Siting Wind Turbines at Acutec Precision and Manufacturing, Inc., Saegertown, Pennsylvania: An Environmental Impact Assessment

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Executive Summary

Acutec Precision Manufacturing, Inc., in Saegertown, Pennsylvania, is beginning a preliminary investigation of the feasibility of installing a large windmill on its Saegertown facility. The firm uses approximately three MW of electricity annually, and in preparation for projected major electrical rate hikes as utility caps are removed in 2010, it is seeking ways to reduce or replace its current source of electricity. As part of this preliminary feasibility assessment, Acutec has partnered with the Allegheny College Center for Economic and Environmental Development to perform an initial environmental impact statement for placement of wind turbines at the Acutec location in Saegertown. The proposed site for placement of windmills at the Acutec Precision Manufacturing facility in Saegertown appears to pose no major threats to the environmental integrity of the area.

Current Land Use

The commercial facility is in an area dominated by forests and agricultural land uses, with a low population density. A large communications cell tower already exists on the site.

Soils

Soils of the area will require care during windmill construction, but standard erosion control measures during site construction should prevent possible problems.

Water Resources

There are no water courses or bodies at the site that would be at risk during construction or operation; the nearest stream, Cussewago Creek, is approximately one mile away and not likely to be affected.

Wildlife

The present commercial land use of the site indicates that the windmill will not cause harm to most local wildlife. The location is positioned approximately one mile from an area identified by Audubon of Pennsylvania as an important bird area, thus potential impacts on birds should be investigated further. Emerging evidence suggests that bats may be negatively impacted by windmills, and this potential impact also should receive continued attention.

Aesthetics

The relatively low population density, a limited viewshed, and current location in an existing commercial zone should preclude major aesthetic concerns.

Introduction

Manufacturing firms that use large amounts of electricity seek to reduce energy use and control manufacturing costs. Although conservation efforts can lead to significant reductions in energy use, replacement of conventional electricity will require much greater use of alternative energy sources. Already, wind energy rapidly is gaining prominence across the United States, as both electricity generators and users seek alternative forms of electrical energy generation. Technological innovation continues to enhance the economic and practical viability of wind energy generation, and the U.S. Department of Energy recently reported that by 2030, wind power could provide 20 percent of the U.S. electricity demand.

To assess the viability of a wind power operation, two assessments are critical. First, the quality and quantity of the wind resource must be established to determine the economic potential for wind-generated electrical production. Secondly, the proposed site to be used for wind generation needs to undergo an environmental feasibility study to determine the environmental and social suitability of the location. According to the American Wind Energy Association, it is common to identify possible major environmental or social issues of concern before proceeding with development of a wind project. As a project moves closer to initiation, a developer may elect to conduct a Phase I Environmental Site Assessment consistent with American Society for Testing and Materials Standard E 1527-05 - "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process."

This report examines a suite of environmental and social factors that will influence the viability of this site as a potential location for placement of one to four large-scale (approximately one MW) wind power generators.

Land Use

The proposed location of Acutec's wind turbine is atop a ridge in a grassy, commercially developed area (Figure 1). Local land cover consists primarily of forest, occupying roughly 49 percent of the area within a five-mile radius (Figure 2). Agriculture comprises the bulk of the remaining area (Table 1), with 16 percent of the area in hay or pasture, and an additional 15 percent in cultivated crops. It should be noted that the amount of land in these agricultural uses can change somewhat as farmers rotate crops between cultivated row crops and forage. Developed land comprises less than eight percent of the surrounding area. As can be seen in both the aerial photograph (Figure 1) and the land-use map (Figure 2), areas classified as "developed" are primarily local roads and highways, with few buildings and homes. The area where Acutec may build wind turbines already is disturbed by some development; the approximate location near the Acutec building already has been cleared, additional road building will be minimal, and there is already a 300-foot-tall cell tower at the site.

Soils

Soils at the site are Cambridge silt loams, with a three to eight percent slope (indicated with the abbreviation CaB (Fig. 3)). This soil formed from weathered glacial till and contains sandstone, siltstone, and shale. It is deep and is moderately well drained, although a high seasonal water table and very slow water permeability present some erosion and water logging concerns.

