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August 29, 2013

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RE: Blue Sky West LLC, Blue Sky West II LLC (First Wind) - Bingham Wind Project: further concerns and preliminary review comments from MDIFW Fisheries Division

Dan:

Biologists in this Department continue to have genuine concerns regarding potentially significant impacts to aquatic resources in headwater streams. The applicant has requested an opportunity for further review of these concerns and offered a site visit before MDIFW submits final review comments for the Bingham Wind Project. Fisheries personnel are available for a site visit with key parties on September 10, 11 or 13. Potential stormwater impacts and altered hydrology of headwater streams is a complex subject, and we hope that appropriate experts can join us. I am copying Art Mcglauflin (Stormwater Engineer, MDEP) to expedite clear interpretations of stormwater impacts. Limited revegetation at some wind energy installations amplifies concerns.

Overview: Due to the extent of information included with the permit application, this evaluation is focused specifically at aquatic resources: primarily freshwater fisheries. General concerns are included, as well as specific comments as they pertain to permit application Sections 1, 1A, 7, 9, 10, 12, 15, 19, the proposed Compensatory Mitigation Package, Document C- 3 – 5, and preliminary construction plans. Final review comments from the Wildlife Division are being drafted separately.

The Bingham Wind Project proposes to build and operate a 62-turbine facility in Bingham, Mayfield Township and Kingsbury Plantation. Access roads and the electrical corridor also intersect with the towns of Moscow, Abbott, and Parkman. To access the turbines, there will be approximately 17 miles of new 38-foot wide crane paths built along ridgelines. Another 5.3 miles of existing roads will be upgraded, although there are few specifics. A maintenance and operations building, an electrical substation and up to five meteorological towers are also being requested in the permit(s). Seventeen miles of 100-foot wide corridors are required as the generator lead line.

General review comments: The extent and scale of the Project are substantial. Ecologically, the region's marked interspersion of streams with mountainous terrain elevates concern for aquatic resources to a greater extent than many wind energy installations in Maine.

The information provided by various consultants to complete fieldwork is not standardized. Thus, it is difficult to associate the location of resources with the development footprint of the Project. For example, streams are identified with an S### coding, while plans are in standard stationing format (###+##). Stream locations are not evident on any Project plan. This made it very difficult to discern if impacts were being avoided, as is indicated in the Fish and Wildlife Report (Section 7). As a further complication, the stationing of the profile views do not line up (are offset) from the plan view above.

The paramount concern of the Fisheries Division is the magnitude and location of the Project and its potential for impacts to intermittent and perennial streams on or downslope of developments. In short, the cumulative impact of clearing vegetation and subsequent development of the Project site will alter the hydrology and hydraulics of the highest elevations in all the watersheds adjacent to the Project. This will result in increased discharge volumes, changes in flow patterns, increased potential for erosion and sedimentation, and net modification of downslope stream channels and aquatic habitats.

At the very minimum, *all* stream channels in proximity to the Project provide the habitat value of being high quality sources of cold water to downstream reaches. Stream surveys focused only on waters in the Project footprint without apparent regard to nearby, downslope streams potentially vulnerable to stormwater or altered hydrology. Each of the five watersheds in the Project area contain brook trout, while two contain unique populations of wild reproducing rainbow trout (Gulf Stream, Austin Stream). Northern spring salamanders and several rare mayflies are Wildlife Division concerns that also frequent clear, cool, high-gradient streams.

The Project proposes to clear large areas of locally high elevation land for placement of turbines and to access infrastructure. Clearing will also be necessary for 17 miles of generator lead at various elevations. Concerns for the turbine corridor, access roads, and the generator feed line are discussed separately.

Turbine corridors: The application identifies 17 miles of 38-foot wide crane path roadways that will be constructed to access 62 turbine installations and a 375-foot diameter circular construction area at each turbine. Thus, removal of vegetation for the crane path totals 63 acres of clearing; additional clearing for the turbines will amount to 160 acres, for a total clearing of 223 acres. It should be noted that these calculations include only the surface area of the developments (38-foot wide and 375-foot diameters, respectively) and do not include any constructed side slopes, which will considerably increase the clearing footprint due to existing terrain conditions. The collector line could is mostly underground along the edge of crane paths.

