

SWCA

## Heart of Texas Wind Project Habitat Conservation Plan

SWCA Project Number 34502

June 2017

**SUBMITTED TO:**

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## APPENDICES

### Appendix A. Rationale for Wind Turbine Collision Coverage

## 1.0 INTRODUCTION

Heart of Texas Wind, LLC (the Applicant) proposes to construct and operate the Heart of Texas Wind Project (Project) within a Project Area of approximately 10,762 acres located in McCulloch County, Texas (Figure 1). The Applicant does not own the property that constitutes the Project Area, but instead leases the use of the area from private landowners. Activities associated with the proposed Project will include clearing for construction of turbine pads, access roads, underground medium voltage collection cables (MV collection cables), a substation, overhead high voltage transmission line, and other necessary infrastructure; installation of turbines and other infrastructure; and ongoing operations and maintenance of the proposed Project.

The Applicant will construct a portion of the proposed Project within areas of suitable habitat for the endangered black-capped vireo (*Vireo atricapilla*, BCVI). The removal or modification of suitable BCVI habitat during construction and the ongoing activity associated with operation and maintenance of the Project could incidentally take the species. The federal Endangered Species Act (ESA) prohibits take of an endangered wildlife species unless authorized by the U.S. Fish and Wildlife Service (USFWS). The USFWS may authorize incidental take for non-federal actions (such as the proposed Project) by issuing an Incidental Take Permit (ITP) under Section 10(a)(1)(B) of the ESA. This Habitat Conservation Plan (HCP) supports an application to the USFWS for an ITP for the proposed Project.

### 1.1 Project Description

The Project is a proposed wind power generation facility on nearly 10,762 acres of private land in McCulloch County, Texas. In addition to the installation of wind turbines, there will also be access roads, MV collection cables, substation, high voltage transmission line, and other related infrastructure constructed within the Project Area. Figure 2 shows the anticipated layout of the proposed Project; however, the final layout is subject to change.

Within the Project Area, the Applicant will install up to 70 wind turbine generators capable of generating 2.0 to 3.5 megawatts each. The Applicant anticipates that turbines will have a 110- to 130-meter rotor width, an 80- to 100-meter hub height, and operate at 60 to 80 decibels at the base. The Applicant micro-sited the placement of each proposed turbine to minimize take of the BCVI and address other site constraints. The Applicant will construct each turbine on a concrete spread foot foundation that is approximately 64 feet in diameter by approximately 9 feet in depth. The foundation area will be excavated, the rebar cage will be assembled in the excavation, concrete poured and after curing the area around the foundation will be backfilled, returning the landscape to near native grade, and subsequently hydro-seeded for revegetation. The vast majority of the foundation will be underground with only a concrete pedestal approximately 20 feet in diameter remaining above grade, to which the steel tower sections supporting the turbine attach. Turbine construction requires temporary workspaces, with a radius of approximately 200 feet centered on each turbine, to facilitate construction. These workspaces are cleared in a manner that minimizes grubbing and grading so to encourage rapid revegetation. Upon completion of construction, all cleared areas where the topsoil has been disturbed will be hydro-seeded for revegetation.

MV collection cables will collect power generated by the turbines. The Applicant will clear collecting line rights-of-way (ROWs) to a width of approximately 30 feet during construction and will reduce the maintained ROWs to 20 feet or less after construction to allow for continued access. Where reasonably possible, the Applicant will place MV collection cables along access roads so that the workspaces overlap.

The Applicant will use existing private access roads within the Project Area to the extent practical. However, the Applicant will need to upgrade existing roads and construct new roads to provide sufficient access to the Project Area. The Applicant will use approximately 20 miles of improved or new access roads within the Project Area. During construction of the proposed Project, the Applicant will clear access road ROWs up to 76 feet wide. After construction of the proposed Project, the Applicant will reduce the maintained ROW width to 16 feet to allow for continued access. Constructed roads will typically be 40 feet in width during construction to allow for movement of the main erection crane. Upon the completion of construction, the shoulders of the road are typically folded in for a permanent road of 16 feet in width with 3 feet to 4 feet of drainage ditches on either side. Where possible, all clearing is done to existing grade, with minimal grubbing, and grading only where necessary. Upon completion of construction, all disturbed areas (including drainage ditches) are hydro-seeded with native grasses.

The MV collection cables will transport power from turbines to a substation that the Applicant will construct within a fenced area of no more than 5 acres. The Applicant will permanently clear the area within the substation fence and will install a medium voltage electrical bus, electrical protection equipment, metering, communication equipment, and a main power transformer. A 345-kilovolt overhead transmission generation tie line (Gen-tie Line) will transport power from the Project Area. The approximately 8-mile-long Gen-tie Line will connect to a switching station outside of the Project Area to deliver power to the Electric Reliability Council of Texas (ERCOT) transmission system. Only approximately 3.8 miles of the proposed Gen-tie Line occurs within the Project Area. The remainder of the Gen-tie Line occurs on adjacent lands.<sup>1</sup> The Applicant requires a cleared ROW of 100 feet to construct the overhead Gen-tie Line that will be maintained clear to facilitate access during operations.