Soil characteristics (Table 2) suggest that there may be some complications with construction equipment, but the commercial site should be well suited for a windmill. During prolonged wetness of this soil, track-type equipment is best for general use. Also, the corrosion potential for concrete (in reference to the windmill's concrete base) is high, and special considerations may need to be taken when considering the type of concrete to be used. Similarly, the windmill foundation may need to be extended to provide adequate stability. The diameter of a tower base is typically 15-20 feet depending on the turbine model, and tower foundations are typically 40 feet deep or less. Due to possibly unstable soil conditions, modifications may be required. However, the presence of a nearby 300-foot cell tower built in the same soil series suggests that problems with building stability can be overcome.

Figure 1. Aerial photograph of Acutec facility and surrounding area. Possible windmill location indicated by orange marker.

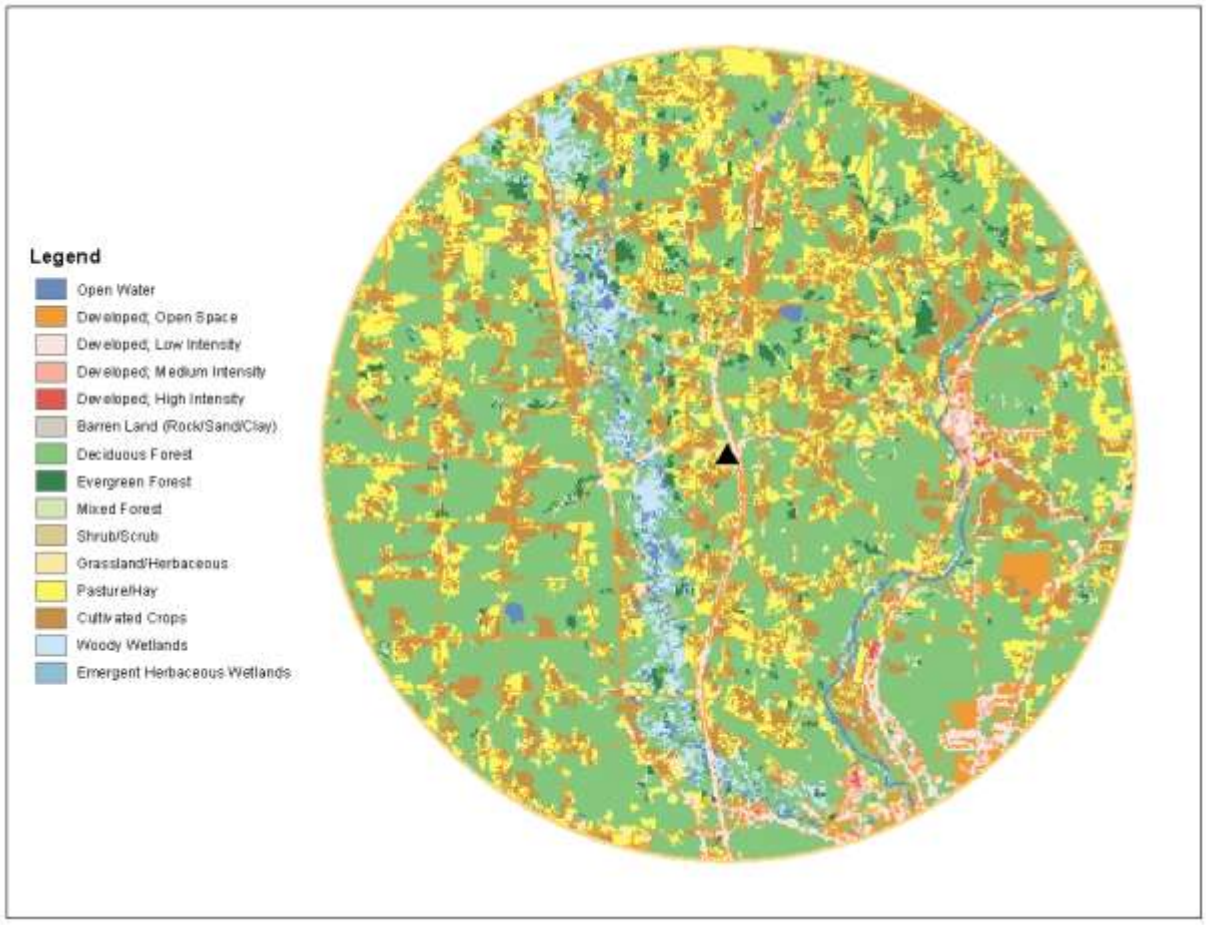

Figure 2. National Land Cover Data map of area surrounding Acutec. Proposed windmill indicated by black triangle.