Most of the proposed clearing for the Project occurs at or near the highest local elevations in local watersheds. The area is currently forested and commercially harvested. Normal forest operations and cutting cycles have a moderate, but relatively temporary impact on local hydrology and hydraulics. Interception of precipitation by leaf and stem cover moderates the timing, volume and immediate vector of precipitation from an event. In typical forest operations, the trees grow back and resume their function of interception of precipitation; the permanent

removal of 250 acres of tree cover from the proposed Project area will significantly alter all of these functions.

Of the 250 acres of total Project clearing, it is stated that 173 acres of those areas cleared for construction are temporary impacts and will be modified and allowed to revegetate. However, in reviewing plan notes, reclamation of construction areas will replace former woody vegetation (mature trees) with forbs and shrubs. Techniques to restore the vegetation include scarifying, loaming and seeding compacted soils, as well as loaming and seeding over blast rock areas.

MDIFW contends that these areas are prolonged impacts since proposed reclamation measures do not replace woody vegetation similar to pre-Project conditions. Forbs and shrubs have a reduced capacity to intercept precipitation, greater evapotranspiration rates, and lessened ability to stabilize soil movements compared to woody vegetation. Also, increased temperatures due to loss of shade from canopy cover can heat up high quality sources of cold water, directly impacting resident and downstream coldwater fisheries. Finally, trees will have difficulty taking root in compacted soils and on blast rock, especially where soil depth and the sub-layer of rock already hinder establishment of woody vegetation.

Reclaimed areas will also have significantly altered capacities for infiltration. Areas of compacted soils will resist water movements to soil depths and runoff volumes will increase as will the potential for shear slope failures. Areas of loamed blast rock may unnaturally increase infiltration. The net effect of rehabilitation will not restore the pre-development potential of forested cover in terms of its hydrological role. Therefore, the Department feels that these efforts must be considered changes to current hydrological conditions at the Project site.

Generator lead line: The Project proposes to clear a 17-mile, 100-foot wide path of vegetation from the east end of the Project to a substation in Parkman. Total clearing for this generator lead is approximately 206 acres. The lead will pass over 34 streams. Vegetative buffers (Table 10-1) proposed for stream crossings stipulate that non-capable vegetation will be retained to within 250 feet from each shore of 24 streams with documented / presumed occurrence of northern spring salamanders, 100 feet from 28 streams designated as Atlantic salmon critical habitat, and 25 feet from 20 “other” streams.

In Section 10.5, the application states that ephemeral stream channels are “disconnected” from larger systems. This is rarely the case in natural drainage patterns. Headwaters (including springs, drainages, and intermittent, first- or second-order streams) are abundant and unique components of a river network, flowing into other first-order streams or into ones that are much larger. The presence of water in ephemeral channels may be seasonal, but there is connectivity evidenced by topographic changes: i.e., the lowest local elevation. Ephemeral streams also provide important seasonal habitat for fish and other aquatic organisms like crayfish and aquatic insects. Moreover, land uses may disrupt and diminish material transport to downstream reaches headwater streams, including ephemeral streams, by removing sources of organic material (e.g., through forest operations), by affecting transport and decomposition processes (e.g., through changes in biotic communities), and by altering mechanisms of storage within headwaters (e.g., through channelization).

A 25-foot buffer width has been proven through numerous studies and MDIFW case experience that this distance results in a strip of vegetation that is insufficient in protecting water quality, even if all capable vegetation were to remain. This is especially true when gradients exceed 3%, as is the case for many of the streams crossed by the generator lead. MDIFW recommends a minimum 100-foot buffer for all streams crossed by the generator lead. Maintenance of capable vegetation should be accomplished by mechanical means within the buffers. Any herbicide applications must be completed by licensed applicators following all state requirements for use. Use of MDIFW's Performance Standards for Buffers in ROW Projects should be utilized.

Section 7.5 Wetlands, Fisheries and Wildlife indicates '"no instream work" for any waterway within the Project footprint. On review of the preliminary construction plans, however, two areas appear to have culverts proposed for streams and rock sandwich layers proposed for riparian wetlands. These sites are:

- page C-S1.10, Sta. 208 + 00, (30"X 50' culvert) and
- page C-N1-27, Sta. 1407 + 50 approx., (30"X 50' culvert).

