Eagle Conservation Plan
For the
Apple Blossom Wind Farm
Huron County, Michigan

Prepared by:
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July 2021

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Acronym and Term List

AES:	Applied Ecological Services
APLIC:	Avian Power Line Interaction Committee
APWRA:	Altamont Pass Wind Resource Area
BBCS:	Bird and Bat Conservation Strategy
BGEPA:	Bald and Golden Eagle Protection Act
BMPs:	Best Management Practices
DDT:	dichlorodiphenyltrichloroethane
ECP:	Eagle Conservation Plan
ECPG:	Eagle Conservation Plan Guidance Module 1 Land-based Wind Energy Version 2
ESA:	Endangered Species Act
ETP:	Eagle Take Permit
FAA:	Federal Aviation Administration
IEUA:	Important Eagle Use Areas
LAP:	Local Area Population
MBTA:	Migratory Bird Treaty Act
MDNR:	Michigan Department of Natural Resources
MNFI:	Michigan Natural Features Inventory
NEPA:	National Environmental Policy Act
NRCS:	Natural Resource Conservation Service
PCB:	polychlorinated biphenyls
PEIS:	Programmatic Environmental Impact Statement
USFWS:	U.S. Fish and Wildlife Service
WEG:	USFWS Land-based Wind Energy Guidelines
WEST:	Western EcoSystems Technology, Inc.

1 Introduction

Apple Blossom Wind, LLC (Apple Blossom, or Project Owner), has developed and is operating the Apple Blossom Wind Farm (Project) located in western Huron County, Michigan.

The Project began in 2005 when a Michigan-based wind energy developer identified the area as having a strong wind resource and landowners interested in wind energy. The Michigan-based developer continued to work on the Project from 2005 until 2011, when Geronimo Energy became the Project's owner and developer. In 2015, Apple Blossom, an indirect wholly owned subsidiary of Sempra Renewables, became the owner and developer of the Project. AEP Renewables, LLC completed the purchase of Sempra wind assets on April 22, 2019. The Project was constructed and started operating in 2017.

The Project is located west of the Village of Pigeon, approximately three miles east of the shore of Lake Huron's Saginaw Bay (Map Exhibit 1). The Project's permanent facilities consist of 29 3.45 megawatt (MW) wind turbines, two meteorological towers (262 feet tall), an underground electrical collection system, a substation, access roads, an operations and maintenance facility, and approximately 4.8 miles of 120 kilovolt (kV) overhead transmission line (the Project facilities).

Apple Blossom is pursuing an Eagle Take Permit (ETP) for the Project, and is creating this Eagle Conservation Plan (ECP) to address the Project's potential impacts on eagles via cooperative, effective, and responsive planning and operations.

2 Facility Description

The Project consists of 29 Vestas V126 3.45 MW wind turbine generators along with associated facilities in Winsor Township in Huron County, Michigan (Map Exhibit 2). The land sections included in the Project are shown in Table 1. These sections together are referred to as the Project site.

Table 1. Public Land Survey System Description of Project

Township Name	Township	Range	Sections
Winsor	16N	100E	3, 4, 8, 9, 10, 11, 12, 15, 16, 17 & 22

The wind turbines are mounted on tubular steel towers approximately twenty feet in diameter at the base. At ground level, each completed turbine location consists of an access road, a circular tower base mounted on a circular concrete foundation slightly larger than the tower flange, with a gravel apron approximately ten feet wide surrounding the tower. Other than these features, the land continues to be used for farming practices typical of the Project site within a few feet of the gravel apron (surrounding the turbine tower base) and access road. No fences or guy wires that interfere with farming practices are used. Collector system cabling was installed approximately five feet below ground surface. The Project facilities are located on the property of landowners who have signed wind energy lease agreements with Apple Blossom.

The Project includes a 34.5 kV/120 kV substation to transform the energy from the Project to transmission voltage. The substation was designed to National Electrical Safety Code, Rural Utility Standards, and other typical utility practices including the Avian Powerline Interaction Committee (APLIC) Guidelines. From the Project substation, the energy from the wind farm travels along a 4.8-mile transmission line. This line was designed to National Electrical Safety Code, Rural Utility Standards, and other typical utility practices including the APLIC Guidelines. Conductors on the line are separated far enough to prevent arcing of electricity when an eagle's wings are fully extended; additionally, portions of the line as well as the low side of equipment at the Project substation are marked with bird flight diverters, which reduce the risk of collision.

3 Existing Legal Framework

The U.S. Fish and Wildlife Service (USFWS) is responsible for implementing and enforcing federal wildlife laws, including the Bald and Golden Eagle Protection Act (BGEPA, or Eagle Act), Migratory Bird Treaty Act, and the Endangered Species Act. The Michigan Department of Natural Resources (MDNR) is responsible for implementing and enforcing State regulations regarding threatened and endangered species.

3.1 BALD AND GOLDEN EAGLE PROTECTION ACT

The BGEPA provides for the protection of the Bald Eagle and the Golden Eagle by prohibiting, except under certain specified conditions, the taking, possession, and commerce of such birds. The BGEPA prohibits anyone, without a permit issued by the U.S. Secretary of the Interior, from taking eagles, including their parts, nests, or eggs. The Eagle Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." The BGEPA provides civil and criminal penalties for persons who violate the law or regulations.

Under 50 Code of Federal Regulations (CFR) 22.3, "disturb" is defined as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." The BGEPA's definition of "disturb" also addresses effects associated with human-induced alterations at the site of a previously used nest during a time when eagles are not present. Upon an eagle's return, if such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death, or nest abandonment, then this would constitute disturbance.

In September 2009, the USFWS established rules (50 CFR 22.26 and 22.27) authorizing limited legal take of Bald and Golden Eagles and their nests "when the take is associated with, but not the purpose of, an otherwise lawful activity, and cannot practicably be avoided." Such authorization is provided in the form of a take permit issued by the USFWS, consistent with the regulatory criteria. As part of the 2009 Eagle Permit Rule (USFWS 2009), thresholds of take were established, under which a regional population of Bald Eagles, or an Eagle Management Unit (EMU), would maintain stable or increasing eagle populations. Regulations under 50 CFR 22.26 distinguish take that might result from short-term or one-time actions from take that might result from ongoing, long-term actions (programmatic take).

In April 2013, the USFWS issued the *Eagle Conservation Plan Guidance: Module 1 – Land-Based Wind Energy* (ECPG). The purpose section states that the ECPG:

> . . . explains the Service's approach to issuing programmatic eagle take permits for wind energy projects under [the authority of the Eagle Permit Rule], and provides guidance to permit applicants (project developers or operators), Service biologists, and biologists with other jurisdictional agencies (state and tribal fish and wildlife agencies, in particular) on the development of *Eagle Conservation Plans* (ECPs) to support permit issuance… The [*ECP Guidance*] is intended to provide interpretive guidance to Service biologists and others in applying the regulatory permit standards as specified in the rule. They do not in and of themselves impose additional regulatory or generally-binding requirements. An ECP *per se* is not required, even to obtain a programmatic eagle take permit. As long as the permit application is complete and includes the information necessary to evaluate a permit application under 50 CFR 22.26 or 22.27, the Service will review the application and make a determination if a permit will be issued. However, Service personnel will be trained in the application of the procedures and approaches outlined in the [*ECP Guidance*], and developers who choose to use other approaches should expect the review time on the part of the Service to be longer. The Service recommends that the basic format for the ECP be followed to allow for expeditious consideration of the application materials (USFWS 2013a).

On December 9, 2013, the USFWS issued a rule extending the maximum term for programmatic eagle take permits from five to 30 years if wind farms adopt measures to minimize harm to eagles. This rule went into effect on January 8, 2014 (USFWS 2013b). On August 11, 2015, a Federal Court (Northern District of California) set aside the 30-year Eagle Permit Rule, finding that the USFWS failed to show an adequate basis in the record for deciding not to prepare a NEPA document prior to increasing the maximum eagle take permit duration.

On December 16, 2016, the USFWS issued a revised rule that includes changes to the regulations for eagle incidental take permits and eagle nest take permits. The Service also issued a final Programmatic Environmental Impact Statement (PEIS) analyzing the revisions under NEPA. The revisions to the Eagle Rule went into effect on January 17, 2017, and include changes to permit issuance criteria, duration (including a maximum permit term of 30 years), compensatory mitigation standards, and permit application requirements. Additionally, the revised Eagle Rule further defines the USFWS-approved protocols for pre-construction eagle use surveys (referencing the ECPG) and post-permit fatality monitoring requirements.

To assist wind project proponents in meeting the requirements of 50 CFR 22.26, the ECPG outlines a five-stage approach to developing successful ECPs. These five stages are:

1. Initial landscape-scale site assessment;
2. Site-specific surveys and assessment;
3. Fatality prediction;
4. Application of conservation practices that avoid and minimize risk to the maximum extent practicable, and application of compensatory mitigation for remaining take (if required); and
5. Post-construction monitoring.

These five stages build upon one another and in conjunction are used to predict the annual eagle fatalities using a USFWS-developed model that employs a mix of Project-specific and existing information regarding eagle behavior. The overall goal of this five-stage approach is to use Project-specific information to minimize risk to eagles and modeling to provide conservative take estimates, to reduce the risk of underestimating the number of annual eagle fatalities.

The Project is applying for a 30-year incidental eagle take permit under section 22.26 of the BGEPA due to the potential for Bald Eagle take during the operating life (2018-2047) of the Project.

The Project Owner has been in consultation with USFWS regarding Golden Eagle risk at the Project, and the Project is not seeking a permit to incidentally take Golden Eagles at this time.

3.2 MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act (MBTA; 16 United States Code [USC] 760c-760g), as amended, implements protection of all native migratory game and non-game birds with exceptions for the control of species that cause damage to agricultural or other interests. The MBTA prohibits the take of any migratory bird, part, nest, egg, or product. "Take," as defined in the MBTA, includes by any means or in any manner any attempt at hunting, pursuing, wounding, killing, possessing, or transporting any migratory bird, nest, egg, or part thereof.

The MBTA does not explicitly include provisions for permits to authorize incidental take of migratory birds. Executive Order (EO) 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds* (January 10, 2001), however, provides requirements for all federal agencies to incorporate considerations of migratory birds into their decision-making, including the conservation of migratory birds, the proper evaluation of them in the NEPA process, and avoidance, minimization, and mitigation of migratory birds impacts and take where appropriate.

The USFWS has provided, and continues to provide, wind power developers with guidance in making a good-faith effort to comply with the MBTA. The USFWS finalized their *Land-Based Wind Energy Guidelines* (USFWS 2012a), which include recommendations that are advisory in nature and do not, in and of themselves, represent or reflect agency law or policy. The *Land-*

Based Wind Energy Guidelines describe how the USFWS exercises its law enforcement discretion in the absence of an explicit incidental permit program:

> The USFWS urges voluntary adherence to the [*Land-Based Wind Energy*] Guidelines and communication with the USFWS when planning and operating a facility. While it is not possible to absolve individuals or companies from MBTA or BGEPA liability, the Office of Law Enforcement focuses its resources on investigating and prosecuting those who take migratory birds without identifying and implementing reasonable and effective measures to avoid the take. The USFWS will regard a developer's or operator's adherence to these Guidelines, including communication with the Service, as appropriate means of identifying and implementing reasonable and effective measures to avoid the take of species protected under the MBTA and BGEPA. The Chief of Law Enforcement or more senior official of the Service will make any decision whether to refer for prosecution any alleged take of such species, and will take such adherence and communication fully into account when exercising discretion with respect to such potential referral. Each developer or operator will be responsible for maintaining internal records sufficient to demonstrate adherence to the Guidelines and response to communications from the USFWS. Examples of these records could include: studies performed in the implementation of the tiered approach; an internal or external review or audit process; a BBCS [Bird and Bat Conservation Strategy]; or a wildlife management plan.

It also notes that federal agencies, including the USFWS, are "bound by their own agency-specific statutes, as well as by the MBTA, BGEPA, ESA [Endangered Species Act], EOs, such as EO 13186, and NEPA. These guidelines should be viewed as complementary to other federal law and policy that may direct information collections and considerations in siting projects."

The Project Owner has relied to some degree on the USFWS's recommendations, as well as other previous USFWS guidance in developing a Bird and Bat Conservation Strategy (BBCS, Appendix 2), as recommended in the *Land-Based Wind Energy Guidelines* (USFWS 2012a).

3.3 ENDANGERED SPECIES ACT (ESA)

Federally listed threatened and endangered species and designated critical habitat are governed by the Endangered Species Act (ESA) of 1973, as amended (16 USC §§ 1531–1544) and the USFWS's implementing regulations at 50 CFR Parts 13 and 17. The USFWS is authorized to identify species in danger of extinction and provide for their management and protection. The USFWS also maintains a list of species that are candidates for listing pursuant to the ESA.

Section 9 of the ESA makes it unlawful for a person to "take" a listed species. "Take" is defined as "…to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." The U.S. Secretary of the Interior, through regulations, defined the term "harm" as "an act which actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering." However, permits for "incidental take" can be obtained from USFWS for take of an endangered species that would occur as a result of an otherwise legal activity.

Section 10 of the ESA, among other things, authorizes the USFWS to issue permits to incidentally take ESA-listed species and allows for the development of "Habitat Conservation Plans" for endangered species on private lands or for the maintenance of facilities on private lands.

The BBCS (Appendix 2) provides more information on ESA-listed species with the potential to occur in the vicinity of the Project.

3.4 STATE REGULATIONS

Under Michigan law, a person:

> shall not take, possess, transport, import, export, process, sell, offer for sale, buy, or offer to buy, and a common or contract carrier shall not transport or receive for shipment, any species of fish, plants, or wildlife appearing on the following lists:
> (a) The list of fish, plants, and wildlife indigenous to the state determined to be endangered or threatened within the state pursuant to section 36503 or subsection (3).
> (b) The United States list of endangered or threatened native fish and wildlife.
> (c) The United States list of endangered or threatened plants.
> (d) The United States list of endangered or threatened foreign fish and wildlife.

Bald and Golden Eagles are not listed as endangered or threatened in Michigan; the Bald Eagle is listed as a Special Concern species in the state.

4 Biological Profile: Bald and Golden Eagles

4.1 SPECIES STATUS AND DISTRIBUTION – GOLDEN EAGLE

Golden Eagles are federally protected under the BGEPA and MBTA.

Golden Eagles are mainly found in western North America from Alaska to central Mexico in open areas that provide hunting opportunities and near cliffs that offer suitable nesting and perching habitat (Kochert et al. 2002). Small breeding populations occur in northern Ontario and Quebec with wintering populations across the eastern United States (NEC 2015). Golden Eagles do not breed in Michigan. According to eBird, Golden Eagles have been observed in Michigan, with a few more observations in spring migration compared to winter or fall migration periods (eBird 2017). In the vicinity of the Project, Golden Eagles have been occasionally recorded along the shores of Saginaw Bay, with only two observations within 10 miles of the Project: one was observed in January 2012 approximately five miles southwest of the Project and one was documented in April 2015 approximately five miles northwest of the Project along Wildfowl Bay (eBird 2017). Bald Eagles are much more common in Michigan than Golden Eagles, and are described in further detail below.