As part of the proposed Project, the Applicant will develop and implement a Bird and Bat Conservation Strategy (BBCS) to document its actions to avoid, minimize, and compensate for potential impacts to birds and bats during the design and operation of the Project. The BBCS will be prepared within one year of ITP issuance and will describe how the Applicant has and will adhere to the 2012 voluntary Land-based Wind Energy Guidelines prepared by the USFWS. The Applicant will coordinate with the USFWS, as appropriate, in the development of the BBCS and to share findings from monitoring activities.

Figure 2 shows the limits of the Project Area and the proposed design of the Project.

In addition to the public comment period required for issuance of an ITP, the Applicant voluntarily engaged in several publicly noticed meetings with county officials and several other in-person meetings with local landowners regarding the proposed Project. In total, the Applicant participated in more than one dozen local, public meetings regarding the proposed Project. In addition, the proposed Project has been the subject of several articles in the local newspaper. These publicly noticed meetings occurred on the following dates:

- Commissioners Court of McCulloch County (July 24, 2015; August 3, 10, 24, 2015; March 14, 28, 2015; April 11, 2016; September 26, 2016)
- Brady Independent School District (August 17, 2015; March 29, 2016)
- Lohn Independent School District (March 28, 2016; November 21, 2016)
- McCulloch County Hospital District (June 13, 2016)

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<sup>1</sup> Only a small portion (+/- 2,000 feet) of the proposed Gen-tie Line outside of the Project Area occurs within 500 feet of potentially suitable BCVI habitat, as mapped by Bio-West (2015). The Plan Area for this HCP, described in Section 2.0, includes this segment of the proposed Gen-tie Line. Therefore, the Plan Area is slightly larger than the Project Area.