Clarification in regards to potential impacts at these sites is requested. Also, there is significant concern with how bankfull widths were determined at these streams, and in all streams in Table C-2 in the Wetland and Waterbody Report (Section 7A). The average bankfull width for most streams appears to be the simple average of the two numbers delineating the width of the stream.

Stormwater management: MDIFW has many concerns related to stormwater analyses. Section 12 consists of two reports: the first concerning the construction and maintenance of crane paths and turbine pads, while the second is in reference to the road system and buildings. In Section 12.6, there is a statement that existing drainage patterns will remain. While it is true in that water will still run downhill, there will be significant changes in land cover and modifications that are likely to alter existing drainage patterns. Current drainage consists of diffuse hydraulic patterns, dictated by vegetative cover, soil type, slopes, terrain variability, and a myriad of other factors. After the Project is built, hydraulic patterns in the upper elevation watersheds will be channelized by Project structures with culverts to form point outlets. In short, these upper watersheds will convert from diffuse hydraulic patterns to channelized patterns.

Paramount among stormwater concerns is the question of analysis and its results. Why were more suitable pre- and post-Project peak flow analysis not performed (Section 12.8)? The applicant's rationale for not completing peak flow analyses was due to the size of the Project. The Department strongly feels that the size of the Project is *precisely* the reason to do peak flow analysis, since it would provide a better estimate of changes in runoff volumes. The process for developing this permit application (Section 1) spanned 5years from 2009 to 2013. MDIFW contends that there was ample time to complete peak flow studies during that time period.

The alternative chosen to evaluate changes in stormwater was TR-20 and TR-55 modeling software. While the report states that terrain gradients varied from 5 to 25%, a single CN number of 77 was used for all watersheds. Ultimately, the overall model results appear generalized and potentially do not represent a close approximation of the actual changes in discharges resulting

from the Project. The results of the analysis are confusing and require explanation. For example(s):

Gulf Stream:
Pre-Project cfs = 508 cfs
Post Project cfs = 162 cfs

Rift Brook:
Pre-Project cfs = 433 cfs
Post Project cfs = 139.5 cfs

From the above examples, it is unclear if post-Project quantities are the net result of treatments or are additive to pre-Project numbers. If they are additive, post-Project volumes at Gulf Stream *and* Rift Brook are 24% greater than pre-Project volumes. If water volumes are *reduced* (to or by), the resulting post-Project volumes in these two watersheds are 68 % less than existing (reduced from pre- condition to post condition) or 32% less than existing (reduced by pre-condition minus post-condition). Ultimately, no matter how these numbers are compared, there will be a significant change as these numbers indicate. The summary table does not reflect the changes as shown in the calculations. These need to be clarified to defend the no-net change claim from the applicant.

Section 12.22 shows Project TMDL phosphorus loading for Mayfield, Kingsbury, Hilton, Withee and Smith Ponds. The summary compares 'allowable' P Loading for the ponds to P 'export' from the Project. There is no estimate of existing P load from the watershed and in many cases P export generated by the Project is over 90% of the allowable budget. It is unclear what effect P export from the Project will have on these waters. That is, if P exported from the Project is added to the pre-Project P load entering the ponds, is that sum more or less than the allowable P budget? Will additional P loading generated by the Project place these waters at risk?

In Section 12.25, the application notes that there will be no thermal impact to downstream fisheries. No further clarification is offered. The statement needs to be explained and justified. The extent of vegetative clearing and modification of terrain indicate that not only will volumes of runoff increase, but that the quality of that water, including temperature of that water, will change. As stated above, increased temperatures due to loss of shade from canopy cover will heat up the high quality sources of cold water, directly impacting resident and downstream coldwater fisheries. The assumption that stormwater BMP's will address water temperatures is true only when the BMP structures provide adequate shading and\or methods of reducing solar exposure to runoff. If the BMP structure needs to be "built," then some method of shading should be part of the construction plan. Forbs and shrubs do not provide the same temperature modification that is provided by mature woody vegetation.