4.2 SPECIES STATUS AND DISTRIBUTION – BALD EAGLE

4.2.1 Species Status

In 2007 the USFWS delisted the Bald Eagle from its Federal Threatened status under the Endangered Species Act in the contiguous United States (USFWS 2007b) as a result of population restoration and stabilization in five regional recovery areas covering virtually all of the bird's historical range. As noted above, Bald Eagles are still federally protected under the BGEPA and the MBTA.

4.2.2 Nationwide Distribution

The Bald Eagle's range is widespread throughout North America, from Alaska and Canada to northern Mexico. Bald Eagles are found in all of the continental United States. The population size of the Bald Eagle has varied greatly in the past one hundred years. In 1963, an all-time low population for the continental U.S. was recorded at 487 nesting pairs, but as of 2006, 9,789 nesting pairs were documented (USFWS 2012c). Large populations of Bald Eagles in North America occur in Alaska, the Pacific Northwest, Canada, the Upper Great Lakes region (where the Project is located), and Florida. As discussed further below, the 2016 Eagle Rule utilized additional data showing increasing Bald Eagle populations to establish updated take thresholds at the eagle management unit level.

The Project is located in USFWS Region 3, in the Mississippi Flyway. When compared with all USFWS management regions in the continental United States, Region 3 has the largest predicted number of Bald Eagle nesting pairs and the largest predicted Bald Eagle total population size.

The Bald Eagle population continues to increase in the lower 48 states. This upward population trend led to the Bald Eagle's delisting from the ESA in 2007.

4.2.3 Great Lakes Region Distribution

Bald Eagle populations in the Great Lakes Region (USFWS Region 3, including all of Michigan) are believed to be increasing; however, exact annual survey numbers are difficult to compare between states due to variability in survey methods (Stuber 2011, personal communication). In 2009, the USFWS estimated Region 3 to contain 6,375 Bald Eagle nests, 3,452 nesting pairs, and an estimated population of 27,617 individuals (USFWS 2009b). These population statistics are used by the USFWS to calculate an annual take of Bald Eagles that would not compromise long-term sustainability of the population (i.e., one-half of the maximum sustainable yield as calculated by Millsap and Allen 2006). Furthermore, as described in the USFWS' *Population Demographics and Estimation of Sustainable Take in the United States* (USFWS 2016), the USFWS has recalculated the Bald Eagle population for the Great Lakes region as part of the overall Mississippi Flyway and determined that the population is higher than previously estimated in 2009, indicating that a higher take threshold is sustainable (USFWS 2016).

4.2.4 Michigan Distribution

The Upper Peninsula of Michigan remained a key stronghold for Bald Eagles throughout the mid-20th century when Bald Eagles populations were at their lowest nationwide (Grier et al. 1983). Between 1960 and 1973, the Bald Eagle was still nesting in 26 counties in Michigan. By 1981, there were 102 occupied breeding areas in Michigan, 18% of the known breeding population in the lower 48 states (Grier et al. 1983). As the entire Bald Eagle population has recovered, the Bald Eagle population in Michigan has greatly expanded. By 2006, there were an estimated 482 breeding pairs in the state (USFWS 2007b). Since then the population has continued to expand, adding some 50 new breeding territories in 2010 alone (Stuber 2011, personal communication). By 2017, there were an estimated 835 occupied nesting territories in the state, representing an expansion of an average of 27 nests per year since 2010. All but three counties in Michigan had documented Bald Eagle nests in 2017 (unpublished USFWS/MDEQ data 2017, provided by C. Mensing 11/27/2017).

4.2.5 Huron County and Eastern Wildfowl Bay Distribution

Historically, Huron County was densely forested. Today, however, over 90% of the county supports agriculture. Remaining forests are concentrated along the coastline and along stream corridors—the Pinnebog, Pigeon, New River and their tributaries. In the last 100 years, wildlife that requires large habitat patches has been replaced by wildlife adapted to agriculture and development. However, Wildfowl Bay (the eastern shore of Saginaw Bay in Lake Huron) and its associated islands have hosted a Bald Eagle population since at least the 1960s, when the USFWS began to track the population. Since that time, the population has expanded to include additional nests on the islands and the coast. As of the 2017 breeding season, eight Bald Eagle territories were documented along the coast of Wildfowl Bay/Lake Huron within 10 miles of the Project.

4.3 LIFE HISTORY – BALD EAGLE

Bald Eagles are large birds, weighing 10 to 12 pounds. They are 34 to 43 inches long with a wingspan of 6 to 7.5 feet. Adults have a distinct white head and tail while the rest of the body feathers are dark brown. Adults have yellow eyes, feet, and beak. Juveniles do not have the white head or tail, and instead have a mottled white and brown pattern covering their body. A Bald Eagle takes about 5 years to develop full adult plumage.

Bald Eagles associate with distinct geographic areas and landscape features, including nest sites, foraging areas, communal roost sites, migration corridors, and migration stopover sites (USFWS 2013). They are typically found in close proximity to water bodies, both natural and manmade, due to the presence of fish. They prefer to nest, perch, and roost in old-growth or mature stands of trees, and they usually select a nesting tree that is the tallest among those in its vicinity to provide visibility. Nesting trees are usually situated near a water body that supports fish, their preferred prey (Buehler 2000).

Eagles typically occupy roosting sites from after sunset to before sunrise. It is less important for roosting sites to be located near water compared to nesting sites. Cover that provides protection from weather is important in the selection of roosting sites.

Bald Eagles feed any time during daylight hours. They are accomplished at capturing fish, hence their affinity for nesting near open water. However, Bald Eagles are opportunistic and also prey on birds, reptiles, mammals, and carrion (e.g., dead white-tailed deer).

4.3.1 Demographics

Bald Eagles are typically monogamous, pairing for life. They lay one to three eggs per clutch, two eggs being most common. It is uncommon for three-egg clutches to produce three fledglings (Gerrard and Bortolotti 1988). Eggs are laid 36 hours apart, with the first-laid egg being the first to hatch, providing a competitive advantage to that eaglet (Buehler 2000). Bald Eagle broods are typically restricted to one per year, but in the event a nest is destroyed, a second nest may be initiated.

Bald Eagles reach sexual maturity at ages ranging from 3-7 years, with an average around 5.5 years (Buehler 2000, Heintzelman 2004). Density of eagles has been shown to modify sexual maturity age, with lower population densities breeding earlier than populations with higher densities (Buehler 2000, Heintzelman 2004). In areas with high eagle concentrations, Bald Eagles may not begin breeding until 6 or 7 years of age (Heintzelman 2004).

Reported survival rates in different age classes vary from one study to the next, with density of breeding grounds and food availability thought to be the leading determinant of survival (Elliott et al. 2011, Swenson et al. 1986). Multiple studies show that survivorship increases as eagles age (McCollough 1986, Wood and Collopy 1995, Millsap et al. 2004), while other studies report that survivorship decreases with age (Harmata et al. 1999, Bowman et al. 1995). Many of these studies report high annual survival rates of juveniles and adults, typically greater than 70%. Survival rates vary from 60-100% for any given age class. Survival rates were not found to differ between males and females, with incubation time, or with time of dispersion from the nest (Millsap et al. 2004). The same study reported a difference between eagles that were raised in nests occurring in suburban versus rural areas, with survival rates lower for suburban-dwelling birds. Buehler (2000) reported that migratory Bald Eagle populations have slightly lower survivorship than populations that remain in one location year-round.

The Ohio Department of Natural Resources estimates the life expectancy of Bald Eagles in the wild is 15-20 years (Ohio Department of Natural Resources, no date). The oldest known Bald Eagle lived for 38 years (Audubon 2015).

4.3.2 Breeding

The USFWS defines the Bald Eagle breeding season as approximately mid-January through mid-August (personal communication from M. Stuber at Lansing Field Office 2012). The breeding period overlaps the spring migration period, discussed below. Nests are established about a month prior to egg-laying, which varies by region (nest building in the north-central states occurs between January and February). Established Bald Eagle pairs typically return to existing nests, while new pairs build from scratch or take over an unused nest. Nests are built from plant material, such as branches, grasses, corn stalks, cattails, and other plant debris. Bald Eagles are fiercely defensive of their nesting territory, aggressively confronting other birds entering the area.

Newton (1979) considered the nesting territory of a raptor as the defended area around a pair's nest site and defined the home range as "...the area traveled by the individual in its normal activities of food gathering, mating, and caring for the young." The size and shape of nesting territories, as well as the pattern of use by a Bald Eagle pair, vary with topography, prey availability, region, and sex (USFWS 2013). Territories also vary seasonally (Newton 1979). At its most basic level, the nesting season home range is described by Mohr (1947) as a minimum-convex polygon formed by connecting the outermost occurrences of an eagle or pair of eagles during the nesting season.

Garrett et al. (1993) found that Bald Eagle territories in the Pacific Northwest extend at least 3.2 km from nests, though studies in areas of dense Bald Eagle breeding territories in superior habitat suggest home ranges may be much smaller (Sherrod et al. 1976, Hodges and Robards 1982, Anthony 2001). In a number of raptor studies, one-half the inter-nest distance has been widely used as a coarse approximation for the territory boundary around a nest (e.g., Thorstrom 2001, Wichmann et al. 2003, Soutullo et al. 2006). This method assumes territories are circular, which is not often the case. Territories vary in shape, depending on several factors, including locations of foraging areas and other eagle territories. In addition to nest site activity during the breeding season, some non-breeding Bald Eagles roost communally during the breeding season (USFWS 2013).

Eggs are incubated by the male and female for about 35 days (generally from February through April), though this role is primarily carried out by the female. Eaglets are fed and cared for by both parents and remain nest-bound for 10 to 12 weeks until they are strong enough to fly (Gehring 2006). Fledging eagles will remain near the nest for a period of time while they learn to hunt from watching their parents. The post-fledging dependency period was found to vary throughout populations in different geographic regions (ranging from 4 to 11 weeks), but was not found to vary with differences in sex, number of fledglings, timing of fledging, or hatch order (Wood and Collopy 1998). Prior to their young becoming independent, parent Bald Eagles will stay near the nest to supply food and training. Both sexes secure food and feed their young. As age increases, the mean distance that fledglings travel from the nest increases (Wood and Collopy 1998). Bald Eagles become independent at 17 to 20 weeks (Wood and Collopy 1998). Based on analysis of band recovery data from a subsample of states (50 cases from Alaska, Arizona, Florida, Minnesota, Virginia), the USFWS estimated the median natal dispersal distance for Bald Eagles to be 69 km (43 mi; USFWS 2009b). Based on additional information and analysis, the dispersal distance for Bald Eagles is now estimated to be 138 km (86 mi; USFWS 2016).

4.3.3 Migration

The USFWS defines the Bald Eagle spring migration season as extending from approximately mid-January through March, and the fall migration season as extending from approximately mid-August through October (USFWS unpublished communication). In the Great Lakes Region, adult Bald Eagles are generally year-round residents; however, individuals (immature or adults from elsewhere) sometimes migrate through the state during spring and fall.

Bald Eagles tend to migrate along north to south-oriented cliff lines, ridges and escarpments, where they are buoyed by uplift from deflected winds (Kerlinger 1989, Mojica et al. 2008). They often soar, and simultaneously hunt and forage, at midday using thermal uplifts or on winds aloft. When migrating they glide from one thermal to the next, sometimes moving in groups with other raptor species. Due to their use of these wind currents, the onset of Bald Eagle migration is influenced by rising temperatures and favorable winds (Harmata 1984). Passage rates of migrant eagles can be influenced by temperature, barometric pressure, winds aloft, storm systems, weather patterns at the site of origin, and wind speed (Yates et al. 2001). Bald Eagles avoid large water bodies during migration and funnel along the shoreline, often becoming concentrated in situations where movement requires water crossings (Newton 1979). Eagles annually use stopover sites with predictably ample food supplies (e.g., Restani et al. 2000, Mojica et al. 2008), although some stopovers may be brief and infrequent, such as when optimal migration conditions suddenly become unfavorable and eagles are forced to land and seek roosts (USFWS 2013).

Outside the breeding season, communal roosts include individuals of all ages and residency status (USFWS 2013). Bald Eagles may roost singly or in small groups, but larger communal roosts are common throughout the year (Platt 1976, Mojica et al. 2008) and tend to be associated with nearby foraging areas.

4.3.4 Wintering

The USFWS defines the Bald Eagle winter season as approximately November through mid-January (USFWS unpublished communication). Due to their primary diet of fish, Bald Eagles are often associated with water bodies that do not freeze, including large flowing rivers, areas downstream of hydro-electric dams, and areas of warmed water such as discharge areas of cooling ponds and outfalls associated with power plants. However, road kill, carrion, and small animals are consumed by Bald Eagles as well, making them not entirely dependent on open water in the winter (Gehring 2006). Communal roosts, as discussed above, may also be used by Bald Eagles during winter.

4.4 CURRENT THREATS – BALD EAGLE

Human factors have the largest impact on eagle mortality. These factors include electrocution or collision with power lines, poisoning through pesticides and contaminants, and gunshot wounds (Buehler 2000, Harmata et al. 1999, Millsap et al. 2004). Other, non-human related factors, such as food availability, disease, and weather-related injuries, also play a role in mortality (Buehler 2000, Harmata et al. 1999, Millsap et al. 2004).

Breeding Bald Eagle populations declined precipitously in the late 1940s due to the extensive use of the pesticide dichlorodiphenyltrichloroethane (DDT), and the eggshell-thinning effects of a DDT biodegradation product on eagle reproduction (Bowerman et al. 1995). The subsequent 1972 ban of DDT in the U.S. and the Bald Eagle’s protection under the ESA were largely responsible for the recovery of this species. Studies by Bowerman et al. (1995) suggest that concentration of environmental toxicants is the most critical factor influencing eagle populations presently. Toxins affecting Bald Eagles include lead, mercury, chlorinated pesticides, and polychlorinated biphenyls (PCBs), all of which bioaccumulate in fish and other prey consumed by eagles (Clark et al. 1998).

The 1991 federal ban on lead shot for hunting waterfowl has reduced the amount of lead introduced into the environment. However, Bald and Golden Eagles admitted to The Raptor Research Center at the University of Minnesota had a 17.5% incidence of lead poisoning before the 1991 ban, and a 26.8% incidence of lead poisoning after the ban (Kramer and Redig 1997). Lead poisoning has been estimated to account for 10–15% of the recorded post-fledging mortality in Bald Eagles and Golden Eagles in Canada and the U.S. (Scheuhammer and Norris 1996). Contaminants monitoring and mortality cause reporting are important steps toward understanding population dynamics and developing conservation plans for Bald Eagles (Mierzykowski S.E., 2013).

In addition to lead poisoning, other threats to Bald Eagles include a) trauma from vehicular collision, impact injuries, animal attacks, and entrapment, b) poisoning that often results from consuming prey which had been poisoned by pest control efforts, c) habitat loss and/or degradation, d) killing for wildlife trafficking, and e) disease. Between 1993 and 2003, trauma was the most common reason (70%) for Bald Eagle admission to the Wildlife Center of Virginia, and 15% of the trauma was due to gunshot (Harris and Sleeman 2007). Vehicular collisions (primarily cars and trains) are especially a threat while eagles are feeding on road kill and carcasses near roads and railroads. In Michigan, collisions with cars accounted for 29% of collisions between 1987 and 2008 (USFWS 2010). Aircraft collisions are also a cause of Bald Eagle mortality; however, this impact is relatively rare (FAA 2007). Two such collisions were reported in Michigan between January 1990 and May 2007 (USFWS 2009b). Power line collisions, electrocution, drowning, and asphyxiation have also been reported as causes of Bald Eagle mortality (Weech et al. 2003; LaRoe et al. 1995). Bald Eagles are killed for financial gain by wildlife traffickers (USFWS 2009b), and they also die from infectious diseases, such as West Nile virus (Harris and Sleeman 2007).