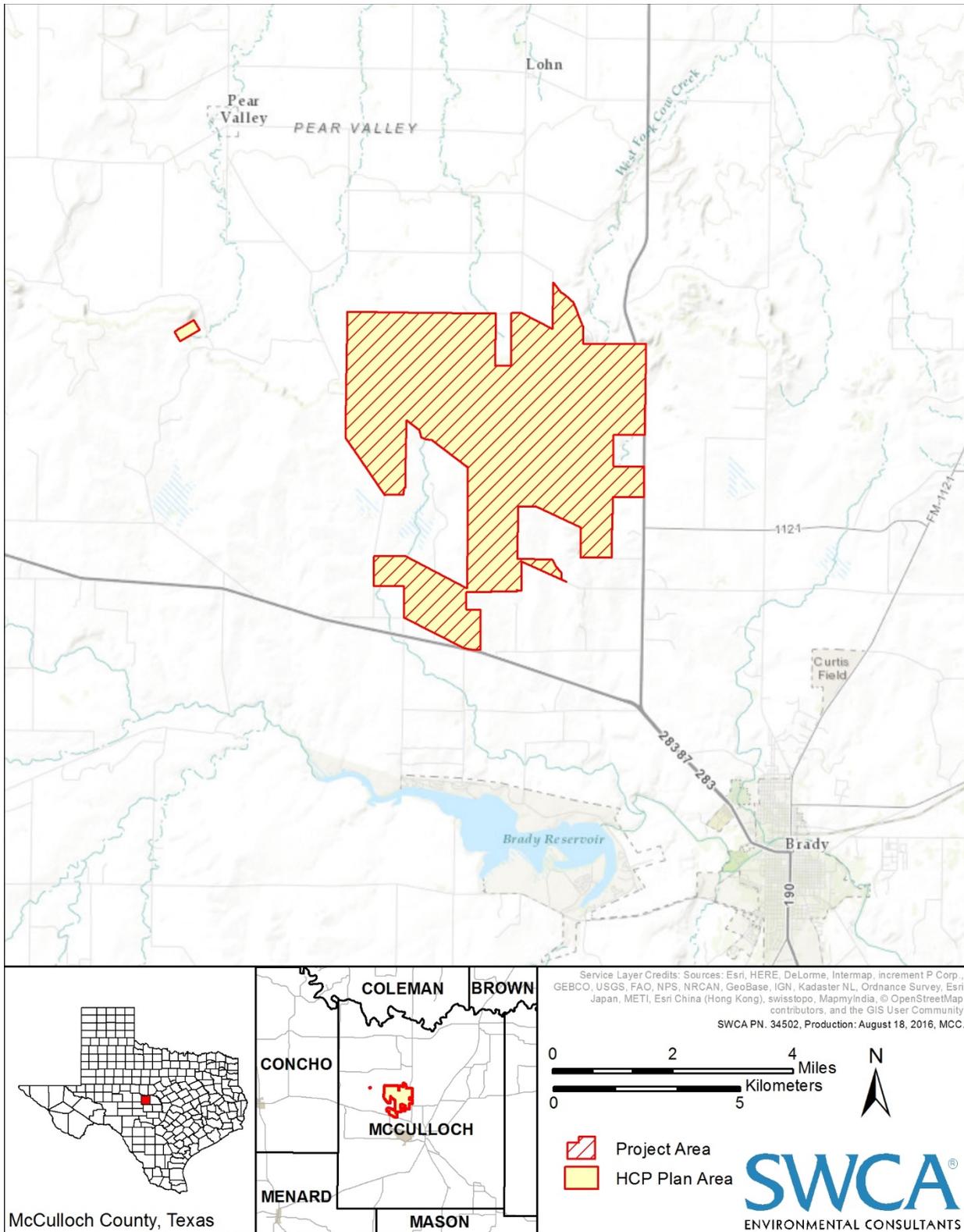
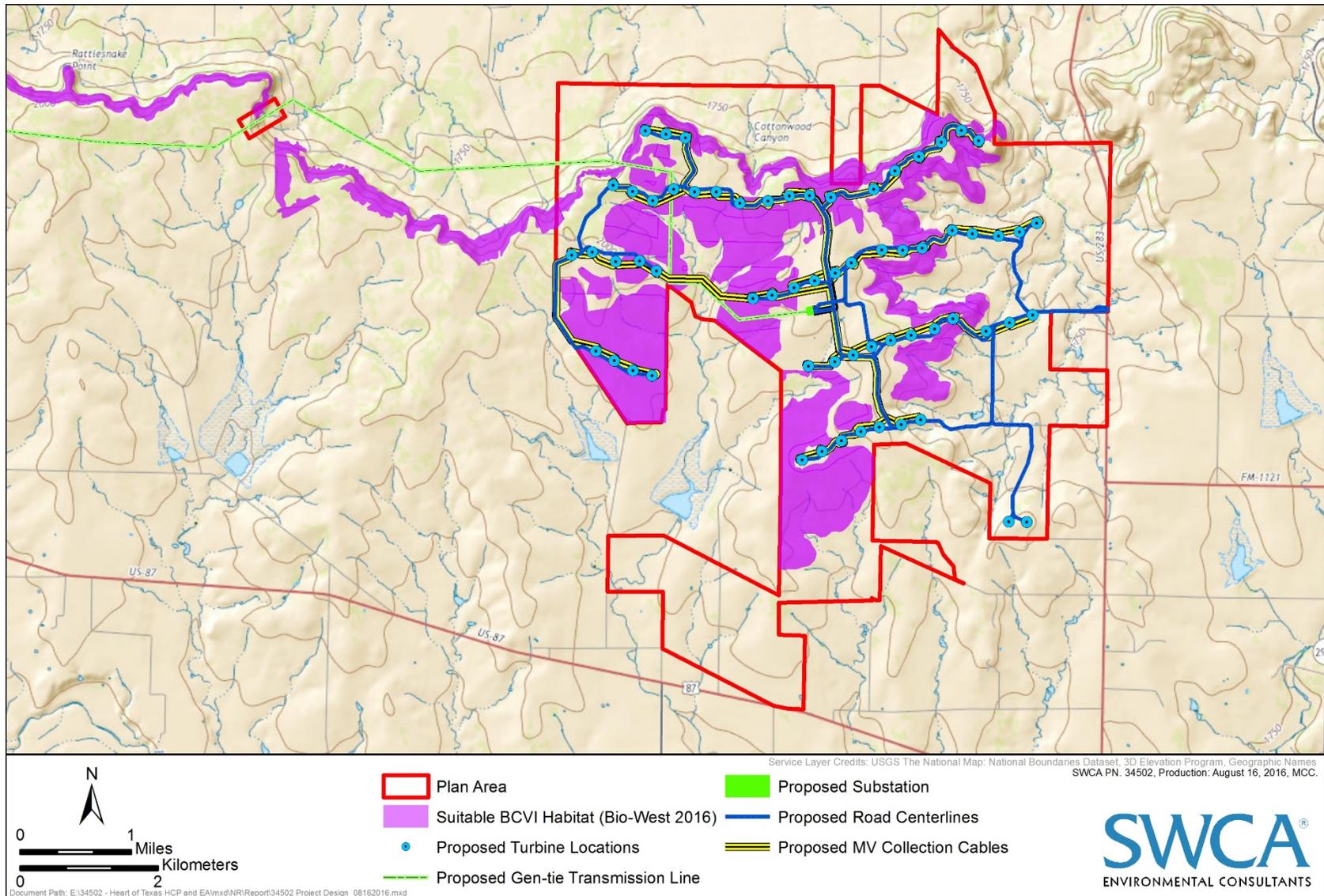


