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Pat Quinn, Governor
Marc Miller, Director

February 10, 2014

Mr. Wayne Hartel
Dept. of Commerce and Economic Development
500 East Monroe Street
Springfield, IL 62701-1509

RE: ASIP Local 150 Wind Turbine, Wilmington, Will County
Endangered Species Consultation Program
EcoCAT Review #1408169

Dear Mr. Hartel:

The Department has received a submission from the International Union of Operating Engineers (IUOE) Local 150 for the purpose of consultation with the Department in accordance with the *Illinois Endangered Species Protection Act* [520 ILCS 10/11], the *Illinois Natural Areas Preservation Act* [525 ILCS 30/17], and Title 17 *Illinois Administrative Code* Part 1075.

The proposed action is the construction and operation of a C&F Green 100-kilowatt wind turbine at Local 150's Apprenticeship and Skill Improvement Program (ASIP) Training Center located at 19800 West Arsenal Road, in the City of Wilmington.

Three state-listed endangered or threatened species are currently known to occur in the vicinity in the vicinity of the Training Center: the endangered **Loggerhead Shrike**, *Lanius ludovicianus*; the endangered **Upland Sandpiper**, *Bartramia longicauda*; and the threatened **Franklin's Ground Squirrel**, *Spermophilus (Poliocitellus) franklinii*. Two other species, the **Indiana Bat**, *Myotis sodalis*, and the **Northern Long-Eared Bat**, *Myotis septentrionalis*, also warrant consideration. The property on which the turbine is proposed lies adjacent to the **Joliet Army Ammunition Plant Illinois Natural Areas Inventory (INAI) Site**.

As described below, the Department of Natural Resources believes the proposed action is unlikely to adversely modify the Joliet Army Ammunition Plant INAI Site and is unlikely to adversely modify the essential habitat of the Loggerhead Shrike and the Upland Sandpiper. The project is unlikely to adversely modify essential habitat of the Franklin's Ground Squirrel unless a population of this animal is present in the immediate vicinity of the wind turbine. The proposed action is unlikely to adversely modify the essential habitats of the Indiana Bat and the Northern Long-Eared Bat, but may result in prohibited incidental taking of the Northern Long-Eared Bat if it forages in the turbine's air-space.

The Department of Natural Resources offers the following recommendations to the Department of Commerce and Economic Opportunity.

Recommendation #1: The Department recommends consideration of a grant condition requiring the applicant to commission a May/June day-time trapping study at the Local 150 Training Center to ascertain whether the Franklin's Ground Squirrel is present on the property. If the results of the survey are positive, Local 150 should further consult the Department regarding means to avoid or minimize adverse effects to this species, whether from the wind turbine or other unrelated training activities at the Center.

Recommendation #2: The Department recommends construction of a 40-meter tower as a condition of the grant. The standard configuration for the C&F Green 100-kW turbine is to mount it on a 30-meter (100-foot) tower. However, since the rotor radius is just over 40 feet, this allows blades to sweep as low as 60 feet above the ground, a zone where foraging bats may frequently be found. A 40-meter tower is available for this model, which would raise the lower blade sweep to about 91 feet; this is much closer to the 100-foot height below which most foraging flights remain.

Recommendation #3: The Department recommends "free-wheeling" be prohibited as a grant condition. Fifty percent or more of bat losses occur at wind speeds below that which generate power, called the "cut-in" wind speed. Typically turbines are allowed to "free-wheel" under these conditions, meaning the blades are rotating but no power is being produced. The mechanical brakes should be engaged or the blades "feathered" to prevent rotation under these conditions from April 1 through November 15. Doing so entails no loss of power production.

Recommendation #4: The Department recommends a grant condition requiring the applicant to feather turbine blades below wind speeds of 5.5 meters per second whenever the air temperature is above 60 degrees Fahrenheit during the bat migration period from July 1 through November 15. Studies have shown that 50%-90% of bat losses can be avoided if turbines are not operated at wind speeds below 6.9 m/s. At another Illinois wind turbine, curtailment below 6.0 m/s resulted in a 100% reduction in bat losses during the month of September. Air temperature also plays a role in reducing bat activity. Currently, the Department recommends curtailment below 5.5 m/s whenever air temperatures remain above 60 degrees Fahrenheit. Below that temperature bat losses are far less likely and normal operation may resume. Larger-scale utility turbines possess integrated programmable control systems (SCADA) which make implementation of these restrictions relatively simple.