Negative impacts on soils primarily will be local erosion during construction. During ground surface disturbance, construction practices will need to prevent potential erosion and siltation. Precautions may include but are not limited to:

- Building only those roads required for construction
- Minimizing road size; an access road already exists nearby
- Avoiding construction activities on slopes
- Minimizing the overall area of disturbed land
- Storing and replacing topsoil removed during excavation
- Promoting rapid revegetation of exposed soil

Table 1. Land cover within a five-mile radius of Acutec.

COVER TYPE	ACRES	% COVER
Deciduous Forest	24619	48.98
Pasture/Hay	7989	15.89
Cultivated Crops	7436	14.79
Developed; Open Space	3623	7.21
Developed; Low Intensity	1637	3.26
Woody Wetlands	1407	2.80
Grassland/Herbaceous	1010	2.01
Evergreen Forest	1007	2.00
Open water	744	1.48
Mixed Forest	256	0.51
Developed; Medium Intensity	180	0.36
Emergent Herbaceous Wetlands	181	0.36
Shrub/Scrub	130	0.26
Developed; High Intensity	43	0.09
Barren Land (Rock/Sand/Clay)	2	0.004
Total	**50264**	**100**

Water Quality

Turbines house a minimal amount of lubrication oil, and any leakage from the tower would likely be inconsequential when compared to the oil leaked into nearby parking lots and onto the local highways. Most wind turbines are designed with sensors and alarms to detect leaks, and any leak will, in the worst-case scenario, be contained within the wind turbine's tower. Also, immediate waterways are small and intermittent, with the closest being approximately 0.2 miles away (Figure 4). Although these intermittent streams drain into the French Creek watershed through Cussewago Creek, lubricants from a turbine pose a minimal environmental threat when considering the amount that could potentially leak and the distance to the nearest creek.

The most important concern with local water quality would be the potential flush of eroded topsoil that could wash away during a rain event after construction has begun. Although the potential for contamination or siltation of local streams during construction is low, typical precautions should be taken both during and after construction to avoid negative impacts. The distance from the site to Cussewago Creek suggests that water quality impacts would be negligible.

Figure 3. Soils near Acutec. Potential windmill shown as orange marker; roads are black lines. Abbreviations indicate local soil series. The Acutec site is on a Cambridge Soil Series (CaB).

Table 2. Profile of the Cambridge Soil Series (CaB).

Slope	3-8 % slope. Slightly sloping.
Depth to Seasonal High Water Table	1.5-3.0 feet
Permeability (Silt Loam)	0.6-2.0 inches per hour
Shrink-Swell Potential	Low. Change in volume of soil material does not suggest a high risk of damage to building foundations or structures.
Erosion Hazard	Slight. Precautions may be required during construction.
Equipment Limitations	Severe. Prolonged wetness restricts use of equipment.
Corrosion Potential for Concrete	High. The soil-induced chemical actions that will dissolve concrete probably require a resistant concrete at this site.
Corrosion Potential for Uncoated Steel	Moderate. The soil-induced chemical actions may require protective measures for steel.