Figure 1. Location of the Heart of Texas Wind Project



**Figure 2.** Proposed Design of the Heart of Texas Wind Project

## 1.2 Regulatory Framework

Section 9 of the ESA prohibits *take* of federally endangered wildlife species. The ESA defines take as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct” (16 U.S. Code [USC] 1532(19)). *Harm* is defined by USFWS regulations as “an act which actually kills or injures wildlife and may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding or sheltering” (50 Code of Federal Regulations [CFR] 17.3). *Harass* is defined by USFWS regulations as “an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering” (50 Code of Federal Regulations [CFR] 17.3). Section 10(a)(1)(B) of the ESA authorizes the USFWS to issue permits allowing take that is “incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.”

Section 10(a)(2)(A) of the ESA provides that the USFWS shall not issue an ITP unless the applicant provides a conservation plan that specifies:

- 1) the impact that will likely result from the taking;
- 2) the steps the applicant will take to minimize and mitigate the impacts and the funding available to implement those steps;
- 3) the alternative actions to the taking that were considered and the reasons the alternatives were not chosen; and
- 4) other measures that the USFWS may require as necessary or appropriate for purposes of the conservation plan.

The USFWS’s *Habitat Conservation Planning and Incidental Take Permit Processing Handbook* (HCP Handbook) also provides guidance on the elements of a habitat conservation plan (USFWS and National Marine Fisheries Service [NMFS] 1996). The USFWS published additional policy guidance for HCPs (the “five-point policy”) as an addendum to the HCP Handbook on July 3, 2000 (USFWS 2000). The policy increases the effectiveness of HCPs by emphasizing the development of biological goals and objectives, adaptive management strategies, monitoring provisions, permit duration considerations, and public participation. This HCP addresses each of the criteria for permit issuance that are specified in section 10(a)(2)(B) of the ESA. These issuance criteria state:

If the Secretary finds, after opportunity for public comment, with respect to a permit application and the related conservation plan that — (i) the taking will be incidental; (ii) the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking; (iii) the applicant will ensure that adequate funding for the plan will be provided; (iv) the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and (v) the measures, if any, required under subparagraph (A)(iv) will be met; and he has received such other assurances as he may require that the plan will be implemented, the Secretary shall issue the permit. The permit shall contain such terms and conditions as the Secretary deems necessary or appropriate to carry out the purposes of this paragraph, including, but not limited to, such reporting requirements as the Secretary deems necessary for determining whether such terms and conditions are being complied with.

## 2.0 PLAN AREA

The Plan Area for this HCP and the permit area for the ITP includes the 10,762-acre Project Area and an additional 46 acres associated with the Gen-tie Line outside and approximately 2.5 miles to the west of the Project Area (see Figure 1). The additional 46 acres outside of the Project Area captures an approximately 2,000-foot segment of the Gen-tie Line that occurs within 500 feet of potentially suitable BCVI habitat. The total size of the Plan Area is 10,808 acres. The following sections describe the general environmental context of the Plan Area.

### 2.1 Ecoregions

Ecoregions represent areas of general similarity in ecosystems and quality, quantity, and type of environmental resources (Griffith et al. 2007). McCulloch County is entirely within the Central Great Plains Level III (i.e., “national scale”) ecoregion (Griffith et al. 2007). Grasslands with low trees and shrubs once characterized the Central Great Plains ecoregion (Griffith et al. 2007). Currently much of this region functions as cropland.

National scale ecoregions are sub-divided regionally into Level IV ecoregions. The Plan Area lies entirely within the Central Great Plains - Limestone Plains Level IV ecoregion (Griffith et al. 2007). The gray and tan limestone beds of the Limestone Plains contrast from the red beds of various neighboring ecoregions. Mixed grasses and shrubs are common within the ecoregion, while trees are typically sparse. Common plants in this ecoregion include honey locust (*Ziziphus obtusifolia*), agarita (*Mahonia trifoliolata*), mesquite (*Prosopis glandulosa*), and tree cholla (*Opuntia imbricata*). Scattered plateau live oak (*Quercus fusiformis*) and Ashe juniper (*Juniperus ashei*) are often found growing amongst mesquite shrub.

### 2.2 Geology

Geology can influence BCVI habitat. Certain geologic substrates, soils, and landscape features are more likely to maintain vegetation communities suitable for use by the species (USFWS 1991). Tazik et al. (1993) notes an association between limestone geologic formations, such as Edwards Limestone, and the occurrence of occupied BCVI habitat in Texas. Approximately 49% of the Plan Area is underlain by Edwards Limestone. Table 1 summarizes the representation of each geologic unit in the Plan Area and Figure 3 shows the geologic formations that occur in the Plan Area.

