark filter berm is listed as one acceptable type of erosion control measure, which may be used on this project. The specification for the berm indicates that it may contain as little as 40 percent organic matter. The spec also requires all of the woody material to pass a 3-inch screen. I believe that allowing up to 60 percent soil material (particularly without a textural requirement so that the soil can be silt or clay) is too much for the berm to act as a filter (it won't be permeable enough). I also believe that the spec should allow for the woody material to be larger and require it to favor elongated fibers. The Department of Environmental Protection has an excellent erosion control mix specification that I recommend the applicant use.

9. Loam is to be applied to the exposed mineral soil surface prior to seeding for vegetative stabilization. Erosion control mix is supposed to be applied in a similar manner as an alternative to vegetative stabilization. I suggest requiring the loam or erosion control mix to be incorporated into the exposed soil surface (key it in), particularly if there is a significant textural difference or if the exposed mineral soil surface is hardpan. This will allow for a greater rooting depth and minimize potential for the loam to slip or slid down the hardpan surface when wet. In general, I prefer erosion control mix to seeding, as it is less likely to fail in the mountains and will be less of an aesthetics issue (will not stand out visually as much as green grass).

10. Borrow material (including gravel and shale) is to be used in areas where fills are required but no mention is made of where this material is to come from. I do not

recommend that borrow pits be excavated on mountainsides or that over excavation of cuts be made to supply this borrow material. Any alteration of the mountains should be minimized to the maximum extent possible.

11. Temporary Construction Roads are proposed to require stumping, grubbing and some cutting and filling. If possible, I recommend leaving stumps in place and not disturbing the soil. Otherwise these temporary roads will create permanent alteration of the sites where they are located (including rutting where the ruts penetrate into the groundwater table and become streams). In order to minimize alteration (at least for soils with a high seasonal water table), I suggest looking into the use of equipment that can cut trees and chip them in place and/or bringing in grindings from the stump dump stockpiles. These chips can be used to provide some leveling and smoothing which should be sufficient for temporary roads without changing the hydrology of a site or exposing soils so that they are susceptible to erosion. This technique should also be used for the transmission line corroder as well.

12. The applicant states that winter rye can be seeded at elevations below 2700 feet up to October 1 but I feel that is too late a date for the area. I suggest September 15 should be the cut-off date.