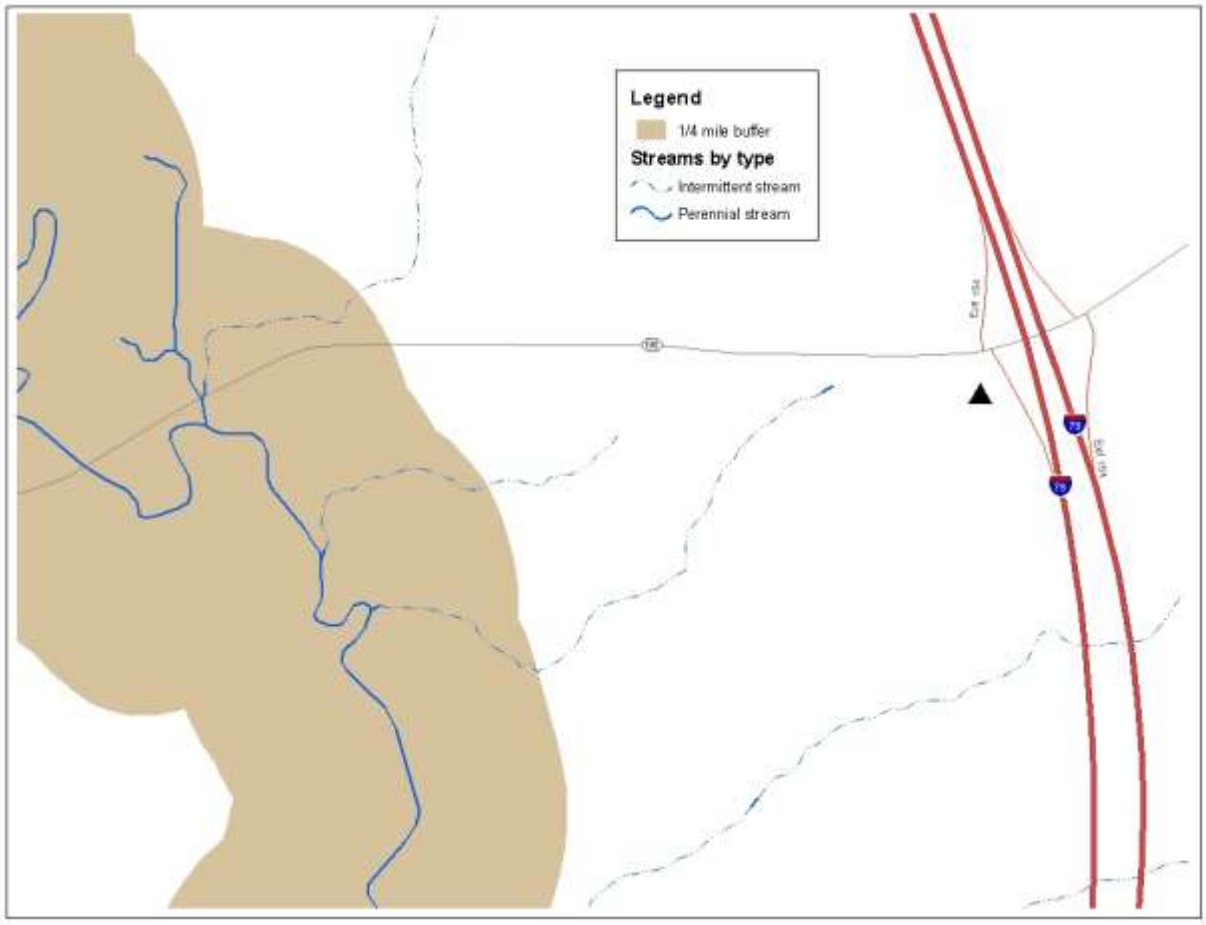

Figure 4. Waterways near Acutec. Proposed windmill indicated by black triangle. Shaded area indicates 0.25 mile riparian buffer area along Cussewago Creek.

Wildlife

Avian Impacts

Turbines have been known to kill birds and bats, but at least for birds, the estimates are far lower than mortality due to collisions with utility lines, automobiles, buildings, or communication towers (Table 3), or due to predation by domestic cats (Erickson et al. 2005). Additionally, most bird and bat mortality has occurred at large and older wind farms.

The Acutec site is near an Important Bird Area (IBA) described by the Audubon Society of Pennsylvania (Table 4). The Cussewago Bottoms IBA is a north-south riparian corridor, approximately 16 miles long and one mile wide along Cussewago Creek, a tributary of French Creek. Much of the site is heavily vegetated forested wetlands with frequent floodplain inundation. At least 190 bird species have been observed, many of which are neo-tropical migrants; the portion of the IBA owned by the Pennsylvania Game Commission may contain a mating pair of bald eagles. No avian inventories or monitoring activities occur in this IBA; detailed information on species residing in the area is not available, and an understanding of the potential effects of Acutec's windmill is limited. Audubon has stated its support for development

of alternative energy sources such as wind energy, but only in the context of minimizing impacts to wildlife populations (Daulton 2007).