**Table 1.** Geologic Units in the Plan Area

Time Period	Geologic Unit and Composition*	Acres of the Plan Area	Percent of the Plan Area
<b>Carboniferous</b>	Harpersville Formation (shale)	69	0.6%
<b>Pennsylvanian</b>	Thrifty and Graham Formations, undivided (mudstone, shale, limestone, and sandstone)	1,328	12.3%
<b>Permian</b>	Pueblo Formation (sand and mudstone)	149	1.4%
<b>Cretaceous</b>	Edwards Limestone (limestone, dolomite, and chert)	5,299	49.0%
	Antlers Sand (sand and clay)	3,064	28.3%
<b>Quaternary</b>	Quaternary undivided (sand, silt, clay, and gravel)	898	8.3%

\* Plummer and Moore 1922; McGowen et al. 1967; Abbott 1973; U.S. Geological Survey 2015a, 2015b, 2015c, 2015d

## 2.3 Land Cover and Land Use

The Multi-Resolution Land Characteristics Consortium created the National Land Cover Database (NLCD), last updated in 2011, as a resource for assessing land use and land cover in the United States (Homer et al. 2012). As mapped by the NLCD, shrub/scrub vegetation communities cover approximately 8,725 acres (80%) of the Plan Area. Approximately 1,576 acres (15%) is composed of other open herbaceous cover or forested cover. Less than 20 acres (0.17 %) of the Plan Area has developed land cover. Based on field observations by SWCA in 2015, the existing land uses in the Plan Area and surrounding areas appear to be dominated by cattle grazing and recreational hunting (Paul Sunby, SWCA, pers. com.). Table 2 summarizes the representation of each cover type within the Plan Area and Figure 4 shows the distribution of NLCD land use and land cover types.

**Table 2.** Land Cover Types within the Plan Area

NLCD Land Use/Land Cover Type	Acres in the Plan Area	Percent of the Plan Area
<b>Shrub/Scrub</b>	8,725	80.75%
<b>Grassland/Herbaceous</b>	950	8.79%
<b>Developed, Open Space</b>	458	4.24%
<b>Deciduous Forest</b>	383	3.54%
<b>Evergreen Forest</b>	242	2.24%
<b>Pasture/Hay</b>	26	0.24%
<b>Developed, Low Intensity</b>	16	0.15%
<b>Developed, Medium Intensity</b>	2	0.02%
<b>Open Water</b>	2	0.02%
<b>Woody Wetlands</b>	2	0.02%