Physical loss of habitat (e.g., forest clearing) and other landscape disturbances (e.g., oil and gas development, noise) can result in abandoned nesting sites and territories (Hockin et al. 1992; USFWS 2009b). Climate change has been identified as another threat to Bald Eagles, primarily due to predicted sea-level rise and associated flooding of coastal lowland habitats where nests are located (USFWS 2009b). Wind energy development has also been documented to impact Bald Eagles, as described in further detail below.

4.5 WIND ENERGY DEVELOPMENT

The threat of commercial wind turbine facilities to birds in the U.S. gained attention in the late 1980s and early 1990s due to mortality reports from Altamont Pass Wind Resource Area (APWRA), a large wind facility, then containing some 6,500 turbines on 189 km^2 (73 mi^2) just east of San Francisco Bay, California. Orloff and Flannery (1992) estimated that several hundred raptors were killed each year at APWRA due to turbine collisions, guy wire strikes, and electrocutions.

Existing data suggest that wind energy facilities are not a significant cause of mortality for Bald Eagles. To date, few impacts on Bald Eagles resulting from collision with wind turbines are known to have occurred, with only eight Bald Eagle fatalities reported at wind energy facilities in North America: three in Iowa, two in Ontario, two in Wyoming, and one in Maryland (Pagel et al. 2013; Allison 2012). The increase in post-construction monitoring occurring at wind energy facilities across the country will provide important data for better understanding the threat of wind energy facilities to Bald Eagles and will promote improved avoidance, minimization, and mitigation measures.

5 Stage 1 - Site Assessment

5.1 METHODOLOGY

The original Project boundary in 2010 was approximately 32 square miles that reflected the entirety of the leasehold in 2010-2011, plus a two-mile buffer around that leasehold (see maps in BBCS, Appendix 2). As Project evaluation progressed Apple Blossom modified its development plans to ensure that the Project was limiting its impacts to eagles and other avian and bat species, addressing other engineering and regulatory issues, and meeting the purpose of installing new renewable energy sources for the State of Michigan.

The original Project boundary was evaluated for issues related to Bald Eagles and other endangered, threatened and special concern species. Research and field work were conducted to provide data to identify opportunities for wind turbine siting that would reduce potential biological impacts from the Project. As part of this process, Apple Blossom followed and conducted site characterization studies (generally following Stage 1 of the ECPG and Tier 2 of the WEG), which included analyzing available data in the literature and soliciting information from expert sources. Apple Blossom conducted field studies (following Stage 2 of the ECPG and Tier 3 of the WEG) to obtain additional data. Apple Blossom contracted with Applied Ecological Service (AES) to conduct point count surveys for bird species including: spring raptor and waterfowl/waterbird, spring passerine migration, breeding season, fall passerine migration, early fall raptor and waterfowl/waterbird, late fall raptor and waterfowl/waterbird, and winter surveys. Due to the proximity of Bald Eagle nests to the original 2011 boundary of the Project, as well as the proximity of the eastern edge of the original Project boundary to the shore of Wildfowl Bay/Lake Huron, extensive pre-construction Bald Eagle surveys were conducted. The focus of those 2011 surveys was to understand both the behavior of these coastal Bald Eagles and the extent to which they utilized coastal versus inland habitats. At the time, this approach was believed to be an effective way to contrast behavior of Bald Eagles near the coast versus at inland locations. In 2013, the USFWS finalized the ECPG, which specified ways to address eagles during the development and operations of wind energy projects. The ECPG recommended that significant hours of observational data be collected inside a wind energy project in order to estimate predicted mortality using a Bayesian model. In response, Apple Blossom implemented eagle point count surveys beginning in August 2013, as described further in Section 6.

5.2 ENVIRONMENTAL SETTING

The Project is situated in Huron County near the eastern shore of Lake Huron's Saginaw Bay. It is located on the western edge of the town of Pigeon and is approximately 4 miles wide (east and west) and about 3 miles long (north and south). The site is approximately 3 miles east-northeast of Wildfowl Bay in Saginaw Bay at its closest point and about 20 miles southwest of the main body of Lake Huron. No turbines are located within three miles of the Lake. The land use in the Project boundary, like the majority of Huron County, is primarily agricultural and row crop fields.

5.2.1 Habitat and Wildlife near the Project Site

Prior to agricultural clearing beginning around 1850, Huron County was densely forested. Beech-maple-hemlock forest predominated on uplands, with oak-hickory forest in the county's south and west portions. Conifer swamps and bogs were extensive. Jack pine scrub, oak savanna, wet prairie, scrub wetlands, and sand dunes extended inland 1-2 miles from the coast. Marsh and other open wetlands were rare away from the coast.

Today over 90% of the county supports agriculture. The most extensive forest survives as a more or less continuous mile-wide strip along the shoreline of the Lake (including Saginaw Bay and the main body of Lake Huron). In the county's interior, remnants of original forest can be found along streams—the Pinnebog, Pigeon, New River and their tributaries—and in a few poorly drained swamps and scattered small patches. The inland forests of western Huron County include several patches covering a square mile or more. The vast majority of forest patches, however, are smaller than 80 acres. Wetlands are common along the coastline, but there are few marshes and open wetlands inland. Agricultural ditches and roads exist on over 95% of the county's section lines—four miles of roads and ditches surround every square mile. A small fraction of the county is developed. Bad Axe, Port Huron, Caseville, and Harbor Beach are the largest towns. Bad Axe, which is the county seat and the largest city in Huron County, has a population of just over 3,400 people (Rummel). Other development is found in several villages, along the coastline, and at individual farmsteads.

In the early 1800s the County's abundant wildlife included Gray Wolf (*Canis lupus*), Eastern Elk (*Cervus canadensis canadensis*), Cougar (*Puma concolor*), and Passenger Pigeon (*Ectopistes migratorius*). The first three were extirpated in the 1800s (i.e., eliminated from the region), while the Passenger Pigeon became extinct. Other once conspicuous wildlife are now rare, such as Ruffed Grouse (*Bonasa umbellus*), Barred Owl (*Strix varia*), and Red-shouldered Hawk (*Buteo lineatus*). These species require extensive habitat, many large habitat patches near each other, or high quality habitat in order to persist. Habitat for these species is limited to large forests and wetlands, mostly near the coast. Large, permanent grasslands, mostly in eastern Huron County, also support declining species, such as Bobolink.

In general, however, the wildlife encountered in Huron County is adapted to agriculture and development. Familiar wildlife include White-tailed Deer (*Odocoileus virginanus*), Raccoon (*Procyon lotor*), Striped Skunk (*Mephitis mephitis*), Mallard (*Anas platyrhynchos*), Canada Goose (*Branta canadensis*), Red-winged Blackbird (*Agelaius phoeniceus*), Common Grackle (*Quiscalus quisculua*), American Crow (*Corvus brachyrhynchos*), American Robin (*Turdus* *migratorius*), and the introduced House Sparrow (*Passer domesticus*), House Finch (*Carpodacus mexicanus*), Rock Pigeon (*Columa livia*), Ring-necked Pheasant (*Phasianus colchicus*) and European Starling (*Sturnus vulgaris*). The agricultural landscape and developments of Huron County have determined the type of wildlife present, supporting chiefly those that can adapt to intensive human land use.

5.2.2 Habitat Cover at the Project

Cropland is the dominant habitat within the final Project boundary, occupying about 86% of the area (Map Exhibit 2, Table 2). The Project boundary is defined as the area that encompasses all parcels where the Owner has wind project leases. Note that approximately one mile of the eastern end of transmission line is outside of this Project boundary (Figure 2); this portion of the transmission line is sited in cropland along a railroad corridor. Approximately 6.9% of the Project is hay/pasture or other grassland. About 4.7% of the site is developed land that includes the western edge of Pigeon, farmsteads and home sites. Other land covers are scattered and limited, including forests (upland and wetland) (2.2 %), and barren and open water (each less than 0.5%).

Table 2. Project Area Land Cover

Land Classification	Acres	Percent of Site
Cultivated Crops	2,954.69	85.9
Hay/Pasture	234.00	6.8
Developed, Low Intensity	92.83	2.7
Developed, Open Space	57.27	1.7
Woody Wetlands	51.57	1.5
Deciduous Forest	22.98	0.7
Barren Land	11.40	0.3
Developed, Medium Intensity	10.35	0.3
Herbaceous	1.78	0.1
Open Water	1.25	0.0
Total	**3,438.11**	**100.0**

5.3 AGENCY CONSULTATION

Apple Blossom anticipated that construction and operation of a wind energy facility in this location may cause some impacts to legally protected wildlife (including Bald Eagles), habitat, or plants. Therefore, consultation with the USFWS and MDNR was scheduled early in the development of the Project to foster a cooperative relationship with agencies and ensure compliance with the applicable laws.

The meetings and other communications between Apple Blossom and USFWS and other regulatory agencies are listed below. Minutes of the agency meetings in August and December 2011, March 2012, June 2013, October 2016, December 2016, February 2017, July 2017, September 2017, October 2017, January 2018, September 2018 and February 2019 are available from Apple Blossom.

Apple Blossom sent proposed survey protocols for birds and bats to USFWS and MDNR on February 9, 2011.

1. A meeting with USFWS, MDNR, Apple Blossom, and AES occurred on August 11, 2011. Issues discussed related to Bald Eagles included:
   - Scope of the Project;
   - Wildlife survey work completed to date;
   - Wildlife survey work to be completed;
   - The presence and behavior of Bald Eagles in the original Project boundary; and
   - A second year of surveys was requested, but one year of pre-construction surveys and one year of post-construction monitoring was preferable to two years of pre-construction data with no post-construction monitoring. AES, USFWS, and MDNR also discussed the field survey protocols, which were developed and discussed prior to the 2013 ECPG. The USFWS and MDNR concurred with AES's field survey protocols.
2. On August 17, 2011, AES requested an environmental review of the original Project boundary, and MDNR replied in a response dated September 8, 2011. The Michigan Natural Features Inventory (MNFI) reported twenty rare species with known records from within five miles of the original Project boundary. The Bald Eagle is not a state-listed species in Michigan and was not included in the MNFI report.
3. Apple Blossom provided USFWS a habitat map of the original Project boundary and discussed the following topics pertaining to Bald Eagles by phone on September 23, 2011.
   - Eagle nesting and activity at the Project;
   - BGEPA process for Non-purposeful Eagle Take Permit;
   - ECP process and timeline; and
   - USFWS eagle mortality model and type of data needed for model.
4. A summary of survey work completed at the original Project boundary and the expected role of the survey in evaluating the proposed project was provided to USFWS and MDNR on December 9, 2011.
5. On December 20, 2011, USFWS provided Apple Blossom with data collected by USFWS on the location of nests that were active in 2011 within 10 miles of the original Project boundary.
6. On March 8, 2012, USFWS, MDNR, Apple Blossom, and AES to discuss initial findings of the 2011 survey work, and next steps for the Project. The following topics related to Bald Eagles were covered:
   - Project overview;
   - Report on all Tier 2 and 3 studies to date;
   - Bald Eagle winter survey by AES;
   - Bald Eagle initial risk assessment; USFWS request for eagle observation data;
   - Eagle Conservation Plan, Programmatic Take Permit, and Environmental Assessment;
   - Post-construction monitoring for birds;
   - Eagle collision avoidance and minimization;

- USFWS recommended 3-mile buffer from coast. Passerine bird migration near the coast was the principle justification for the 3-mile buffer recommendation at this Project.

7. Apple Blossom provided a memo with eagle observation data to USFWS on March 24, 2012.
8. Apple Blossom provided update on eagle survey work to USFWS on May 10, 2012.
9. Meeting of USFWS Regional and Field Office staff, Apple Blossom, and AES in Bloomington, MN on July 16, 2012 to discuss night migrants and USFWS radar studies.
10. USFWS sent Apple Blossom an Initial Assessment of Eagle Risk on or around September 6, 2012.
11. Meeting of USFWS Regional and Field Office staff, Apple Blossom, AES and Hamer Environmental in Bloomington, MN on June 15, 2013 to discuss Project siting.
12. Meeting of USFWS Regional and Field Office staff, Apple Blossom, AES and Hamer Environmental in Bloomington, MN on September 10, 2013 to discuss Project siting.
13. Meeting of USFWS Field Office staff, Apple Blossom and WEST in Lansing, MI on October 19, 2016 to introduce the new Project owners, discuss the updated project layout and schedule and ECP approach (see Appendix 1 for additional information on discussion points).
14. Conference call with USFWS Field Office staff, Apple Blossom and WEST on December 19, 2016 to discuss the draft ECP (see Appendix 1 for additional information on discussion points).
15. Conference call with USFWS Field Office staff, Apple Blossom and WEST on February 8, 2017 to discuss the initial take model results (see Appendix 1 for additional information on discussion points).
16. Meeting with USFWS Field Office staff, Apple Blossom and WEST on July 20, 2017 to discuss survey data, take model approach, and ETP schedule (see Appendix 1 for additional information on discussion points).
17. Letter sent to USFWS Field Office staff, on September 5, 2017, outlining Apple Blossom's intent to pursue an Eagle Take Permit.
18. Conference call with USFWS Field Office staff, Apple Blossom and WEST on September 26, 2017, to discuss ECP/ETP application timeline and NEPA approach, and discuss risk model inputs.
19. Conference call with USFWS Field Office staff, Apple Blossom and WEST on October13, 2017, to discuss risk model inputs and approach.
20. Conference call with USFWS Field Office staff, Apple Blossom and WEST on October 26, 2017, to discuss revised runs of risk model inputs, PCM approach and ECP and NEPA schedule.
21. Apple Blossom provided a revised ECP draft to USFWS Field Office staff on November 4, 2017.
22. Conference calls with USFWS Field Office staff, Apple Blossom and WEST on November 21 and November 28, 2017 to discuss USFWS comments on ECP draft.
23. Conference call with USFWS Field Office staff, Apple Blossom and WEST on January 24, 2018, to discuss post-construction monitoring
24. Apple Blossom informed USFWS Field Office staff and Office of Law Enforcement of a bald eagle fatality found at the Project on July 17, 2018.