Recommendation #5: The Department recommends a grant condition requiring investigations of bat activity prior to construction and the submission of results to the grantor and Department of Natural Resources. Bat activity at the Training Center can be assessed through acoustic monitoring and mist-netting. Acoustic monitoring entails making digital recordings of bat calls, then analyzing them to identify species; this is most useful if done both at ground level and at the height of the turbine nacelle. Acoustic monitoring can suggest which species are locally active at the turbine site, but results will not be conclusive: not all bats emit calls during all flights, and even those which are recorded may represent repeated calls from just a few bats, so that total numbers are not indicated. Further, several species, especially those of the *Myotis* genus, emit calls which are difficult to differentiate. Mist-netting can produce more reliable identifications, but results in much smaller samples, increasing the risk that particular species are overlooked. Moreover, there may be no suitable mist-netting locations in

proximity to the actual proposed turbine location, and captures at more distant sites may not characterize bat populations in the area of interest.

Recommendation #6: The Department recommends a grant condition requiring post-construction mortality monitoring, with results submitted to the grantor and the Department of Natural Resources. Information about bird and bat mortality can be gleaned by searching for carcasses beneath the operating wind turbine. This method not only identifies species at risk, but can provide a measure of the effectiveness of mortality-avoidance measures, such as curtailment. It would be wise to conduct such a study prior to the formal listing of the Northern Long-Eared Bat as endangered.

Recommendation #7: As an alternative to #4, #5, and #6 above, the Department recommends a grant condition restricting operation of the turbine to daylight hours, only. If the turbine is primarily for training apprentices and journeymen rather than for energy production, it may be feasible to operate the turbine only in daylight during the period from April 1 through November 15; bats are only at risk in the hours of darkness. Operation should cease one-half hour before civil sunset and resume one-half hour after civil sunrise. If this alternative is selected, Recommendations #4, #5, and #6 are unnecessary, but should be implemented prior to initiating after-dark operations.

Further information and discussion of the Department's conclusions is provided below.

Joliet Army Ammunition Plant INAI Site. This INAI Site is comprised of a number of disjunct parcels scattered across the former location of the Joliet Arsenal. Significant portions now comprise the Midewin National Tallgrass Prairie, while many portions provide essential habitat to a number of state-listed endangered or threatened species. Unless screened by vegetation or topography, this wind turbine should be visible to observers up to five miles away within the INAI site, but will be only one of many industrial features within and surrounding the INAI Site. No direct or indirect effects of the turbine, other than visibility, will extend into the INAI Site. The turbine is not tall enough to require FAA safety lighting.

Shrike/Sandpiper. The proposed site for the wind turbine is no closer than 1400 feet to the nearest suitable habitats for the Loggerhead Shrike and the Upland Sandpiper, both considered grassland birds, although the Shrike prefers grassland interspersed with small shrubs and trees, while the Sandpiper prefers more open habitats. The nearest known nesting records for either species are more than half a mile to the east and west, both slightly to the north.

The maximum height of a C&F Green 100-kW on a 40 meter tower is just less than 175 feet. At this height, the maximum reach of shadow flicker at dawn/sunset under ideal conditions is 3,325 feet. However, the azimuth orientation of the available habitats to the proposed turbine location means that flicker shadows can reach the nearest habitats only in the winter, outside the breeding and rearing season for these migratory species, which are absent when shadows could be present. Consequently, there is no potential for shadow-flicker to adversely modify essential habitat or to harass resident members of these species.

The Loggerhead Shrike has rarely been reported as a victim of rotor blade collision at wind farms in the West, but none have been documented in Illinois. The Department deems the greatest collision risk to the Shrike exists during migration. However, the relatively small diameter of the rotor (83 feet) at a

height less than 175 feet reduces the probability of a collision with migrating birds, which generally travel at higher altitudes.