The stormwater report pertaining to generator lead construction roads construction (Section 12-1) depicts 2 miles of existing corridors as "winter-only" roads with travelways from 8 to 12-feet in width. The application indicates that these roads will need to be improved to 24-foot travelways. The report also states that roadway drainage on these roads is "maintained by an inadequate

number of cross culverts and overland flow" (Section 12 – page 176). The preliminary construction plans do not show the work necessary to improve these roadways, including any necessary lengthening of culverts, although a general list of replacement culverts for the improvements is provided. It is also unclear if any of these cross culverts convey ephemeral or perennial streams.

Both stormwater reports detail culvert prescriptions, each for their areas of Project coverage. Seven culverts are proposed to improve the existing roads and 143 culverts are proposed for all other Project components. While most of the roadway culverts appear to be replacement upgrades, the 143 pipes proposed for crane paths and turbine accesses are new culverts. The "rational" method of culvert sizing was utilized to determine specific pipes; HDPE pipes are proposed. The rational method determines a design discharge (Q, in cfs) for a storm of particular intensity where the culvert is at 100% of its capacity. For the Project, designers chose a storm event with a 25 year recurrence probability. That is, culverts on the Project will carry 100% of their volumes during a storm event of 25-year intensity.

The rational method is commonly used by designers for *drainage* structures. It is appropriate where this "drainage" *is not associated with habitat* since the design only considers carrying water volumes, *and does not address energy transfer in channels, channel geomorphology, or ecological considerations of any kind*. Since recent climatological events have well exceeded return periods traditionally used in culvert sizing methods, it may be useful to utilize a return period of greater duration, if only to check the Q25 design.

Of the 143 culverts proposed for high elevation Project components, 25 are of 24-inch diameter or larger. Other culvert pipes range from 12 to 18 inches in diameter. A 12-inch diameter pipe flowing 100% full can carry a volume of water that will expend considerable energy at the outlet of the pipe. A 24-inch pipe will have twice the outlet energy. All of the culverts will have the potential to generate channel development in currently ephemeral drainages adjacent to the Project, a significant change from the existing site conditions that will have effects that will manifest in downstream reaches of perennial streams. The slopes where the energy from these outlet velocities will be expended are from 5 to 25%. There is no information to determine if the BMPs proposed will withstand the energy expended by these volumes of water.

The applicant indicates that there will be no significant change in runoff volumes or quantity and has met Maine's Stormwater Law requirements by placing approved BMPs for treatment of stormwater. However, the Department finds that the information provided does not clearly indicate the proposed actions will not impact fisheries resources downstream.

HDPE pipes proposed for all culverts are smoothbore by design. The lack of roughness compared to corrugated culverts impairs the ability for aquatic organisms, including fish, as well as some semi-aquatic and terrestrial species to effectively utilize these structures for passage. Moreover, limited openness ratios of these culverts, some of which are 100 feet or more in length, can impact habitat connectivity for certain organisms such as small mammals and herptiles on a landscape scale. The use of corrugated pipes, sized to an openness ratio of at least

"0.75" will more effectively slow water velocity and minimize the barrier to certain animals that are dependent on more light for passage, particularly through the longest culverts.

Finally, it is apparent that use of existing roads and culverts built during previous forestry operations are now arguably a partial responsibility to the Project applicant. The current infrastructure of roads and culverts should be scrutinized to determine potential changes in stormwater. The extent and condition of critical stream buffers require attention to minimize potential cumulative impacts downslope.

Stream surveys – general comments: The following remarks are based on review of the US Army Corps of Engineers Application provided by the applicant.

Most of the streams along the Project are considered headwater streams. Regardless of whether they are perennial or ephemeral in nature, these waters provide critical linkages to downstream resources for many species. Headwater species include permanent residents as well as migrants that travel to headwaters at particular seasons or life stages. Movement by migrants links headwaters with downstream and terrestrial ecosystems, as do exports such as emerging and drifting insects. Evidence suggests that headwater streams are critically important to downstream ecosystems. They dominate channel networks in terms of stream length and watershed area, they transport matter to navigable waterways, and they have intimate and direct connections to these waterways. These ecological values are a stark contrast to the statement in the MDEP application (Section 10.5) that ephemeral stream channels are "disconnected" from larger systems.