25. Meeting with USFWS Field Office staff, Apple Blossom and WEST on September 7, 2018, to discuss interim results of post-construction monitoring and updating collision risk model
26. Conference call with USFWS Field Office staff, Apple Blossom and WEST on February 8, 2019, to discuss results of updating collision risk model with post-construction data
27. Conference call with USFWS Field Office staff, Apple Blossom and WEST on April 12, 2019, to discuss updating collision risk model with updated dataset of use surveys.
28. Apple Blossom informed USFWS Field Office staff and Office of Law Enforcement (on May 4, 2020) and Migratory Bird staff (on May 5, 2020) of a bald eagle fatality found at the Project on May 4, 2020.
29. Conference call with USFWS Field Office and Migratory Bird Permit staff, Apple Blossom and WEST on May 7, 2020, to discuss the bald eagle fatality and the ECP and EA development
30. Apple Blossom provided data package for the first year of PCM to the USFWS on May 15, 2020
31. Conference call with USFWS Field Office and Migratory Bird staff, Apple Blossom and WEST on July 23, 2020, to discuss the USFWS' proposed approach to the collision risk model/permitted take levels
32. Apple Blossom provided a revised ECP draft to USFWS Field Office and Migratory Bird staff on September 18, 2020.
33. Conference call with USFWS Field Office and Migratory Bird staff, Apple Blossom and WEST on March 17, 2021, to discuss the status of the EA and comments on the PCM plan
34. Apple Blossom provided a revised ECP draft to USFWS Field Office and Migratory Bird staff on May 18, 2021.

5.4 KNOWN EAGLE USE AREAS

The ECPG states that project proponents should identify the location and type of all Important Eagle Use Areas (IEUA) on and within a 16-km (10-mi) perimeter of a project footprint. The USFWS defines IEUAs as "an Eagle nest, foraging area, or communal roost site that eagles rely on for breeding, sheltering, or feeding, and the landscape features surrounding such nest, foraging area, or roost site that are essential for the continued viability of the site for breeding, feeding, or sheltering eagles" (USFWS 2009a; 50 CFR 22.3).

The USFWS' East Lansing Field Office has been compiling eagle nest success and activity data in Huron County since 1960. In 2011, the USFWS provided Applied Ecological Services ("AES") with known Bald Eagle nest locations. The data identified the known nests as either active, inactive (nest present but thought to be inactive), or historic (nest known as a historic site, but nest no longer present). The USFWS data and subsequent surveys (through 2017 data as provided by the USFWS) indicated that no Bald Eagle nests were/are located within the Project footprint.

In spring 2014, Apple Blossom contracted with AES to perform an aerial stick nest survey using a fixed wing aircraft to update the Bald Eagle nest data and record any new Bald Eagle nests in the area. The 2014 aerial survey observed six nests within ten miles of the Project as active

(Table 3). During coordination with the USFWS on development of the ECP, the USFWS provided information on Bald Eagle nests documented between 2013 through 2017 within 10 miles of the Project boundary. These surveys are conducted by the MDNR on a statewide basis, and they included the nests documented by AES, along with additional stick nest locations (either historic or inactive; the status of many nests changed from year to year). Overall, the data have shown a consistent set of eight occupied Bald Eagle territories along the Wildfowl Bay area within 10 miles of the Project area (Table 3); although more than eight stick nests structures have been documented, these are thought to be alternate nest sites within a given territory. No new Bald Eagle nests within 10 miles of the proposed turbines were documented in the surveys conducted by the MDNR since AES conducted site-specific surveys in 2014. In both 2016 and 2017, all eight territories within 10 miles of the Project were occupied and active; further, all Bald Eagle nests were productive in both of these years, with one to three eaglets hatched in each of the eight active nests (Table 3).

As shown in Map Exhibit 5, one-half the inter-nest distance among the active nests in a 10-mile buffer of the Project is approximately 1.5 miles[1]. No nests are within one-half the inter-nest distance from the proposed turbine locations. All of the active nests are within one mile of Lake Huron (specifically Wildfowl Bay) at the time of the surveys. Observations by AES in 2014 and the annual surveys conducted by the MDNR through 2017 have shown that Bald Eagles in Michigan's Thumb strongly orient to Lake Huron and its coast rather than inland locations. This orientation toward the coast is reflected by the Bald Eagles' nesting location choices. Inland sightings of Bald Eagles are infrequent and typically occur within 1-2 miles of the coast, as described further in Section 6.1.

[1] Methodology for determining potential risk areas associated with eagle nests follows the USFWS guidance from the 2013 ECPG. In April 2020, after the pre-construction risk assessment was conducted for this Project, the USFWS updated its guidance to indicate that a two-mile buffer from nests reflects potential risk areas.

Table 3. Bald Eagle Territories and Nests within 10 Miles of Project, 2013 – 2017*

Territory	Nest	Nest Tree Species	Nest Status in 2013	Nest Status in 2014	Nest Status in 2015	Nest Status in 2016	Nest Status in 2017
HU02	HU02f	Cottonwood	Active; 2 eaglets	Active; 1 eaglet	Active; 0 eaglets	Inactive	Inactive
	HU02g	Cottonwood	Inactive	Inactive	Inactive	Active; 2 eaglets	Active; 2 eaglets
HU03	HU03f	White pine	Inactive	Inactive	Inactive	Active; 1 eaglet	Active; 2 eaglets
	HU04b	Red oak	Inactive	Inactive	Inactive	Inactive	Inactive
	HU04d	White oak	Active; 0 eaglets	Active; 0 eaglets	Inactive	Inactive	Inactive
HU04	HU04e	White pine	Inactive	Inactive	Active; 1 eaglet	Active; 1 eaglet	Active; 1 eaglet
HU05	HU05a	Cottonwood	Inactive	Inactive	Inactive	Inactive	Inactive
	HU05b	Cottonwood	Active; 1 eaglet	Inactive	Inactive	Inactive	Inactive
	HU05c	Cottonwood	Inactive	Active; 2 eaglets	Active; 0 eaglets	Active; 1 eaglet	Active; 3 eaglets
HU11	HU11a	Cottonwood	Active; 1 eaglet	Active; 2 eaglets	Active; 2 eaglets	Active; 1 eaglet	Active; 2 eaglets
HU12	HU12a	Cottonwood	Active; 3 eaglets	Active; 2 eaglets	Active; 2 eaglets	Active; 3 eaglets	Active; 2 eaglets
HU13	HU13b	Cottonwood	Active; 0 eaglets	Active; 1 eaglet	Active; 1 eaglet	Inactive	Inactive
	HU13c	Cottonwood	Inactive	Inactive	Inactive	Active; 1 eaglet	Active; 3 eaglets
HU18	HU18a	Cottonwood	Inactive	Inactive	Active; 2 eaglets	Active; 2 eaglets	Active; 2 eaglets

*All information provided by USFWS from MDNR survey data. AES survey in 2014 documented the same six active bald eagle nests listed above from MDNR data. Terminology for nest status (Active and Inactive) reflect those used at the time of survey; note that the USFWS currently uses In-Use and Alternate for nest status.

6 Stage 2 - Site Specific Surveys and Assessments

6.1 SURVEY METHODS

Apple Blossom contracted with AES to conduct survey work at the Project in multiple field seasons. The first and most substantive field season began in March 2011 and continued through February 2012, consisting of over 240 hours of surveys within the original Project boundary (which extended to the west to within half a mile of the shore of Wildfowl Bay) as well as within areas between the original Project boundary and the shore. The study design was informed by the WEGs as well as guidance from USFWS and MDNR staff to assess eagle risk at the Project. The second survey effort began in August of 2013 and continued through July 2014. The 2013/2014 survey effort was focused on developing quantitative data as described in the ECPG, and consisted of 120 hours of eagle-use surveys at 10 points. Map Exhibit 3 shows the locations of the 2011/2012 and 2013/2014 survey points in relation to the final layout of the Project. The following section summarizes the methods and effort for each survey type.

2011/2012 Survey Methodology

The methodology of the surveys conducted in 2011 and early 2012 is discussed in greater detail in the BBCS (Appendix 2), and summarized in Table 4 below. Passerine surveys were conducted for 10-minute durations at 30 points within the original Project boundary as well as several points between the Project and the shore of Wildfowl Bay. The passerine surveys were conducted in spring migration, breeding season, and migration periods, and were focused on small birds and passerines, although larger birds including eagles were documented when observed. Spring and early fall raptor and waterfowl surveys were conducted in 2011 (March, May and September) at three points located between 1.2 and 2.3 miles from the shore along the western half of the original Project boundary, for a total of 93 hours. During the 2011 breeding season (May – July), 65.75 hours of eagle use surveys were conducted at four points: two coastal points and two inland points. Inland locations were used to document time that eagles spent near or within the original Project boundary. Inland points were located 1.2 and 1.6 miles from the coast, with clear views of the entire Project boundary. The coastal points were located outside of the original Project boundary, near the coast where road access was available; views at these locations were limited by trees and tall herbaceous vegetation. Late fall waterfowl and raptor migration surveys and eagle winter use surveys were conducted from November 2011 through February 2012, for 30 minute intervals at points located within the original Project boundary as well as points located adjacent to the shore, for a total of 52 hours.

During the surveys conducted in 2011/2012, all eagles observed during raptor and waterfowl/waterbird surveys and passerine surveys, at all points and during all survey periods, were documented (Table 4).

Observers recorded weather conditions, all eagles seen and heard in an unlimited radius of the survey point, numbers of individuals, behavior, distance and direction from the observer, flight origin direction, flight direction, flight height and eagle flight path.

2013/2014 Eagle Use Survey Methodology

Starting in August 2013, eagle use surveys were conducted following the newly released ECPG recommendations. Based on the results of the 2011 surveys and continued coordination with USFWS and MDNR, the original Project boundary was modified in 2013 to move turbines at least two miles from the shore of Wildfowl Bay (note that the final Project design further modified the layout so that turbines are at least three miles from the shore). Ten points were set up within this modified Project boundary and each of the points were surveyed for one hour once a month between August 2013 and July 2014. Information on eagle observations were recorded, similar to what was described above for the 2011 surveys. Table 4 summarizes the effort for each of the 2011/2012 surveys as well as the 2013/2014 eagle use survey.

Table 4. Bird Survey Effort in or near the Original Project Boundary

Survey Season	Survey Dates	Year	# of Points	Total Survey Hours	Survey Hours
Spring Raptor Waterfowl/Waterbird	March 21 – May 5	2011	3	72.8	Dawn to dusk
Spring Passerine	May 2-5	2011	30	10	Dawn to 11am, 5pm to dusk
Breeding Bird	June 13-16	2011	30	10	Dawn to 10am
Fall Passerine	September 12-15	2011	30	10	Dawn to dusk
Early Fall Raptor Waterfowl/Waterbird	September 12-15	2011	2	20	9:00am to 5:15pm
Late Fall Raptor Waterfowl/Waterbird	November 1-5	2011	20	29	Dawn to dusk
	November 21-22	2011	10	5	8:30am to 12:30pm
Eagle Survey – Breeding	May 24–26, June 14-16, June 24-25, July 6-7	2011	2 coastal; 2 inland	13.75 coastal 52.0 inland	Dawn to dusk
Eagle Survey – Winter	February 7-9	2012	18	18	Dawn to dusk
Quantitative Eagle Point Counts	August 7th – July 22nd	2013/14	10	120	Dawn to dusk
Stick Nest Survey	March	2014	N/A Aerial Survey	N/A	Dawn to dusk

6.2 SURVEY RESULTS AND DISCUSSION

As discussed above, Bald Eagles in Michigan's Thumb strongly orient to Lake Huron and the coast, rather than inland locations. Inland sightings of eagles are not frequent and typically occur within 1-2 miles of the coast. Inland sightings recorded in the surveys at the Project included eagles soaring over the agricultural landscape during the migration season, juvenile eagles foraging at recently cut hayfields, juvenile eagles exploring the Pigeon River riparian corridor, and one eagle seen in winter that was likely foraging for road kill.

Consistent with past field observations and the reports of residents, Bald Eagles were observed more often near the coast than farther inland (Map Exhibit 4). Bald Eagle-specific surveys in the

2011 breeding period observed 1.75 Bald Eagles per hour at the two coastal points outside the original Project boundary and 0.19 Bald Eagles per hour at the two inland points inside the Project boundary. Bald Eagles observed at the inland points were usually west of survey points, flying above the coastal forest or over Saginaw Bay (Map Exhibit 4). No Golden Eagles were seen in any surveys in 2011 or 2012.

Other surveys outside this eagle-specific breeding period observed Bald Eagles four times inside the original Project boundary, at much lower rates, as listed in Table 5. No Bald Eagles were observed during the spring passerine migration surveys, fall passerine migration surveys, or in the late fall (November) raptor waterfowl/waterbird surveys.

Table 5. Rate of Bald Eagle Presence (Bald Eagles/Hour) in 2011 Surveys

Survey	Rate of Bald Eagle Presence (Bald Eagles/Hour)
Breeding Bird	0.20
Spring Raptor and Waterfowl/Waterbird	0.26
Early Fall Raptor and Waterfowl/Waterbird	0.40
Winter Eagle	0.10

In the 2013/2014 eagle use surveys, four Bald Eagles were seen during the 120 hours of surveys conducted at the 10 points in the modified Project boundary (two were seen at point 103 on June 5, and at point 108, one was seen on June 6 and one was seen on July 22nd), further indicating that eagle use is expected to be relatively low farther than two miles from the shore. No Golden Eagles were observed during any of the 2013/2014 eagle use surveys at points inside or outside the modified Project boundary.

As described further below in Section 8.1, after the 2013/2014 eagle use surveys, the Project Owner modified the Project boundary and layout in 2016 to set back at least three miles from the shore of Wildfowl Bay/Lake Huron, in order to further minimize risk to eagles and other avian species. Section 7 below describes the mortality risk assessment to Bald Eagles using relevant data from 2011/2012 and 2013/2014 survey points that overlap the final Project footprint; as noted below, the final footprint does not overlap with the viewshed of point 103 where two of the four bald eagles were seen in the 2013/2014 surveys. As detailed in Section 7.1, survey data from the breeding bird surveys was excluded from the eagle risk model because the focus of these breeding bird surveys was on passerines versus large birds, and the survey methodology (length and timing) was significantly different than the methodology recommended in the ECPG. Appendix 4 provides additional information on how the raptor/waterfowl surveys and eagle surveys conducted at the Project conform or deviate from the survey protocols that were standardized in the 2016 Eagle Rule.

6.3 POST-CONSTRUCTION MONITORING STUDIES

6.3.1 Standardized Monitoring

Post-construction mortality monitoring was implemented by the Project Owner to evaluate the actual impacts of the Project on birds and bats consistent with the WEG, with attention to eagles as per the approach and objectives in Tier 4 of the *USFWS Land-Based Wind Energy Guidelines*, and additionally, will adhere to the objectives outlined in the ECPG (USFWS 2013a). The Project Owner, in consultation with the USFWS, designed and implemented a post-construction avian and bat fatality survey that began in June 2018, prior to receiving an eagle take permit. The surveys conducted in 2018 and 2019 consisted of five turbines searched as cleared plots (120m x 120m) and the remaining 24 turbines searched on the road and pads on a weekly basis. These cleared plot and road and pad searches serve to estimate all bird and bat mortality at the Project. The all bird and bat survey was conducted for a minimum of one complete field season after the commencement of commercial operation, as described further in the BBCS (Appendix 2). In addition to the cleared plot and road and pad searches, visual scans (scanning with binoculars the area around each turbine contained within a 300m x 300m square) were conducted at every turbine twice a month from June 2018 through May 2019. The results of this study are included in Appendix 5.

The remains of one bald eagle was discovered on July 17, 2018, within a designated search area associated with Turbine 22 during the standardized post-construction monitoring period. The USFWS was notified of the bald eagle within 24 hours.