Because Acutec most likely will have one to four wind turbines in an area that is not a major fly-way, the potential impact on birds most likely will be low. Mortality rates are considerably lower when proper planning has been implemented at newer farms, and deaths rarely occur where there is a single or few units (Defenders of Wildlife 2007), as would likely be the case with Acutec. Also, because the proposed site is near a major highway and would be constructed on already existing commercial location, construction of a windmill facility will not cause added habitat loss or fragmentation.

A comprehensive understanding of potential bird impacts would be enhanced by studies of avian activity in the vicinity of the windmill site prior to construction (Kunz et al. 2007a). Impacts of wind turbines on avian mortality are more accurate when studies are conducted locally than when regional or national data are used in assessments.

Table 3. Anthropogenic causes of avian mortality (adapted from Erikson et al. 2005).

Cause of death	**Mortalities per year (millions)**
Buildings	550
Power lines	130
Automobiles	80
Communication towers	4.5
Commercial wind turbines	0.03

Table 4. Profile of Important Bird Area (IBA) Cussewago Bottoms (from pa.audubon.org.).

County	Crawford and Erie
Site #	4
Approximate Size	12,682 acres
Latitude/Longitude	41”45’ / 80”14’
Key Environments Present	Riparian corridor along Cussewago Creek with frequent inundation of floodplain, forested wetlands
Reasons for IBA Selection	High diversity of bottomland and wet forest species
Number of birds identified	190, many neo-tropical migrants
Representative birds	Bald eagle (possibly one mating pair, 2-4 individuals) Marsh Wren, Pied-billed Grebe, Green-winged Teal

Bat Impacts

Recent work indicates that bat fatalities resulting from wind turbines could be a concern that equals or greatly exceeds concerns of avian mortality. Only 11 of the 46 North American bat species have been identified as having had wind-facility related deaths, but mortality rates for bats exceed those for birds at many sites. In recent years, large numbers of bat fatalities have been observed at utility-scale wind energy facilities (Table 5), particularly along forested ridge tops in the eastern U.S. (Kunz et. al. 2007b). In a study conducted at a large wind plant in

Minnesota, fatalities were primarily adult bats, whose species composition did not relate to local populations (Johnson et al. 2004). Fatality rates peaked during late July and early August, when tree bats are known to migrate (Johnson et al. 2004). Of 11 species identified in ground searches at wind energy facilities, three that are known to migrate long distances (eastern red bats, *Lasiurus borealis*; hoary bats, *Lasiurus cinerus*; silver-haired bats, *Lasionycteris blossivilli*) comprised 86 percent of the wind-related deaths in the Upper Midwest and 69 percent in the East (Kunz et.al. 2007b). It was postulated that bats involved in wind turbine collisions were migratory species navigating without use of echolocation.

Table 5. Range of mean bat fatality estimates per wind turbine (adapted from Arnett et al. 2007). Studies periods ranged from less than one to approximately three years.

Region	Number of Study Locations	Lowest Estimate	Highest Estimate
Canada	3	0.5	18.5
Eastern USA	7	20.8	69.6
Rocky Mountains, USA	1	1.3	1.3
Pacific Northwest, USA	5	0.7	3.4
Midwestern, USA	5	0.1	7.8
South-central, USA	1	1.2	1.2

Studies suggest that bat fatalities at wind energy facilities are highest near forested areas and lowest in fairly open landscapes (Johnson et al. 2004). The Acutec area is characterized by both a forested ridge top and open agricultural spaces. Ideally, a study of local bat activity at the Acutec site could be conducted and could provide insight into risks for bats. Currently, solutions to minimize bat problems are being developed by Bat Conservation International (BCI), the American Wind Energy Association, the U.S. Fish and Wildlife Service, and the U.S. Department of Energy's National Renewable Energy Laboratory. One study being conducted by BCI in south-central Pennsylvania was initiated in 2005. The study monitors bat activity and mortality three years before wind turbine construction and two years post-construction, and will determine if pre-construction bat activity could be used to predict post-construction bat fatalities at proposed wind facilities. Although definitive results from this and most other studies are still unavailable, and recommendations are few, Acutec's single to few proposed windmills do not appear to pose a serious threat to local bat populations.