The Upland Sandpiper engages in acrobatic courtship flights which pass through the projected rotor elevation of this machine, but such flights occur over the nesting territory and would be remote from the turbine's proposed location. Consequently, collision risk for this species is likely also greatest during migration. No Upland Sandpipers are known to have been reported as wind turbine collision victims.

Despite the presence of significant numbers of these species at the nearby Midewin National Tallgrass Prairie, the Department believes the risk of incidental taking as a result of rotor blade collision for these species, though not zero, is very low.

Beyond avoiding the siting of a machine in a restricted flyway (there are no geographical features in the vicinity which serve to concentrate birds), there are no known effective techniques to reduce the risk of random bird collisions. Due to a phenomenon known as motion smear, turbine blades become less visible to birds as they approach the turbine; at ranges which could result in a bird-strike, the blades are virtually invisible. Consequently, the Department does not recommend applying colors or designs to turbine blades, because they are not effective means of reducing avian mortality. However, they *are* visible to more distant wildlife (and people!) which may be adversely affected by the constant motion of the rotor, so the addition of markings is not considered neutral, but negative.

The proposed wind turbine is also very quiet, with a claimed noise level of 35 decibels at 60 meters at rated wind speed. This is comparable to the noise emitted from a refrigerator or normal conversation, and is considerably less than that emanating from the heavy equipment which is routinely operated at the training center. Therefore turbine operating noise is unlikely to alter conditions in the nearest suitable breeding/rearing habitat.

Beyond the low potential for random collisions, the Department anticipates no adverse effects from this proposed action to the Loggerhead Shrike or to the Upland Sandpiper.

Franklin's Ground Squirrel. Illinois' largest ground squirrel, this species prefers the same habitats as the Shrike and the Sandpiper, and is a noted egg predator of those and other grassland/shrub bird species. Several populations of Franklin's Ground Squirrel are known from western Will County, including Midewin National Tallgrass Prairie and the Des Plaines State Conservation Area.

Perhaps the most unusual feature of this animal's natural history is its very long hibernation period, running from mid-September through mid-April. It is active only during the day from spring through late summer, but even then spends up to 90% of its time underground. During hibernation, the animal is vulnerable to excavation and grading activities which destroy or bury its burrow.

Juvenile Franklin's Ground Squirrels are driven from their parents' territories once weaned, which occurs about mid-July. Young Squirrels have been documented in Illinois to disperse two miles or more to suitable habitats, and appear to be particularly drawn to areas of recent disturbance, such as semi-permanent soil stockpiles on construction sites. Dispersion often follows linear features such as railroads, highways, power lines, and drainage ditches.

While the Franklin's Ground Squirrel is not known to occupy the Local 150 Training Center, the Training Center lies within dispersal range of known colonies to the east and west. It is possible that some features on the property may already be occupied, such as the berms on the eastern side. It is extremely unlikely the proposed location for the wind turbine is occupied by this species, so that foundation excavations for the turbine do not pose any threat.

Whether turbine noise might pose an issue is unknown. Members of colonies emit various calls and alarms, portions of which are ultra-sonic, pitched above human hearing thresholds. Noise data for this machine is stated in terms of A-weighted overpressures, and likely does not cover the full range of frequencies above and below human hearing thresholds emitted by the machine that may be pertinent to assessing effects on the Franklin's Ground Squirrel. However, the Department is unaware of any research demonstrating the sensitivity of this species to anthropogenic noise; many populations exist in noisy environments. The Department believes it is unlikely this species would be adversely affected by turbine noise, given other sources of noise on the property.

Shadow-flicker may affect this species. A California study of the Richardson's Ground Squirrel, a closely-related species, found that ground squirrels in the vicinity of operating wind turbines emitted more alarm calls and were more vigilant than those where no wind turbines existed. However, the study did not address any possible relationship between squirrel behavior and turbine shadows. The older turbines in that study provided perches for raptors which prey on ground squirrels (although no attacks on ground squirrels were reported as part of the study) and researchers surmised the presence of raptors may have contributed to higher stress levels, although they cited no supporting evidence. (Newer turbines, including the C& F 100-kW, are designed to prevent or discourage perching, which also contributes to bird collision deaths.)