6.3.2 Incidental Monitoring

As described in Section 9.5, the Project has implemented an operational incidental monitoring protocol whereby any dead or injured wildlife documented by (or reported to) Project staff is logged and tracked. On May 4, 2020, a landowner discovered the remains of a bald eagle within 400 ft of Turbine 11. The landowner reported the remains to the Project Owner that same day, and the find was reported to the USFWS on May 4, 2020.

7 Stage 3 - Mortality Risk Assessment

7.1 USFWS BAYESIAN COLLISION RISK MODEL METHODOLOGY

For the purposes of the eagle risk assessment for the Project, the USFWS (2013) Bayesian collision risk modeling (CRM) framework was used to predict impact to Bald Eagles. The CRM is a statistical model that specifies the relationship between eagle exposure, collision probability, and fatalities, and to account for uncertainty. Variables used are presented in Table 6 and discussed in this section. Details of the model and approach are presented in the ECPG (USFWS 2013).

Golden Eagles were not observed in any of the surveys conducted in 2011, 2012, 2013 or 2014, either within the modified Project boundary or along the shore of the Lake. As described in Section 4.1, Golden Eagles are a relatively rare migrant through Michigan, and do not breed in the state. Given there were no observations of Golden Eagles during the Project surveys and risk to this species is considered negligible, the Apple Blossom's CRM analysis was not applied for an estimate of Golden Eagle fatalities.

Based on discussions with the USFWS, including the fact that the 2012, 2013 and 2014 pre-construction use data were not fully compliant with ECPG survey recommendations, and the fact that post-construction data indicated that risk may be somewhat higher than the pre-construction surveys would indicate, it was decided to use a conservative approach to develop the predicted take at the project, at least for the first five year term. The risk model methodology presented below therefore uses the ECPG priors only, rather than site-specific data, to inform the collision risk model for the Project.

Table 6. Variables used in the US Fish and Wildlife Service (USFWS) approach for predicting annual eagle fatalities from turbine collisions at a wind facility (USFWS 2013). Note units in the Eagle Conservation Plan Guidance are 2-dimensional, but the USFWS prefers to calculate units in three dimensions (3D), as presented here.

Symbol	Name	Definition and units
F	Annual Fatalities	Annual eagle fatalities from turbine collisions
λ	Exposure Rate	The expected number of exposure events (eagle minutes) per survey hour per 3D survey area (hr × km^3)
C	Collision Probability	The probability of an eagle colliding with a turbine given exposure
ε	Expansion Factor	Product of daylight hours and total hazardous area (hr × km^3)
k	Eagle Minutes	Number of minutes that eagles were observed flying within 800 m and below 200 m during surveys
δ	Turbine Hazardous Area	Rotor-swept area around a turbine from 0 – 200 m above ground level (km^3)
n	Trials	Number of trials for which events could have been observed (the number of hr × km^3 observed)
τ	Risk Hours	Total hours eagles are at risk of collision during a given year or season (all daylight hours)
n_t	Number of Turbines	Number of turbines at the Project

<u>Exposure Rate</u>

Exposure rate (λ) is defined as the expected number of exposure events (eagle minutes) per hour per km^3. The prior distribution presented in the ECPG for exposure rate was derived from data from a range of projects under USFWS review and the projects from Whitfield (2009). These projects provided data for golden eagles only, and, therefore, the prior distribution may not be accurate for bald eagles. In May 2021, the USFWS updated the collision risk priors for both bald and golden eagles using a different set of projects than those used in the ECPG; however, the model used for the Apple Blossom Project was run prior to the release of these new priors and therefore the ECPG-defined priors were used. The USFWS defines the ECPG prior distribution for the 3-dimensional (3D) exposure rate as:

$$\text{Prior } \lambda \sim \text{Gamma}(\alpha, \beta)\text{, with shape and rate parameters } \alpha = 0.97 \text{ and } \beta = 0.55$$

The ECPG prior for exposure rate specifies that 1.75 eagle minutes per hour per km^3 are expected for either eagle species at any location in the U.S. Because this analysis excludes site-specific survey data, we assumed that the bald eagle exposure rate at the Project would match that specified by the ECPG prior.

Expansion Factor

A facility-specific expansion factor was multiplied by the bald eagle exposure rate to estimate the number of bald eagle exposure events expected at the Project after construction. The expansion factor scales the exposure rate to the total hours eagles are at risk of collision during a year (assumed to be all daylight hours at the Project location; τ) across the total 3D hazardous volume (δ_i) surrounding proposed turbine locations (n_t; USFWS 2013):

$$\varepsilon = \tau \sum_{i=1}^{n_t} \delta_i$$

The USFWS defines the turbine hazardous volume (δ_i) as the 3D cylinder around each turbine with radius equal to the rotor radius and height of 200 m above ground level, or 25 m (82 ft) above the maximum turbine blade reach, whichever is greater (USFWS 2013, 2016). The expansion factor (ε) was calculated for the Project assuming 29 turbines with a rotor radius of 63 m (126-m diameter) and hub height of 87 m. The Project location was used to estimate the number of daylight hours in a year at 4,461.65. The annual expansion factor for the Project was 322.67 hr × km^3 (Table 7).

Table 7. Estimated annual expansion factor (ε) at the Apple Blossom Wind Farm.

Variable	Value
1) Daylight hours per year	4,461.65
2) Number of turbines	29
3) Turbine rotor radius (m)	63
4) Turbine hazardous height (m)	200
5) Total turbine hazardous volume (km^3)	0.07
6) Expansion Factor (Line 6 × Line 10)	322.67

Collision Probability

Collision probability (C) is defined as the probability of an eagle colliding with a turbine given one minute of eagle flight in the 3D risk cylinder. The prior distribution presented by USFWS in the ECPG (USFWS 2013) is:

$$\text{Prior } C \sim \text{Beta}\,(v, v'), \text{ with parameters } v = 2.31 \text{ and } v' = 396.69$$

The USFWS estimated the parameters for the collision rate prior distribution using results from the Whitfield (2009) study of avoidance rates, including data collected on golden eagle use and fatalities from four wind facilities in California and Wyoming: Altamont, Tehachapi, San

Gorgonio, and Foote Creek Rim. This collision rate prior distribution was used to predict annual fatality rates for bald eagles at the Project.

As noted above, the model used for the Apple Blossom Project was run prior to the release of the new priors that the USFWS approved in May 2021 and therefore the ECPG-defined prior distribution was used. The ECPG-defined prior distribution is assumed to provide a conservative prediction of eagle take at the Project, as the prior distribution was developed using data from projects with outdated wind turbine technology. It is understood that older wind turbines have a different risk profile than modern turbines (Leslie et al. 2012, USFWS 2016). In addition, while bald eagle use at wind energy facilities is relatively common, there are few known bald eagle fatalities at wind energy facilities (Pagel et al. 2013, USFWS 2018). The ECPG prior for collision probability specifies that for each exposure event (i.e., a bald eagle spending one min flying within the hazardous area surrounding a turbine), the mean probability of a collision occurring is less than 1% (0.00579). Because this analysis excludes site-specific survey data, we assumed that the bald eagle collision probability at the Project would match that specified by the ECPG prior.

Predicted Annual Fatalities

The priors-only CRM estimates the distribution of predicted annual fatalities as the product of the expansion factor, the prior distribution of the exposure rate, and the prior distribution of the collision probability:

$$F = \varepsilon \times prior\ \lambda \times prior\ C$$

Credible intervals (CI; i.e., Bayesian confidence intervals) are calculated using a simulation of 1,000,000 samples each from the prior distribution of eagle exposure (λ) and the prior distribution of collision probability (C). The product of each of these draws along with the expansion factor is used to estimate the distribution of possible fatalities at the Project. The upper 80% credible limit of this distribution is used as the estimated take for a project seeking an incidental eagle take permit (USFWS 2013, 2016).

7.2 COLLISION RISK MODELING RESULTS

Based on the USFWS CRM and using the priors defined in the ECPG (USFWS 2013), the predicted annual mean bald eagle fatality rate is 3.28 eagles/year (upper 80% credible limit = 5.01). As described above, the ECPG-defined priors for the CRM are based on information from prior Golden Eagle fatalities and exposure events at projects in the western U.S. Due to difference in flight behaviors and habitat use, Bald Eagles may exhibit different exposure rates and collision probabilities. Nevertheless, for purposes of the ETP application, the Project Owner has assumed that the 80% credible limit for the ECPG model for the optimized Project layout (5.01 eagles/year) provides a reasonably conservative prediction of facility-wide Bald Eagle fatalities. The Project Owner is therefore requesting take authorization for a total of 151 Bald Eagles over the duration of the 30-year take permit requested for the Project (5.01 × 30, rounded up). Over any 5-year review interval, the model predicts that up to 26 Bald Eagles (5.01 × 5, rounded up) could be taken.

8 Stage 4 - Avoidance and Minimization of Risk Using Conservation Practices (Stage 4); Adaptive Management

Stage 4 of this ECP includes a review of avoidance, minimization, and conservation measures that have been and/or will be implemented in an effort to reduce adverse impacts to Bald Eagles and a voluntary monetary contribution to conservation projects intended to benefit regional Bald Eagle populations. Sections 8.1 and 8.2 below describe measures that Apple Blossom has taken to minimize the potential impacts to eagles. Section 8.3 discusses the voluntary conservation measures that Apple Blossom proposes to further mitigate any remaining risks.

Additionally, this section documents how the Project meets the criteria laid out in the 2016 PEIS for the Eagle Rule Revision for projects that qualify for tiering and associated streamlined review, and discusses the adaptive management process proposed for the Project.

8.1 IDENTIFICATION OF AVOIDANCE AND MINIMIZATION MEASURES BEFORE AND DURING PROJECT CONSTRUCTION

Below is a list of avoidance, minimization and conservation measures that have been implemented before and during Project construction as well as associated restoration.

- The main measure to minimize risk to eagles at the Project is overall Project siting. As described in Section 6, the original 2011 Project boundary extended west to within half a mile of the shore of Wildfowl Bay/Lake Huron. After the results of the initial 2011 Tier 3 studies were examined, the Project boundary was reduced in 2013, and the western edge of the Project boundary was set back from the shore by at least two miles. During final design in 2016, Apple Blossom set back even farther from the areas of eagle use along the shore that had been documented in the Tier 3 surveys, excluding Project facilities within three miles of the shore of Wildfowl Bay/Lake Huron in order to further minimize potential impacts to eagles. As described above in Section 7.1, the final Project footprint excluded all but one eagle flight path observed during the pre-construction surveys (Map Exhibit 4), and no turbine is located closer than three miles from the shore of the lake.
- Turbine type was selected to significantly decrease the number of turbines and overall Project footprint, from over 50 turbines in the original layout to 29 in the final proposed layout. By reducing the Project footprint (overall rotor-swept area), the risk of eagle collision is reduced.
- Turbines are sited in disturbed areas, primarily cropland. Turbines are sited away from the coastal areas (mostly forests and wetlands) where all known eagle nests are located and nearly all eagle activity was observed and documented (Map Exhibit 4). The western edge of the Project footprint (i.e. the least convex polygon) is approximately three miles from the coast and approximately four miles from the closest known eagle nest. Aside from the Pigeon River, which runs through the eastern portion of the Project boundary, no other large blocks of forests (>20 ac) are found within a mile of the Project.

- Access roads were designed to minimize tree clearing and wetland impacts. The road network was minimized to reduce habitat fragmentation, wildlife collisions, and noise effects, which minimizes impacts to eagle habitat as well as minimizes impacts to prey species such as waterfowl.
- The Project turbines use tubular towers rather than lattice, avoiding potential eagle perch locations (lattice towers are associated with higher collisions to raptors than tubular).
- All collector lines within the Project were placed underground to minimize collision and electrocution risk.
- Hazardous materials were handled in accordance with federal and state regulations in order to minimize the danger to water and wildlife resources (including eagles) from spills.
- Within economic, engineering, land access and electrical performance constraints, the length of the above ground transmission line was minimized to the extent feasible to minimize the potential of eagle collision and electrocution. It was not feasible to completely avoid constructing a transmission line for the Project; the point of interconnect is located several miles east of the area where turbines are being built (where the wind resource is), so direct connection in the middle of the Project was not possible. Additionally, underground transmission lines cost 10 to 15 times the cost of the same length of overhead lines, and any damage that occurs during the operation of the line is harder to repair, making an underground transmission connection to the point of interconnect impractical and not feasible for the economics of the Project.
- The above ground transmission line was designed using APLIC Guidelines, including installing bird flight diverters at 20-ft intervals in locations where habitat exists for raptors and other birds. These locations include water and grassland crossings. Bird diverters will also be installed on the low side of equipment at the Project substation; these measures will minimize the potential for eagle collisions with transmission and substation equipment.
- Additionally, the above ground structures were designed to follow APLIC Guidelines to minimize the potential for electrocution of eagles.
- Native species were used when seeding or planting non-cropped fields during restoration. USFWS and the Natural Resource Conservation Service (NRCS) will be consulted regarding native species to use for restoration as this will provide a general benefit for eagle habitat and their prey such as waterfowl. Restored areas will be monitored to determine reestablishment, and reseeding or replanting will occur in areas where non-establishment occurs.
- Existing trees and shrubs were protected where practicable to minimize impacts to raptor habitat.
- Accumulation of outdoor storage or waste was addressed immediately so as not to attract birds or rodents, which could serve as prey for eagles.
- Site construction personnel were required to receive training on the wildlife incident reporting system in the event that an injured eagle or eagle carcass was discovered during construction.
- The Construction Monitoring Plan focused on instilling an awareness of construction activities that may affect bird species of concern including eagles, so as to identify opportunities to minimize those effects where warranted.

- All construction-related traffic within the Project was limited to a maximum speed limit of 25 mph unless a lower speed limit is posted to reduce the risk of vehicle/eagle collisions.
- Animal carcasses and any animal parts (carcass remains) detected by Project personnel on or near Project access roads during the construction phase were removed to prevent the attraction of scavengers or other wildlife that may serve as prey to eagles.

8.2 IDENTIFICATION OF AVOIDANCE, MINIMIZATION AND CONSERVATION MEASURES DURING PROJECT OPERATIONS

The following measures have been or will be implemented during operation:

- Lighting has been minimized while meeting the Federal Aviation Administration's (FAA) minimum requirements; duration of the flash is minimized, duration between flashes maximized, and the lights flash simultaneously across the Project. Lighting at turbines and substations for safety and security is controlled by motion detectors or infrared sensors. These measures minimize the potential to impact night migrating birds, which in turn minimize the potential for scavenging Bald Eagles to be attracted to the site and put at increased risk of collision;
- All operation-related traffic within the Project is limited to a maximum speed limit of 25 mph unless a lower speed limit is posted to reduce the risk of vehicle/eagle collisions. Employees, contractors, and regular visitors are trained regarding techniques to protect Bald Eagles and avoid collisions;
- Foraging opportunities for eagles and other raptors will be limited by:
    - Removing rock and brush piles that could create prey habitat within the Project;
    - Removing road-kill or other carcasses from within the Project;
    - Prohibiting food waste littering by employees;
    - Providing educational materials to landowners in the wind farm on non-raptor attracting livestock disposal.
- Hazardous materials are handled in accordance with federal and state regulations to avoid and minimize impacts wildlife resources (including eagles) from spills or other exposure;
- Temporary met towers will be removed and replaced with an unguyed permanent lattice towers for meteorological monitoring. In the event that temporary towers are installed as part of an operational assessment of the Project, guy wires will be marked with marker balls to improve visibility to birds and reduce collision risk for Bald Eagles; and
- If a Bald Eagle nest is observed/recorded in the Project vicinity when the Project is operational, coordination with the USFWS will occur and the nest may be monitored as described in Section 9.3.