Aesthetic and Viewshed Concerns

Aesthetic issues concerning Acutec's proposed wind turbines should be among the least worrisome issues in this project. Generally, the public is concerned with impacts on scenic views, the turbine's appearance, and noise levels. However, the location of the Acutec site and the low human population density of the area are likely to reduce these concerns (Table 6).

Wind turbines tend to be highly visible, because the highest wind effect typically is found in areas of high elevation and open ground. Although the site for Acutec's windmill is on a ridge, geographic information systems analyses suggest that only 26.5 percent of the area within a five-

mile radius of a large tower actually will be able to see the windmill due to local topography and forest height. The overall area within the tower's five-mile radius is sparsely populated (Figure 5), with land use dominated by agriculture and forest; few residents living within the area are likely to see the turbine. Additionally, a 300-foot-tall cell tower at the site exists already, suggesting that any scenic vista already is compromised. Addition of a wind turbine should not severely impact the skyline any more than the present cell tower does already.

When the turbine is visible, several techniques can minimize negative appearance. A large turbine probably will be recommended for the site based on efficiency, but the appearance of larger turbines also is favored because they spin more slowly than smaller turbines. Turbines should be a neutral color (possibly matching Acutec buildings or skyline) and devoid of advertisements. No lights should be directed at the tower, and only an aircraft warning light should be present. Uniformity of multiple turbines will make the scene seem less intrusive.

Wind turbines make a low humming sound while blades are spinning, but technology has reduced this noise pollution to be comparable to the level of an office environment (http://defenders.org/habitat/renew/wind.html). In comparison to nearby highway noise as well as to the sound from wind itself, noise generated by one to four turbines should be minimal. It should be noted that noise increases as wind speed increases; a study of turbine noise in Germany found that a 17 turbine farm generated noise 15dB higher than expected and annoyed residents over a mile away during quiet nights when noise was more noticeable (van de Berg 2003). Precautions should be taken to avoid excess noise, even in the case of single or few turbines. Acoustic insulation installed inside of the turbine may help to lessen noise.

Table 6. Summary of possible aesthetic concerns and assurances for Acutec's windmill.

Public Concern	**Public Assurance**
Visual intrusion on skyline	▪ 300-foot Cell tower already exists obstructing view ▪ Visible by only 26.5 percent of the area within five-mile radius of a 300-foot turbine ▪ Area is sparsely populated
Structural Appearance	▪ Turbine should be a neutral color & devoid of advertisements ▪ Turbine should not be lighted except for aircraft warning light ▪ Favored tubular appearance is standard design ▪ Large turbines spin slowly; considered more visually appealing than rapidly spinning rotors ▪ Multiple turbines should look uniform and rotate the same way
Shadow Flicker	▪ Turbine should not cast a blinking shadow nearby
Noise Pollution	▪ At speeds of 4.7 m/s or more, other sounds exceed turbine sounds ▪ Humming noise from modern turbines is comparable to an office environment decibel level ▪ Highway noise will be greater than wind turbine