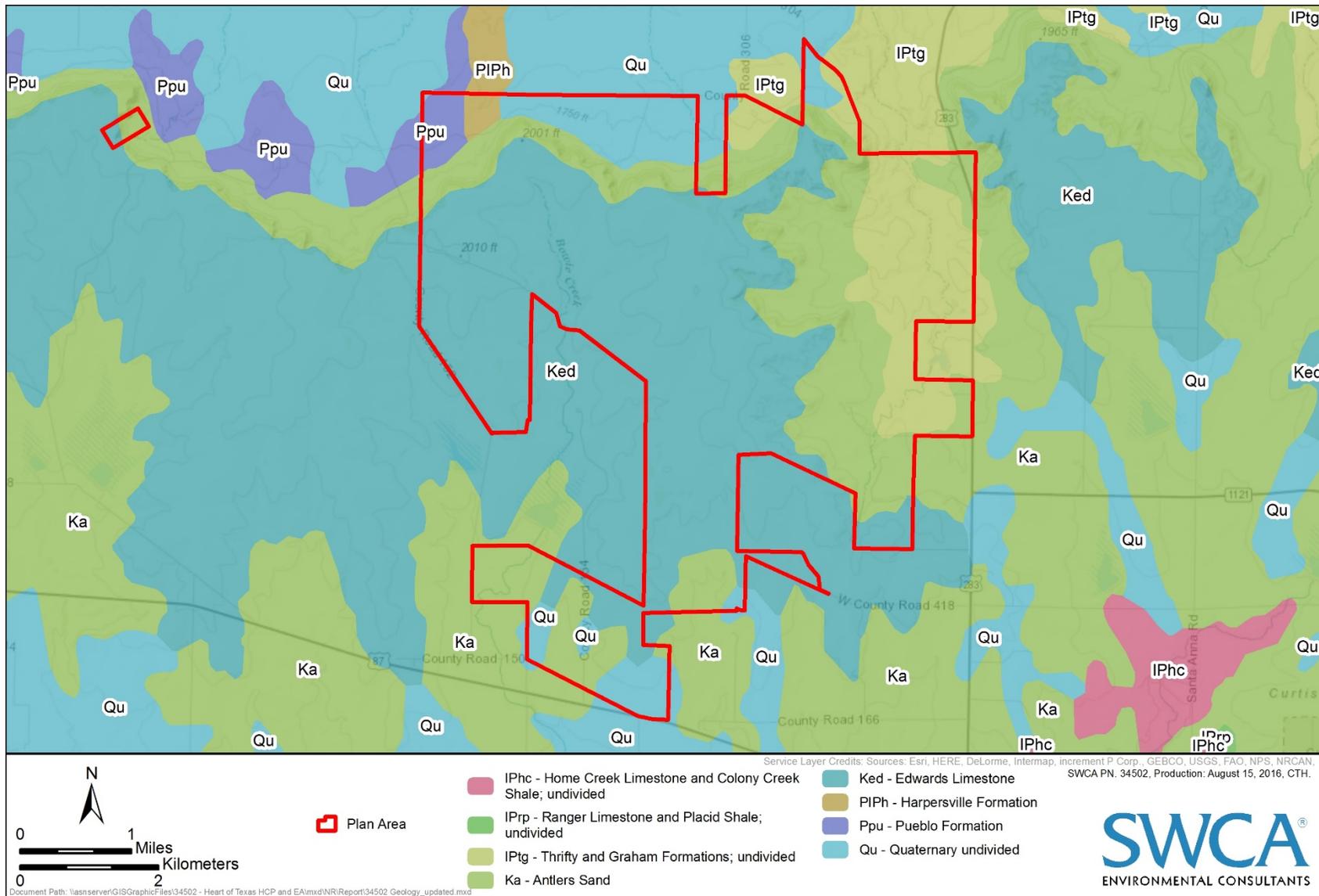


Figure 3. Geology of the Plan Area

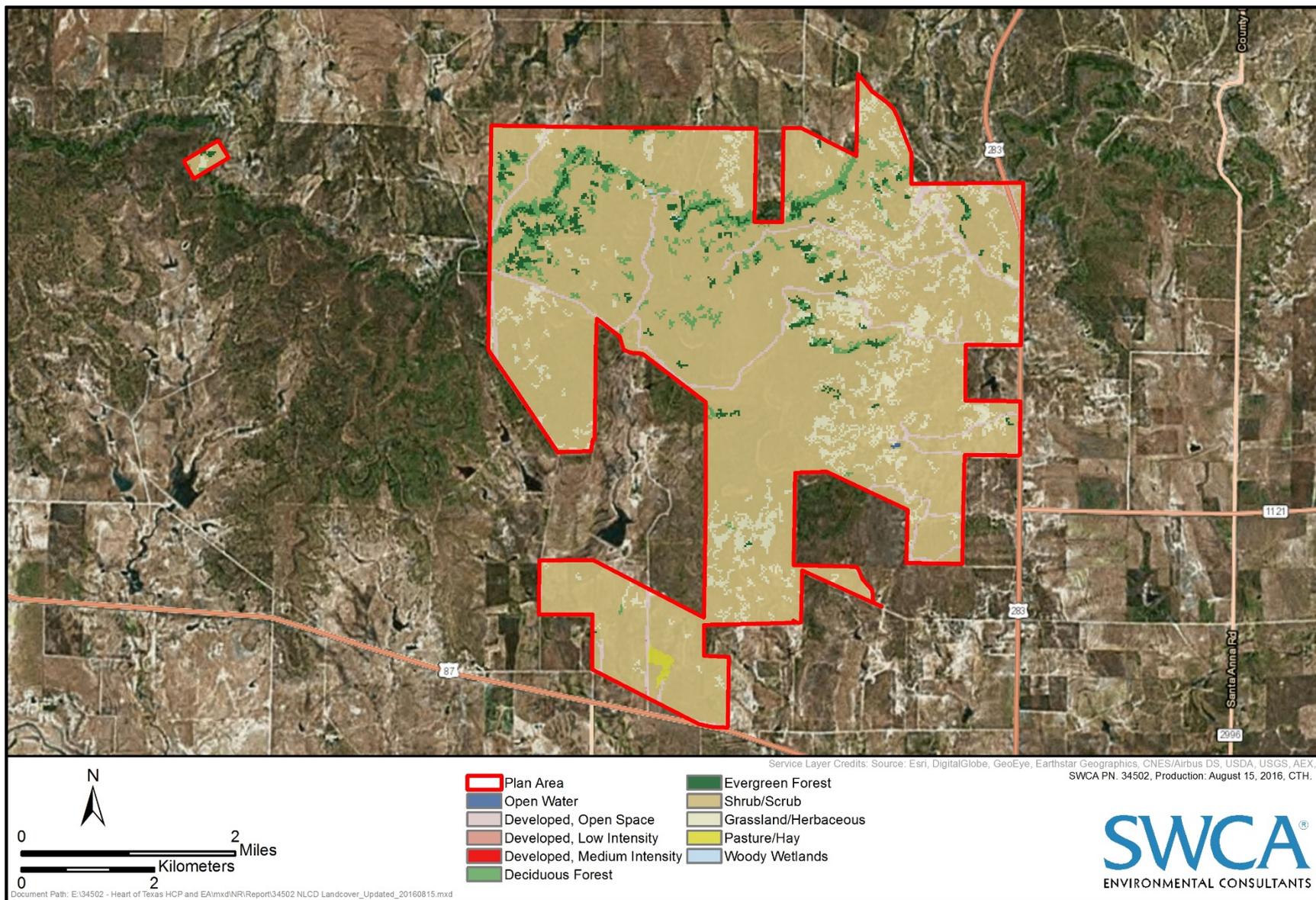


Figure 4. NLCD Land Cover Types for the Plan Area

## 3.0 SPECIES ADDRESSED BY THE HCP

### 3.1 Evaluated Species

Table 3 provides a list of species protected by the ESA or that are candidates for future protection and that may occur within McCulloch County, Texas (Texas Parks and Wildlife Department [TPWD] 2015; USFWS 2015a). The Applicant evaluated the habitat requirements and known distributions of each of these species and assessed their likelihood of occurrence within the Plan Area.

**Table 3.** Federal Special Status Species Occurring in McCulloch County, Texas

Species Name	Listing Status*	Habitat Characteristics	Occurrence in Plan Area
<b>Birds</b>			
Black-capped Vireo ( <i>Vireo atricapilla</i> )	FE	Rocky limestone areas with shrub vegetation reaching to ground level. Often combined with open, sparse tree canopy (Campbell 2003)	Known – See Section 3.2
Golden-cheeked Warbler ( <i>Setophaga chrysoparia</i> )	FE	Closed-canopy juniper-oak woodlands (Texas Parks and Wildlife Department [TPWD] 2015)	None – Vegetation requirements are not met on the Plan Area. Avian surveys and habitat assessments did not detect the presence of this species (Bio-West 2015; West, Inc. 2015a).
Interior Least Tern ( <i>Sterna antillarum athalassos</i> )	FE	Sand and gravel bars within braided streams (TPWD 2015)	None – Plan Area lacks necessary habitat to support the species.
Piping Plover ( <i>Charadrius melodus</i> )	FE	Wintering and migratory habitat includes beaches, tidal sandflats, mudflats, algal mats, washover passes, and small dunes (USFWS 2009)	None – Plan Area does not include necessary migratory habitats
Red Knot ( <i>Calidris canutus rufa</i> )	FT	Coastal marine and estuarine with large areas of intertidal sediments (USFWS 2013a)	None – Migratory habitat not available within Plan Area