However, shadow-flicker may mimic the shadows of raptors overhead, or stimulate a similar fight-or-flight response in ground squirrels within range of such shadows. The rotation rate of the C&F Green 100-kW at rated wind speed is 45 rpm. A three-bladed rotor thus places shadows on any given point up to 135 times a minute (every 0.4 seconds). It is doubtful repeated shadows at this speed would mimic a raptor's passage, but the rapid oscillation of light might still discourage surface activity by the Franklin's Ground Squirrel for extended periods. Because no existing Illinois wind turbine is known to stand in proximity to occupied FGS territories, this possibility has not been explored, so the potential for adverse effect due to this cause remains a matter of speculation. However, the Department expects that only burrows closer than 500 feet to this turbine may experience any effect from shadows, given the daily activity patterns of this animal, which is less likely to be above-ground when shadows are longer.

Indiana Bat, *Myotis sodalis*. Although comprising a very small percentage of documented bat losses, the federally-listed endangered Indiana Bat has demonstrated its vulnerability to wind turbines. Five such losses have been documented, all but one females and all but one in the month of September, when this species is migrating to winter hibernation sites.

The Indiana Bat spends the spring and summer in trees, but hibernates in caves and mines. This species has been collected in Cook County (although not since 1928), and the nearest known maternity colony location lies 34 miles to the east-southeast, on the Kankakee River in Indiana. Recent acoustic studies of bat calls in Will County suggest small numbers of Indiana Bats may be present, but this species

presents grave difficulties in acoustic identification, so that the evidence for its presence in Will County is inconclusive.

The Indiana Bat has been shown to migrate up to 300 miles from its winter hibernation site, although most individuals move much smaller distances. The nearest known hibernaculum for this species is the Blackball Mine on the Pecumsaugan Creek Nature Preserve near LaSalle-Peru, approximately 50 miles due west of the proposed turbine location. While Wilmington is well-within "range" of the hibernaculum, a 2011 radio-tacking study of Indiana Bats emerging from the Blackball Mine showed that most traveled west and south along the Illinois River or remained in the vicinity of the Mine. Though only a small fraction of the Indiana Bats using this site were tagged, the results suggest that few, if any, Indiana Bats which winter there spend the summer in Will County. The next nearest known hibernation site for this species is a cave in Greene County, Indiana, and the Kankakee River maternity colony is believed to be associated with that site.

It is the Department's opinion the proposed wind turbine poses no threat to the Indiana Bat.

Northern Long-Eared Bat, *Myotis septentrionalis*. On October 3, 2013, the U.S. Fish & Wildlife Service announced its decision to list the Northern Long-Eared Bat (also known as the Northern Myotis or Northeastern Myotis) as endangered under the federal *Endangered Species Act* due to the inroads of White-Nose Syndrome (WNS), an exotic fungal disease which is killing millions of cave-hibernating bats in the United States and Canada. This species may be the most susceptible to this disease, due to its higher winter hibernation humidity requirements, a condition in which the WNS fungus thrives. Final listing will not occur until late in 2014. This species is widely-distributed in Illinois.

Recently, acoustic bat studies were carried out by the Forest Preserve District of Will County in a number of Will County Forest Preserves, including those along Forked Creek near Wilmington. Unlike the Indiana Bat, calls of the Northern Long-Eared Bat are much easier to identify with confidence. The Northern Long-Eared Bat is present in most Will County Forest Preserves studied, including those near Wilmington.

Like the Indiana Bat, the Northern Long-Eared Bat hibernates in caves or mines, but in the spring and summer roosts in trees, generally in riparian woods. But it also will establish day-roosts in box culverts, under bridges, and in human structures such as barns, sheds, and picnic shelters. This species shows a higher degree of fidelity to maternity colony sites than does the Indiana Bat, meaning it has much less flexibility to respond to changes in breeding habitat.

More Northern Long-Eared Bats have died at wind turbines than have Indiana Bats, but their number still comprises a very small percentage of bat losses at wind turbines. Like the Indiana Bat, most flight activity (except during migration) takes place at heights less than one hundred feet, with the great majority being within 30 feet of the ground. In common with other bats, flight activity drops off sharply at wind speeds above 6 meters/second and at temperatures below 60 degrees Fahrenheit. Most collision losses occur in the months of July, August, and September as they migrate toward hibernation sites.