As noted above, it is extremely difficult to match up the stream #s in the Perennial Stream Summary Table to the station #s in the plans. A tabular compilation with stream # and the corresponding station # should be provided since many streams were not clearly depicted on the plans available for review.

As stated above, under each stream description the bankfull widths are given as a range, with the average also listed; however, in most cases the average given is simply the average of the range of widths listed. For example, Stream S045 lists the bankfull width range as 15-20 feet, with the average as 17.5 feet. The number "17.5" is simply the average of 15 and 20 and is not the accepted method to gauge bankfull width. Methodology similar to the US Forest Service should be used to make these determinations.

At each temporary crossing, there is concern that a build-up of dirt and mud on the crossings will discharge into the streams: a direct impact. Specific safeguards were not found in this review. Also, timber mats or other crossing structures can compress stream banks and /or stream substrate. Details of crossing structures are requested to assure no *direct* impacts to streams.

Perennial stream crossings:

- Stream S027: The applicant is proposing to cross this stream using the existing logging road and culvert; no upgrades are planned. A photo of this culvert, and any existing

stream-bearing culvert, would be very helpful in determining present and possible construction-related impacts to passage of aquatic organisms.

- Stream S045: Average bankfull is given as 17.5 feet. This is pushing the limits of a standard crane mat. Additional details of any approach work adjacent to the crossing (e.g., abutments, piers for larger streams, etc.) and consideration of alternative stream crossings are advised.
- Stream S050: same comments as Stream S045, only this is a larger stream.
- Stream S060: The Construction and Maintenance narrative states "It is likely that construction of the generator lead will not involve a temporary crossing of this stream…" Based on this statement, it is possible that a stream crossing *may* be necessary at this location, which would be considered a direct impact to the resource. Given the width of this stream and its associated emergent wetland, a detailed description and plans of a possible crossing is needed for review to ensure connectivity be maintained.

Intermittent streams: As stated above, ephemeral streams are important components of a river network. Some of these streams may seasonally bear brook trout and / or juvenile Atlantic salmon. Therefore a 100-foot buffer should apply to these streams rather than 25-foot buffer prescribed for most.

Our review could not find specifications on when (or how) ephemeral streams will be crossed. Given their significance in the headwaters, these streams also warrant suitable protection.

- Stream S003: the photo shows what appears to be a perennial stream—how was intermittency determined? A photo of it in the dry would be very helpful, especially since there will be work within 10-feet of it.

Summary: MDIFW has continuing unresolved concerns for aquatic resources from the Bingham Wind proposal. Major construction projects invariably are challenged to avoid impacts to downstream aquatic resources. Risks are much greater on an extensive network of ridgelines with significant slopes and stream interspersion. MDIFW welcomes …

1. **Review and feedback from the applicant:** I applaud the willingness of the applicant to continue efforts to reconcile concerns and conduct a site visit with key staff of appropriate agencies. Urgency for these review comments is the sole reason that our staff have been not yet participate in a special site visit focused on aquatic issues. We remain willing to meet on site.
2. **Review of MDIFW comments by MDEP's Stormwater Engineer:** Cumulative impacts on aquatic resources hinge on a clear understanding of stormwater management. Art Mcglauflin is well-versed in the subject and applicable standards. The many unresolved concerns in his initial review parallel questions from this agency. Review of the applicant's response (posted on-line August 12) is ongoing. The evaluation of increased discharge volumes, changes in flow patterns, increased potential for erosion / sedimentation, and modification of downslope stream channels is crucial to our determination of potential impacts to aquatic habitats. Any reclamation deficiencies on

site amplify the risks of increased runoff, altered hydrology, and potential impacts to sensitive headwater streams.

Thank you for the opportunity to resolve and clarify our concerns for aquatic habitats at the proposed Bingham Wind Project. The July 22 public meeting in Moscow certainly demonstrated that Maine citizens are also concerned with potential risks to aquatic resources near the proposal.

Charles Todd

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cc: Art Mcglauflin, Stormwater Engineer - Maine Department of Environmental Protection

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