Sprague's Pipit ( <i>Anthus spragueii</i> )	Not Warranted (81 FR 19527)	Migratory habitat assumed to include pastures, fallow cropland, and heavily grazed prairies (TPWD 2015)	Likely – Plan Area includes migratory habitat and the species has been recorded in McCulloch County
Whooping Crane ( <i>Grus Americana</i> )	FE	Utilize wetlands for roosting grounds and croplands for nearby feeding ground, typically within 1 kilometer (Canadian Wildlife Service and USFWS 2007)	Highly Unlikely – Plan Area lacks typical migratory stop-over habitat of wetlands and croplands and is outside migratory corridor. At least one large off-site pond occurs less than 1 km from the boundary of the Plan Area; however, none of the ponds is closer than 2 km from any of the actual impact areas within the Plan Area.
<b>Mammals</b>			
Gray Wolf ( <i>Canis lupus</i> )	FE	Formerly known in forests, brushlands, and grasslands (TPWD 2015)	None – extirpated from Texas
Red Wolf ( <i>Canis rufus</i> )	FE	Formerly found in brushy and forested areas (TPWD 2015)	None - extirpated from Texas
<b>Aquatic Invertebrates</b>			
Smooth Pimpleback ( <i>Quadrula houstonensis</i> )	C	Small to moderate streams and rivers with mixed mud, sand, and fine gravel substrate (TPWD 2015)	None - Plan Area lacks aquatic habitat

Species Name	Listing Status*	Habitat Characteristics	Occurrence in Plan Area
Texas Fatmucket ( <i>Lampsilis bracteata</i> )	C	Streams and rivers with sand, mud, and gravel substrates (TPWD 2015)	None - Plan Area lacks aquatic habitat
Texas Fawnsfoot ( <i>Truncilla macrodon</i> )	C	Short stream reaches of the Colorado and Brazos River Basins (USFWS 2012)	None - Plan Area lacks aquatic habitat
Texas Pimpleback ( <i>Quadrula petrina</i> )	C	Mud, gravel, and sand substrates with slow flow rates (TPWD 2015)	None - Plan Area lacks aquatic habitat

\* FE=Federally Endangered; FT=Federally Threatened; C=Federal Candidate for Listing (USFWS 2015a). Updated with the publication of a 12-month Finding that listing of the Sprague's pipit is not warranted (81 Federal Register [FR] 19527).