8.3 VOLUNTARY CONSERVATION PROJECTS

Bald Eagles' vulnerability to wind turbine collision is uncertain. Assessment models used to determine eagle risk at this Project used collision risk estimates developed for Golden Eagles, which are considered more vulnerable to wind turbine collision than Bald Eagles. Therefore, assessment models used in development of this permit application are believed to result in conservative estimates for Bald Eagles. Nevertheless, the analysis included in this document estimated average annual Bald Eagle fatalities of 3.28 Bald Eagles per year with an upper 80-percent credible interval of 5.01 Bald Eagles. Even at the upper 80-percent credible interval, this level of take is well below the local-area 5% mitigation benchmark (and is in fact less than the 1% benchmark), as described further in Section 8.5. This suggests that the Bald Eagle population could sustain this level of take without adverse impacts to the local population.

Despite the fact that compensatory mitigation is not required, the Owner plans to voluntarily contribute to ongoing projects that benefit the Bald Eagle population to assist in offsetting the potential take of Bald Eagles as a result of the Project. Once an eagle incidental take permit is received, the Owner will donate $15,000 for use by:

- a fund to help pay for continued Bald Eagle nest surveys in the state of Michigan, to help continue to monitor location, activity, and productivity data in the State;
- a local rehabilitation center actively involved in the treatment, rehabilitation, and re-release of wild eagles to the local/regional eagle population;
- a local non-profit environmental organization actively involved in educating the public on the negative impacts of lead in the environment on eagles and other wildlife; and/or
- other groups involved in eagle conservation projects, if these efforts are determined to be beneficial to Bald Eagle populations

As long as the total mitigation contribution does not exceed the funds committed to above, the Owner could also consider other acceptable uses for mitigation funds. At 5-year intervals during the eagle incidental take permit term, Apple Blossom will assess if similar voluntary contributions will be made available to eagle conservation projects. The level of voluntary contribution as well as the recipients will be reviewed during the five-year check-ins, and changes may be made based on the results of post-construction monitoring.

8.4 ADAPTIVE MANAGEMENT

Adaptive management is an iterative process implemented throughout the operational life of a project, which allows for continuous improvement regarding decisions and actions taken in an effort to avoid or minimize impacts to eagles. For the Project, adaptive management will consist of a program designed to monitor and assess impacts to eagles at the Project and an iterative process of assessing and implementing additional avoidance and minimization measures should results of the monitoring indicate that such additional measures are warranted.

Over the course of the life of the Project, eagle use patterns of the site may change, eagle populations may increase, risk management measures may evolve, and improved monitoring and mitigation measures may become available. The Project Owner will follow responses described in Table 8 when the associated threshold is met; while the Owner is committed to following the processes described at each response level (assessing the specific cause of risk, consulting with the USFWS to determine the appropriate response), the specific corrective response (for example carcass removal, additional monitoring, implementation of additional conservation measures) cannot be proscribed at this time because that response will be determined through evaluation of the specific data relevant to the eagle take and through coordination with the USFWS to determine the most appropriate response at each level.

Table 8 provides the adaptive management framework that would be implemented for the Project.

Table 8. Summary of Adaptive Management Measures using a Step-wise Approach to be Implemented When/If an Eagle Take Occurs.*

Level	Threshold or Trigger	Adaptive Management Response
1	Up to 10 Bald Eagle fatalities estimated** with a 60-month period	• Continue implementation of ECP; and • assess the cause or likely contributing risk factor(s) to the eagle fatality and whether a management response is warranted and/or feasible.
2	Between eleven and 23 Bald Eagle fatalities estimated** within a 60-month period	• Level 1 adaptive management responses; • Evaluate cumulative monitoring effort to date to assess if take estimate is inflated by limitations in survey design; and • consult with the USFWS to help determine if: o immediate response or management action is needed; o additional carcass removal or landowner carcass disposal outreach efforts should be implemented to minimize the presence of eagle attractants within the Project; and/or o a longer term action plan or management response plan should be developed.
3	24 or more Bald Eagle fatalities estimated** within a 60-month period	• Level 1 and 2 adaptive management responses; and • as appropriate and under consultation with the USFWS, temporarily implement and test the effectiveness of additional conservation measures to further avoid or minimize risk to eagles.

*Note: this table will be updated at 5-year intervals if appropriate. Because 5-year check-ins may adjust the permitted number, the number of eagle fatalities that trigger a change in action may also change. However, the adaptive management responses will stay the same.

** USFWS will estimate via Evidence of Absence using monitoring results, at the median (50^{th}) level at five year periods. These triggers will also be evaluated immediately (within the same season) following the discovery of any eagle remains documented at the site; for example, if two Bald Eagle carcasses are documented during third-party or O&M monitoring season, in addition to reporting the remains to the USFWS per Section 9.4, the responses and processes described in Level 2 of this table would be followed, regardless of when the next official five year evaluation period would occur.

As described in Table 8, at Level 3, the Project Owner would consider the implementation of additional conservation measures (beyond those discussed in Section 8.2) that might include:

- seasonal, daily, or hourly weather-related turbine shut-downs targeting “problem” turbines
- detect-and-curtail systems through the use of biomonitors, radar, or camera imaging systems (or other available systems) that could be used to identify at risk eagles and shut-down or slow turbine operations
- detect-and-deter systems that might detect eagles and use sound, light, or drones to deter eagles from the area, pending USFWS approval and legal feasibility

Costs for implementation of any additional conservation measures would not be open ended, and would be subject to practicable considerations. The Owner will discuss with the USFWS additional measures to implement to reduce risk to eagles at the site if any of the triggers in Levels 2 or 3 in Table 8 are met, as well as the associated cost and practicability of such measures. Such measures would be implemented in a manner that attempt to specifically addresses the root cause(s) of take. For example, if take has only been documented during the winter months, additional measures may only be implemented during the winter months at the site. Or, if take has only occurred in one area of the site, additional measures would only be implemented in those areas where take has previously occurred. For Level 3 responses, as noted in Table 8, the Owner would test the effectiveness of any additional conservation measures; if the measure is proven effective, the Owner would continue to implement the measure as long as the specific risk it was designed for is still present at the Project. Additionally, as noted in Table 8, the Owner may discuss with the USFWS the possibility of amending the permit to allow for additional take, if the local-area bald eagle population has increased or other risk factors (such as nest density in the Project area) change to the point that bald eagle risk increases beyond what was analyzed during the initial permit issuance review.

In addition to the adaptive management framework described above, any new Bald Eagle nest that is documented within 1 kilometer of turbines will be reported to the USFWS and checked for activity status during the breeding season by trained on-site personnel. Depending on the specifics of the nest (proximity to turbines, any specific risks identified by the USFWS or by monitoring), further monitoring such as utility/flight path mapping surveys may occur, through coordination with the USFWS, so that further adaptive management responses, if appropriate, may be identified.

Over the life of the permit and Project it is also possible that conservation measures that were once deemed effective will later become obsolete and be replaced by more effective measures. Should the implementation of additional conservation measures above what is committed to in Section 8.2 be necessary, and should more effective measures be identified that would reduce risk to a greater degree than existing, the Project Owner may propose revising the adaptive management strategy to the USFWS.

8.5 REVIEW OF COMPLIANCE WITH TIERING CRITERIA

8.5.1 Introduction

The 2016 PEIS states that the USFWS anticipates tiering subsequent reviews for site specific projects off of the PEIS, which would involve a streamlined review, including a summary of the issues discussed in the PEIS and incorporation by reference of appropriate analysis included in the PEIS (USFWS 2016). This tiering approach is stated as appropriate when a specific project meets the following three criteria:

a) The project “will not take eagles above the eagle management unit take limits (unless it is offset)”
b) The project “will not result in cumulative authorized take within the Local Area Population (LAP) exceeding 5%”

c) The project "will fulfill their compensatory mitigation requirements via methods that will offset the take"

The Project meets all three of these criteria, as described further below, and therefore qualifies for tiering to the PEIS.

8.5.2 Eagle Management Unit Take Limits

Per the ECPG, where take which may occur after avoidance and minimization measures have been used to the maximum extent practicable and when eagle populations at the scale of the USFWS eagle management units are not healthy enough to sustain additional mortality over existing levels, permit applicants must reduce the effect of permitted mortality to a level that is compatible with the preservation of eagles, best accomplished through compensatory mitigation (USFWS 2013a; 2016).

The allowable annual threshold of Bald Eagle take in the USFWS Mississippi Flyway eagle management unit is 1,640 eagles (USFWS 2016). This sustainable annual take is based on the predicted population of Bald Eagles in this geographical area (27,334 for Mississippi Flyway) in conjunction with the harvest threshold for estimated annual production of the population (6.0%; USFWS 2016).

The estimated annual level of take at the Project, 5.01 eagles, is less than 0.01% of the overall take limit for the Mississippi Flyway eagle management unit. The Project therefore meets the first criteria for tiering to the PEIS because it does not result in take above the eagle management unit take limits.

8.5.3 Local-Area Population Take Thresholds

To determine if the Project's impact on the local-area Bald Eagle population is biologically problematic, local-area 1% and 5% benchmarks were calculated (Table 11). The local-area population of Bald Eagles is that number of Bald Eagles within an 86 mile radius of the turbines, or 818 Bald Eagles (see Map Exhibit 7 and Table 11). This population estimate is based on the median distance eagles disperse from the nest where they are hatched to where they settle to breed (USFWS 2016), and takes into account the portion of the 86-mile radius local-area that occurs on U.S. land (i.e., excludes the open water of the Great Lakes) and Canada within the Mississippi Flyway and its associated eagle densities (USFWS 2016). Take rates between 1% and 5% of the estimated local-area eagle population size are considered sustainable by USFWS, with 5% being at the upper end of what might be appropriate under the BGEPA preservation standard (USFWS 2013a) as well as one of the criteria considered when determining if a project can tier to the PEIS.

The conservative estimated level of take for the project is 5.01 Bald Eagles per year. This level of estimated annual take represents less than 0.7% of the total calculated local-area population of 818 Bald Eagles. This level of take, should the USFWS authorize it, is far below the 5% threshold at the local-area level.

The USFWS conducted a Cumulative Effects Analysis on this Project on June 17, 2021 to look at other permits issued in the local-area population of this wind facility. There is overlapping permitted take of 1.24 eagles a year (0.15% of the local-area population). If the Project is permitted with 5.01 Bald Eagles/year, this will be a cumulative impact of less than 0.8% of the local-area population, which is well within the USFWS benchmark for permitted take.

8.5.4 Compensatory Mitigation Requirements

As stated above, the estimated annual take at the Project represents less than 0.7% of the total local-area population of 818 Bald Eagles and is well below the 1% sustainable annual take of the local-area population.

In addition, as Bald Eagle populations continue to increase in Michigan and the Mississippi Flyway eagle management unit, the level of take predicted by the conservative USFWS collision risk model for this Project is likely to stay well within the sustainable threshold for the regional Bald Eagle population for the foreseeable future. Compensatory mitigation is not required for an ETP for this Project. Therefore, the Project meets the third criteria for tiering to the PEIS.

Table 11. Calculated Local-area Annual Take Benchmarks

BAEA Management Unit	Region[a]	Maximum Take Rate (% local-area population per year)[b]	Local-area Population[c]	Local-area 5% Benchmark (eagles per year)[d]	Local-area 1% Benchmark (eagles per year)[e]
Mississippi Flyway – Great Lakes	Region 3	5.0	771	–	–
Mississippi Flyway – Canada	Canada	5.0	47.09	–	–
Total LAP		**5.0**	**818.58**	**40.9**	**8.2**

[a] Region 3 (within Mississippi Flyway) is referenced in order to determine appropriate Bald Eagle densities to use.
[b] USFWS upper benchmark for Bald Eagle take at the local-area population scale.
[c] Local-area population , as calculated by USFWS LAP Tool.
[d] Local-area 5% benchmark = (local-area * regional eagle density) * 0.05.
[e] Local-area 1% benchmark = (local-area * regional eagle density) * 0.01.

9 Stage 5 - Post-Construction Monitoring Plan (Stage 5)

9.1 FATALITY MONITORING

Monitoring is an essential component of an effective adaptive management plan because it allows for responses based on actual site data. The monitoring results are used to assess the accuracy of take predictions. The assessment can result in a scaled back, increased, or continued effort to reduce eagle take at the Project.

The following sections describe the protocol for standardized fatality monitoring (i.e., baseline and long-term fatality monitoring) for Bald Eagles to be used at the Project. For eagles, this monitoring framework consists of standardized searches conducted at all of the Project's turbines.

9.2 POST-CONSTRUCTION/POST-PERMIT EAGLE FATALITY MONITORING

As described in Section 6.3, the Owner voluntarily conducted bird and bat fatality monitoring consisting of road and pad searches and cleared plot searches and eagle fatality monitoring consisting of eagle scans during the first year of operations; these protocols were coordinated with the USFWS and covered the first year of operations (from June 2018 through May 2019; see Appendix 5 for detailed protocol and results). As Appendix 4 details, the Project Owner proposes to conduct two years of third-party eagle fatality monitoring at the Project after an eagle take permit is received. All of the turbines will be surveyed twice a month, during which the third-party surveyor will visually scan the area around all directions of the turbine to a distance of 150 m. Due to the relatively flat terrain of the Project and the relatively large size of eagles (i.e., eagle remains will be visible from relatively far distances), plots will not be cleared and transects will not be walked; instead the 150 m area will be visually scanned from around the turbine. As described further in Appendix 4, scans may not occur during the summer when crops are anticipated to inhibit visibility; if some turbines continue to have acceptable visibility through the summer, scans will continue. Specific search efficiency trials and carcass persistence trials using raptor carcasses as available (and as permitted through a Special Utility permit, which the Project Owner plans to apply for) will be used for these surveys. This post-construction mortality monitoring will continue to assist in establishing the Bald Eagle fatality rates for the Project and allow for comparison to the predicted rates per the USFWS collision risk model.

At the end of Year 2 of the Permit Term, the Owner's O&M staff will be trained, by the third-party monitors, on the eagle monitoring protocol that will be implemented in Years 3, 4 and 5. In Years 3 through 5 of the Permit Term, the Owner's O&M staff will visit each of the operating turbines on a quarterly basis and inspect roads, pads and any other area visible by binoculars (out to approximately 150-m) from a vehicle. The frequency and number of turbines visited may be increased or reduced if deemed appropriate after the first two years of O&M monitoring.

Prior to implementing an O&M staff monitoring program, O&M staff searcher efficiency will be tested by a third-party (e.g., as part of the formal two-year fatality monitoring program described in Section 1.a). These searcher efficiencies (and carcass removal rates measured during the two-year third-party fatality monitoring program) will be estimated for at least one year in every 5-year period of the 30-year permit. Because searcher efficiency may vary among searchers, searcher efficiency will be estimated for any new O&M staff if they begin work more than 1 year before the next scheduled searcher efficiency trials. The searcher efficiency and carcass persistence estimates will be used along with the number of eagles discovered during monitoring to estimate overall actual eagle fatality numbers using Evidence of Absence fatality estimator or another software program agreed to by the Service and the Owner. Changes to the scheduled searcher efficiency and carcass persistence trials (such as increasing or decreasing the number of trials, number of carcasses, years studied, etc.) can be made if agreed to by the Service and the Owner.