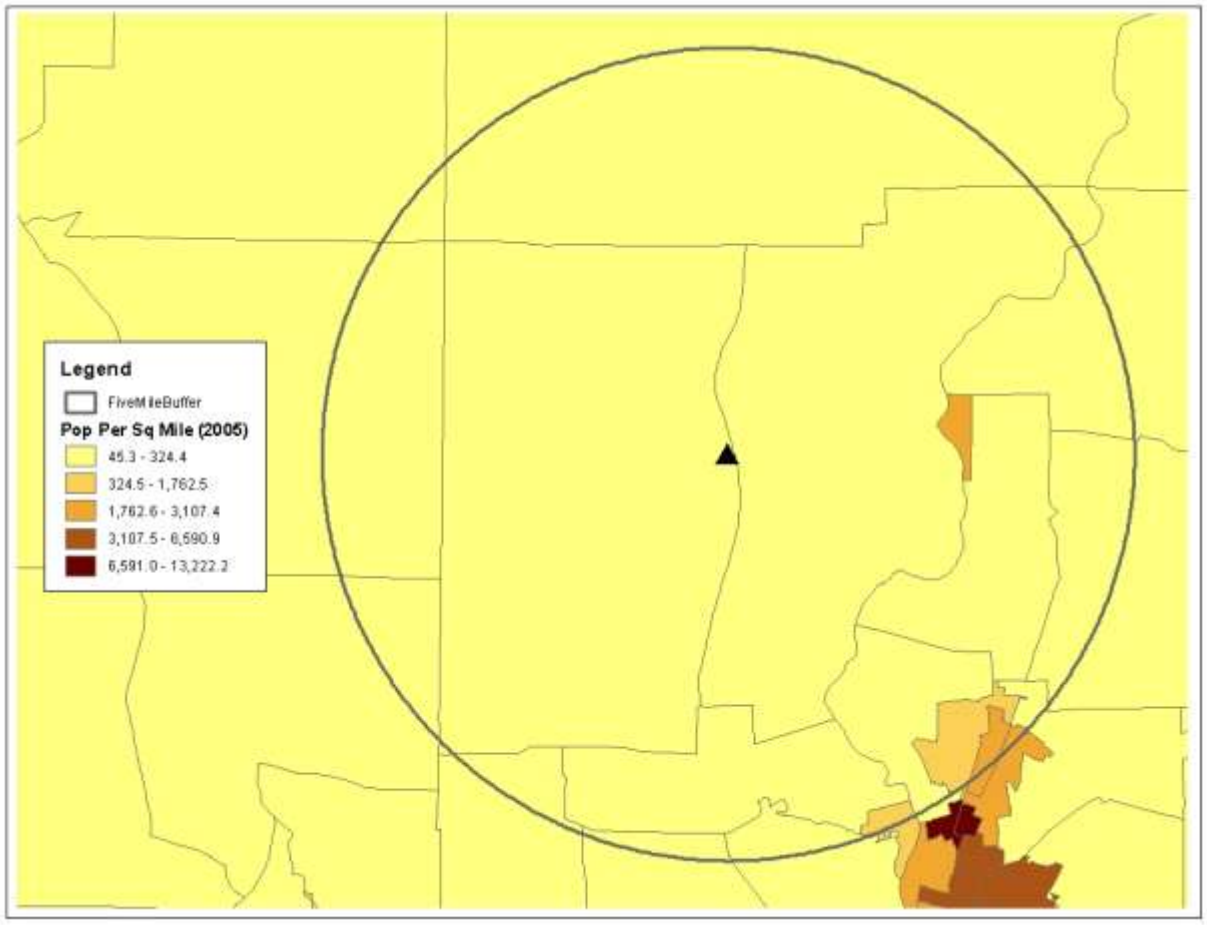

Figure 5. Population density of area surrounding Acutec. Acutec site indicated by black triangle; dark circle indicates a five-mile radius from the proposed site.

Conclusion

Placement of windmills at the Acutec Precision Manufacturing facility in Saegertown does not seem to pose a major hazard to the environmental integrity of the area. The area is dominated by a forested and agricultural landscape with a relatively low population density. Specifically, the site is located upon a commercial area immediately adjacent to a major interstate highway and state highway interchange, where a large communications cell tower already exists. Windmills would not appear to result in a negative impact upon the landscape. Soils will require care during construction, but standard erosion control measures during construction should minimize possible problems. There are no water courses or bodies at the site or in the area that would be threatened; the nearest stream, Cussewago Creek, is approximately one mile away and is not likely to be impacted. The present commercial land use of the site indicates that a windmill will not cause harm to most local wildlife. The location is positioned approximately one mile from an area identified by Audubon of Pennsylvania as an Important Bird Area; potential impacts on birds should be further investigated. Previous studies suggest that bird impacts are likely to be minimal. Emerging evidence suggests that bats may be negatively impacted by windmills, and this potential impact should receive additional attention.

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