The proposed location for the turbine at the Local 150 Training Center is located near a tributary of Forked Creek and near a large storm-water detention basin. Much of the tributary's length is lined with a narrow band of trees, with here and there a wider grove, providing a potential travel corridor. While

Northern Long-Eared Bats prefer to forage along streams and in the woods, they will cross large open areas and they frequently feed over water. Thus, there is a potential for this species to forage at the Training Center, especially if security lighting at the Center attracts large numbers of insects. In the absence of actual data to the contrary, this species may be presumed to be present at the Training Center, and thus at risk of collision mortality. Once officially listed as endangered, collision mortality of this species poses a potential legal liability if the turbine is operated during the hours of darkness.

Other Bats. Experience in Illinois has demonstrated that wind turbines result in significant bat mortality, with mortality concentrated among three species of migratory "tree" bats: the **Eastern Red Bat**, *Lasiurus borealis* (accounting for nearly 80% of mortality); the **Hoary Bat**, *Lasiurus cinereus*; and the **Silver-Haired Bat**, *Lasionycteris noctivagans*. Together, these species account for 94% of bat losses at wind turbines. None of these species hibernates in caves or mines, and so are not likely to be adversely affected by White-Nose Syndrome. No accurate population estimates for these species exist.

Cave-hibernating bats make up the balance of losses; notably the **Little Brown Bat**, *Myotis lucifugus*, and the **Tri-colored (Eastern Pipistrelle) Bat**, *Perimyotis subflavus*. Due to WNS, the Little Brown Bat may soon warrant federal listing as endangered, and the Tri-Colored Bat may trend in the same direction. Both have been tallied as casualties at Illinois wind turbines, and both have recently been demonstrated to occur in Will County, where they are currently considered to be common.

Recent studies of bat mortality at utility-scale wind turbines in Illinois demonstrate that per-turbine losses run, on average, around 16 bats per year, of all species. In aggregate, this is a large number, upwards of 32,000 bats annually. Eighty percent of bat mortality occurs in July, August, and September, the months all species of bats are moving towards winter habitats. (There is no similar mortality peak in the spring, for reasons unknown.) Because bats are long-lived and generally produce but one pup a year, wind turbine mortality could prove to be a significant problem for these species. Fortunately, the same or similar measures are effective in reducing losses of all bat species; adopting minimization and avoidance measures for one species benefits all species to some degree.

However, none of these studies include turbines in the 100-kW class, and it is possible that bat mortality at wind turbines in this class differs significantly. It is generally assumed that smaller turbines produce less mortality but, as more is learned of bat behavior, this assumption may prove incorrect. Well-planned studies are needed to characterize the interactions between bats and turbines of this size. The proposed wind turbine at the ASIP Training Center may produce lesser or greater losses, but only a good post-construction mortality study will tell.

Consultation on the part of the Department is closed, unless the Department of Commerce and Economic Opportunity desires additional information or advice related to this proposal. In accordance with 17 Ill. Adm. Code 1075.40(h), the Department should notify IDNR of its decision regarding these recommendations, whether it will:

- Proceed with the action as originally proposed;
- Require the action to be modified per Department recommendations (please specify which measures if not all will be required); or
- Forgo the action.

This consultation is valid for two years unless new information becomes available which was not previously considered; or the proposed action is modified; or additional species, essential habitats, or Natural Areas are identified in the vicinity. If the project has not been implemented within two years of the date of this letter, or any of the above listed conditions develop, a new consultation is necessary.

The natural resource review primarily reflects the information existing in the Illinois Natural Heritage Database at the time of this consultation, and should not be regarded as a final statement on the site being considered, nor should it be a substitute for detailed site surveys or field surveys required for environmental assessments.

If additional protected resources are encountered during the project's implementation, the applicant must comply with the applicable statutes and regulations. Also, note that closure of consultation does not imply IDNR's authorization or endorsement of the proposed action. Please contact me if you have questions regarding this review.

Sincerely,

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cc: Julian Muller, IUOE Local 150