For the remaining 25 years of the permit term, third-party monitoring will occur at five year intervals for the operational life of the Project (Years 6, 11, 16, 21 and 26), following the same general approach as described in Appendix 3 for the first year. In the years when third-party monitoring is not conducted in the remaining 25 years, operations staff will visit each turbine at least quarterly; during visits, the staff will inspect roads, pads and any other cleared area in the immediate vicinity of turbines visible from their vehicle by binoculars (out to approximately 150 m). Any eagle carcasses that are discovered by operations staff or incidentally observed will be reported to the Service (Migratory Bird Permit Office and Office of Law Enforcement) within 48 hours. Appendix 3 provides more detail on the proposed approach to post-permit eagle fatality monitoring.

9.3 POST-CONSTRUCTION DISTURBANCE MONITORING

Disturbance monitoring may be required of any eagle nesting territories and communal roost sites as stated in the permit regulations at 50 CFR 22.26(c)(2). Per the ECPG, the objective of such monitoring will be to determine post-construction: 1) territory or roost occupancy rates, 2) nest success rate, and 3) productivity. The Project Owner will coordinate with USFWS and DNR if a new Bald Eagle nest is observed or reported in the vicinity of the Project. If the coordination with the agencies on a particular nest determines that further monitoring may be warranted (if the nest is relatively near operating turbines [~1 km], for instance), a monitoring plan may be developed to document general observations of nesting, nesting success, and any potential disturbance associated with the Project; qualified biologists and/or trained on-site personnel will conduct this monitoring.

9.4 REPORTING

If eagle remains are discovered, the Project Owner will immediately contact the USFWS's Office of Law Enforcement, the USFWS East Lansing Office, and the Migratory Bird Permit office. A take data sheet will be completed and include the following information per the ECPG (USFWS 2013a):

1. Date and time of discovery.

2. Species.
3. Age and sex when possible.
4. Band number and notation if wearing a radio-transmitter or auxiliary marker.
5. Observer name.
6. Turbine or pole number or other identifying character.
7. Distance of the remains from the turbine or pole.
8. Azimuth of the remains from the turbine or pole.
9. Decimal-degree latitude-longitude or Universal Transverse Mercator (UTM) coordinates of the turbine or pole and remains.
10. Habitat/ground cover surrounding the remains.
11. Condition of the remains (entire, partial, scavenged).
12. Description of the remains (e.g., intact, wing sheared, in multiple pieces).
13. A rough estimate of the time since death (e.g., ≤ 1 day, > a week), and how estimated.
14. A digital photograph of the remains.
15. Information on remains disposition.

The Project Owner will provide a written annual report as well as raw data to the USFWS and MDNR detailing the post-construction monitoring and results following each year of third-party fatality monitoring.

9.5 WILDLIFE INCIDENT REPORTING SYSTEM (WIRS)

Upon commissioning, the Project has employed the site-specific Wildlife Incident Reporting System (WIRS). The WIRS is designed to provide a means of recording avian and bat casualties found in the Project to increase the understanding of wind turbine and wildlife interactions. The WIRS provides a set of standardized instructions for the Project personnel to follow in response to wildlife incidents in the Project. Each incident will be documented on a data sheet or electronically and reported by Project personnel to the Project's Environmental Compliance lead. The data is logged into and maintained within a tracking spreadsheet or system by the Project environmental affairs staff, and regular review of the reported incidents is undertaken by the same staff. Site personnel are required to receive training on WIRS procedures as well as how to complete and submit the WIRS data.

The long-term operational effort consists of managerial, operations, and maintenance staff documenting and reporting fatalities discovered during the course of wind farm operation.

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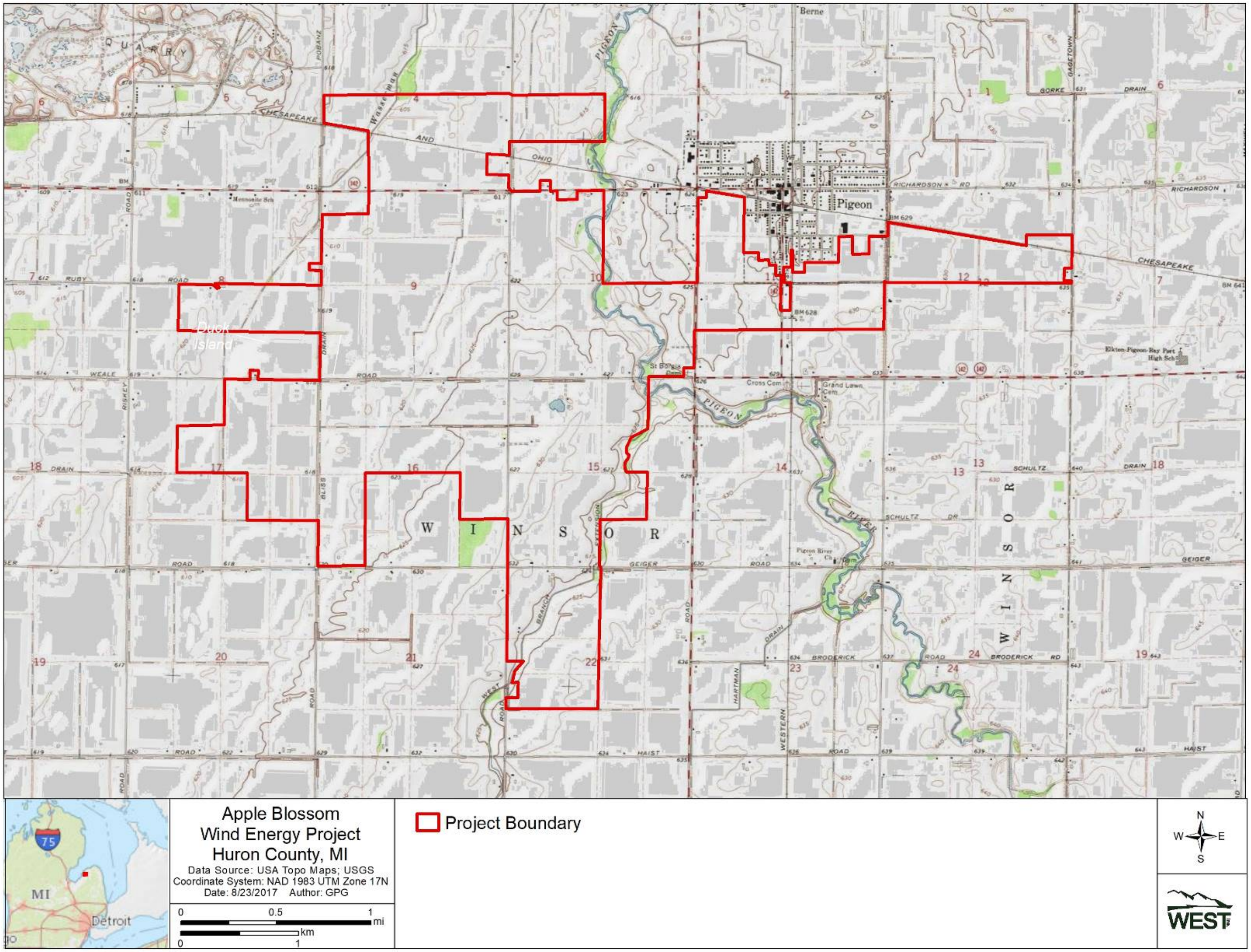
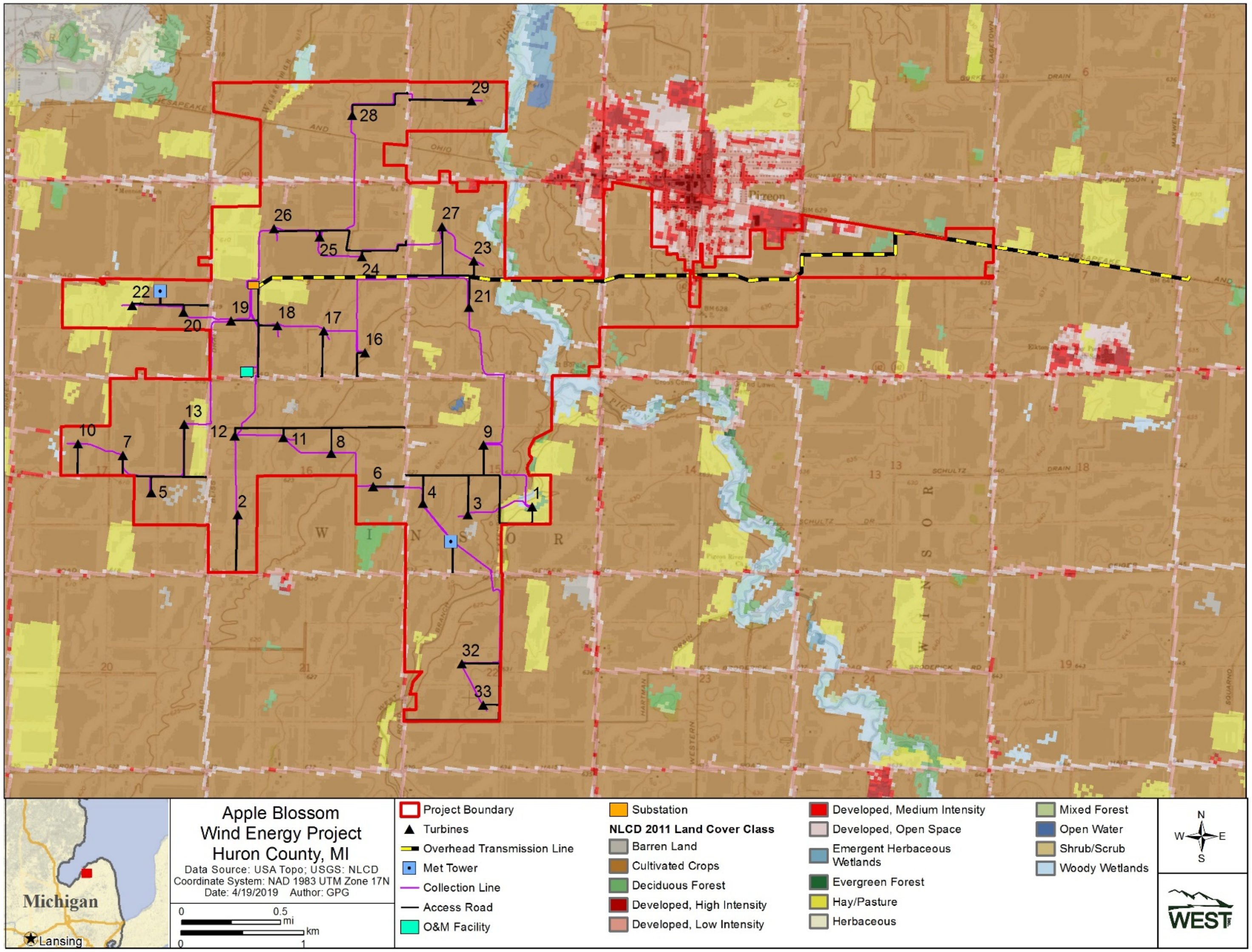
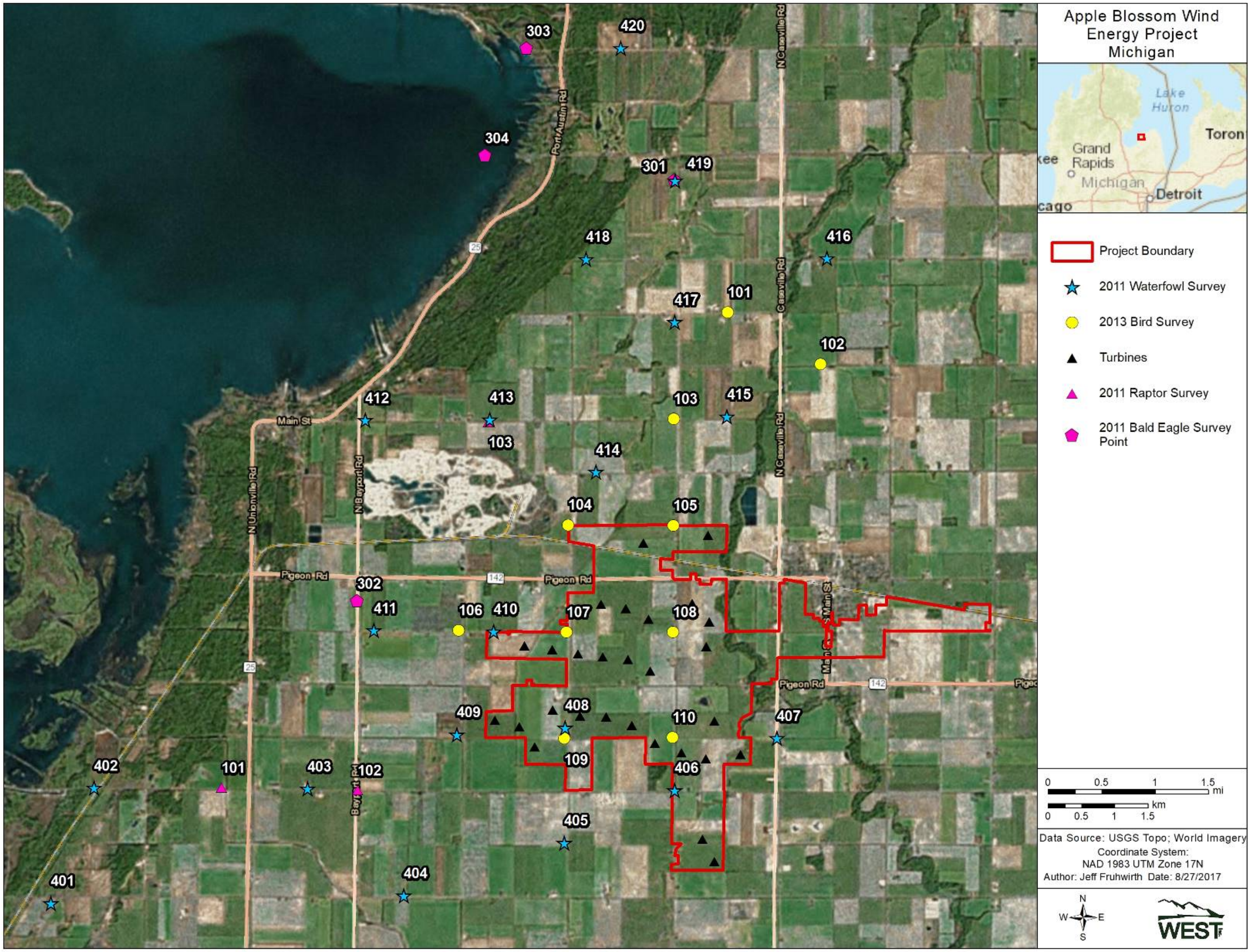
11 Map Exhibits



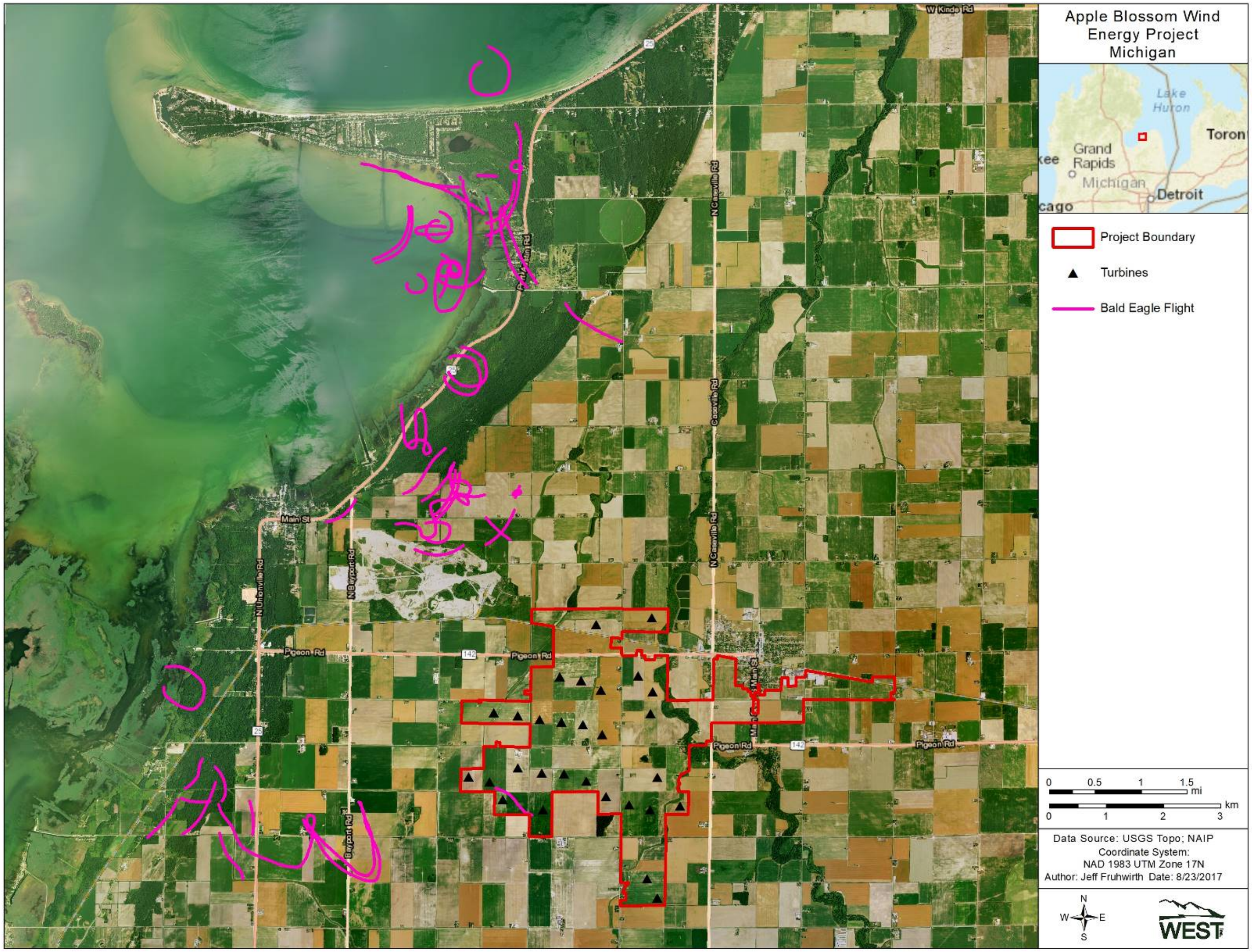
Map Exhibit 1. Project Site



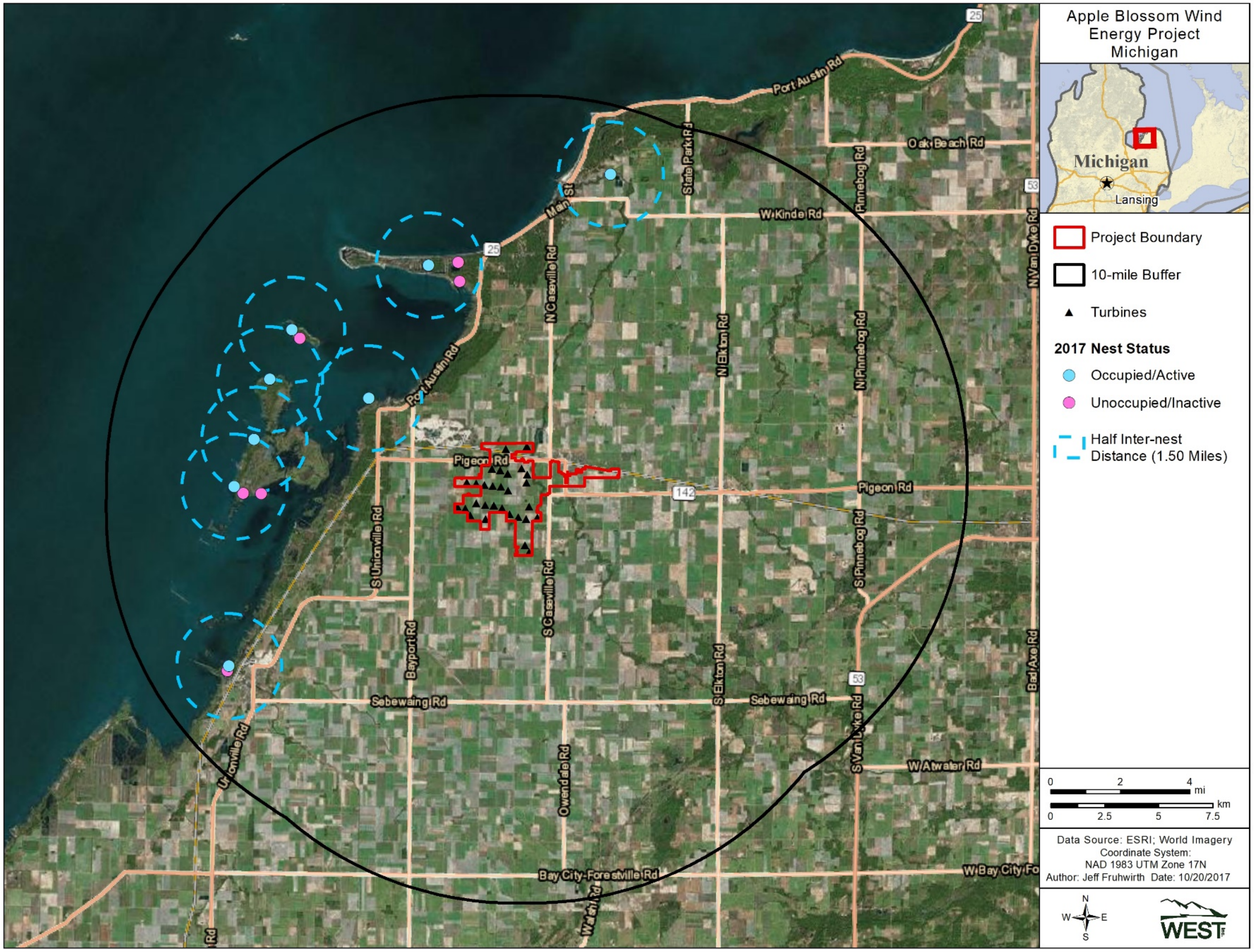
Map Exhibit 2. Turbine and Other Project Facility Locations and Land Cover



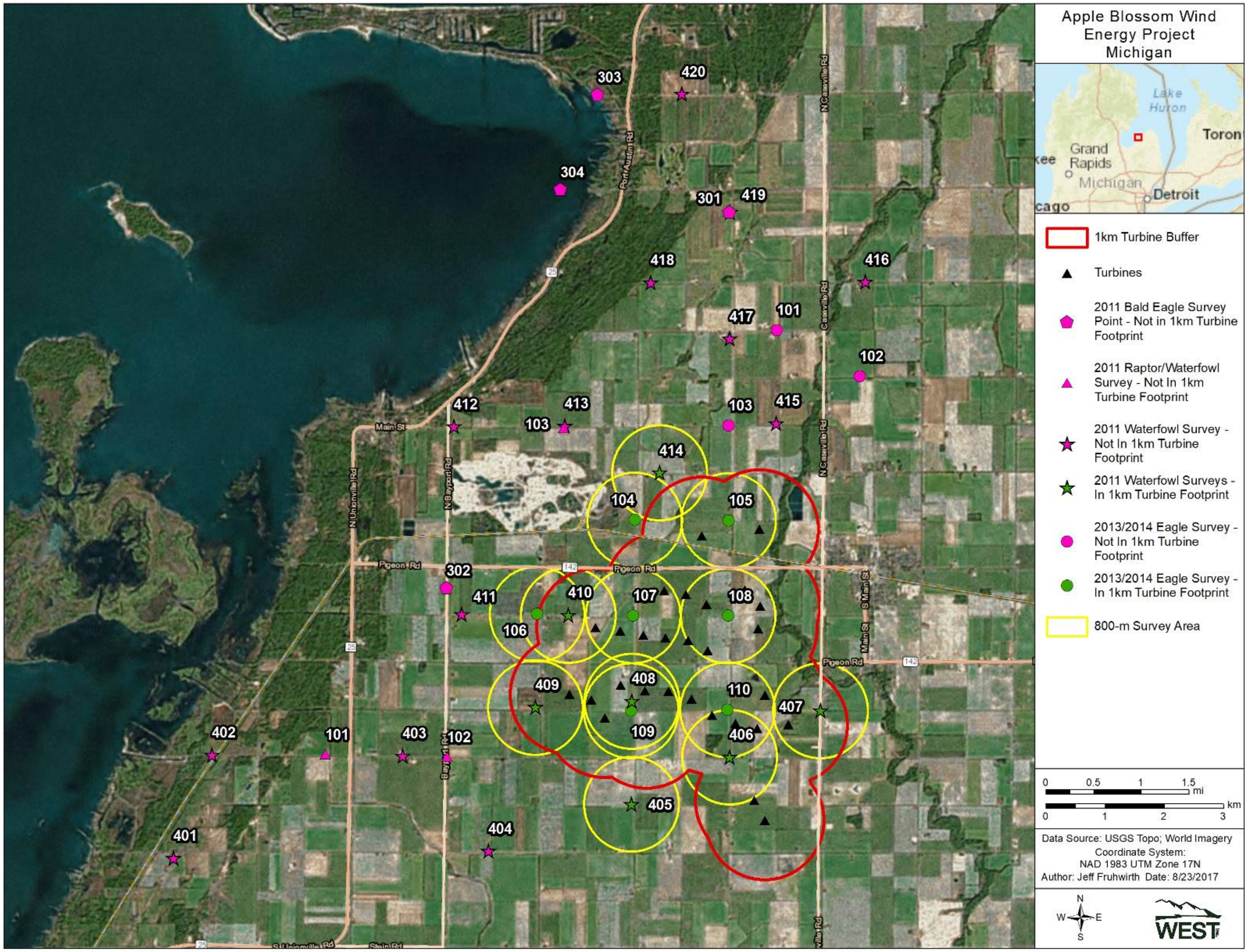
Map Exhibit 3. Survey Point Locations



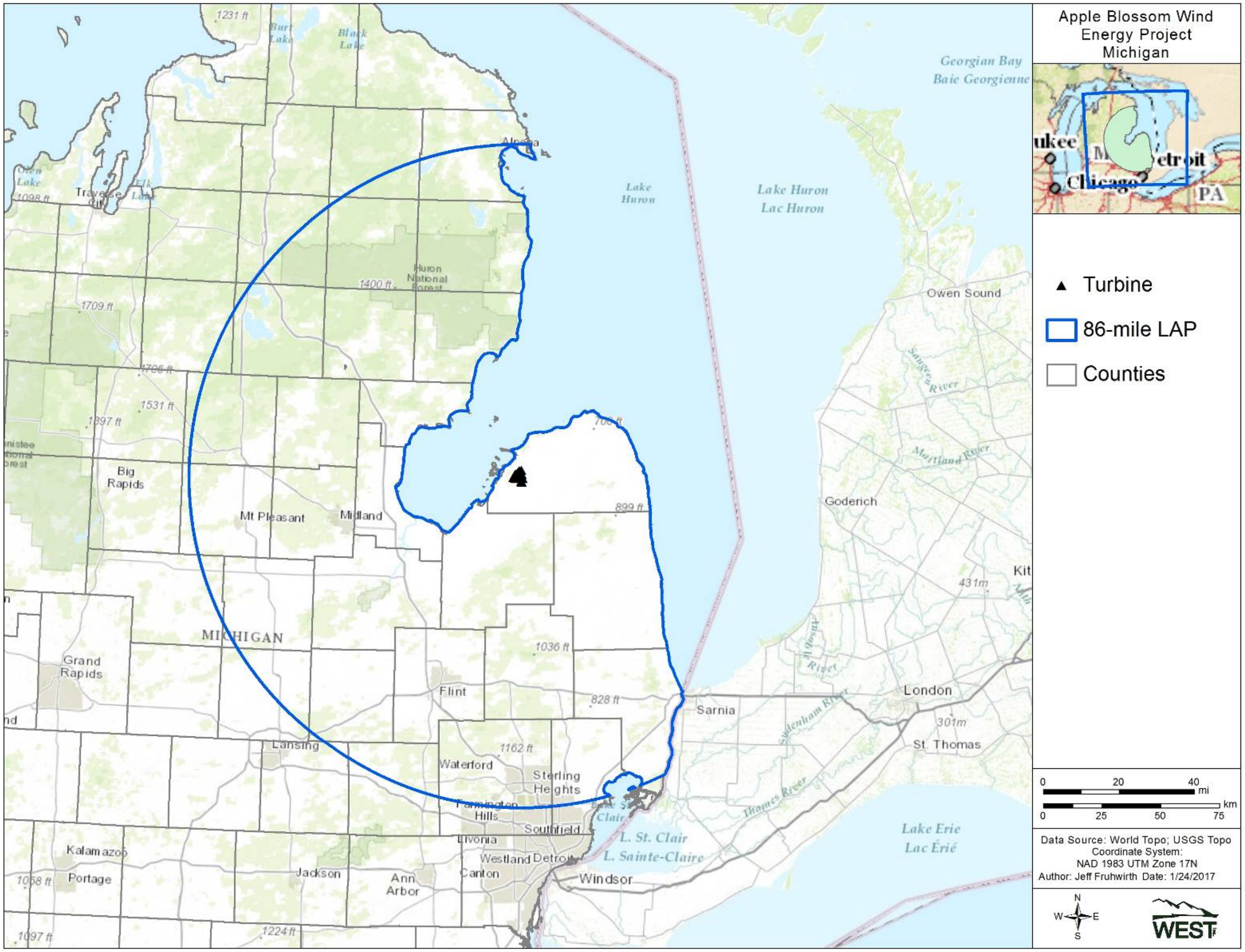
Map Exhibit 4. Eagle Flight Paths



Map Exhibit 5. Eagle Nest Locations and Half-Mean Inter-nest Distance (using previous USFWS nest risk assessment guidance)



Map Exhibit 6. Survey Points Overlapping 1-km Project Footprint



Map Exhibit 7. 86-Mile Local-Area Population