Except for the BCVI and Sprague's pipit, the Plan Area generally lacks suitable habitat for the species in Table 3 and their occurrence in the Plan Area is not expected. The Sprague's pipit may utilize the Plan Area as a stopover during migration; however, this species is not listed as threatened or endangered and the Applicant is not seeking incidental take coverage for this species at this time. Additionally, no Sprague's pipits have been observed within the Plan Area.

## 3.2 Covered Species: Black-capped Vireo

The USFWS listed the BCVI as an endangered species in 1987 due to loss of habitat and nest parasitism by the brown-headed cowbird (*Molothrus ater*) (USFWS 1987). The USFWS has not designated critical habitat for this species. The USFWS's mitigation guidance for the BCVI places the Plan Area within the BCVI Central Recovery Region (USFWS 2013b). In 2013, the USFWS (2013c) reported that the status of the BCVI merits downlisting the species from endangered to threatened, but the USFWS has yet to publish a proposed rule to implement this recommendation.

### 3.2.1 Life History

BCVI are small insectivorous songbirds that arrive in Texas between mid-March and mid-April to establish breeding territories (USFWS 2007). Migration to their wintering grounds, located along the Pacific slopes of Mexico, occurs in September (USFWS 1991). For the purposes of this HCP, the BCVI breeding season is defined as March 15 through August 31 (USFWS 2013b).

Males establish territories ranging in size from 1 to 10 acres, with an average size of 2 to 4 acres (Campbell 2003; Graber 1957). BCVI territories tend to be clustered within suitable habitat (USFWS 1991). A positive relationship between cluster size, survivorship, and reproductive success has been found (USFWS 1991). However, the clustering behavior of BCVI can cause areas of suitable habitat to be unoccupied due to individuals remaining in close to proximity to one another and not utilizing the habitat in its entirety (McFarland et al. 2013). Conspecific attraction is thought to cause much of this clustering behavior, though the quality and vegetation structure of a habitat could also affect distribution (McFarland et al. 2013). Site fidelity is also common among BCVI, as the birds will return to the same site year after year, or another close by (Campbell 2003). Individual BCVIs in smaller clusters of birds tend to disperse to other sites more frequently (Graber 1957; USFWS 1991).

Threats to the BCVI include low reproductive success, loss of habitat, and grazing by wild and domestic herbivores (USFWS 2007). Brown-headed cowbirds are the main nest predator of BCVI nests, responsible for much of the low reproductive success witnessed in some populations of the species (Smith et al. 2012). Although brown-headed cowbird populations have decreased in recent years, they still pose a major threat to nesting BCVI (USFWS 2007). The threat of red-imported fire ants (*Solenopsis invicta*) (RIFA) as a nest predator on BCVI populations is on the increase (USFWS 2007).

### 3.2.2 Habitat

Patches of low, scrubby shrubs and deciduous trees of irregular height typify the breeding habitat of BCVI (McFarland et al. 2013). Breeding habitat is variable in vegetation and structure across the breeding range of the BCVI, but often has a distinctive patchy structure (USFWS 2007). Generally, the deciduous scrubs extend from the ground to about 10 feet off the ground with 30% to 60% coverage over the total area. Though highly variable, common vegetation within Texas BCVI habitat includes shin oak (*Quercus sinuata*), Texas oak (*Quercus buckleyi*), sumac (*Rhus* spp.), and other deciduous shrub and tree species (Campbell 2003). BCVI also use dense foliage areas around widely spaced clusters of tall trees in open woodlands and woodland edge habitat with taller canopy heights (Maresh 2005). Geology and soils can greatly influence BCVI habitat. Eroded gullies, shallow soils, or rocky substrates appear to support appropriate vegetation communities for BCVI (USFWS 1991). BCVI habitat in Texas is often found on limestone soils of the Edwards Plateau, Eastern Trans-Pecos, or through the Cross Timber and Prairies (USFWS 2013b).

BCVI generally occupy early successional vegetation types within the eastern portion of its range, which is maintained through fire or moderate grazing activities (Wilkins et al. 2006). In the western portion of the BCVI range, suitable habitat structure tends to be a mature stage and maintained by the abiotic characteristics of the area (Farquhar and Gonzalez 2005).

Bio-West (2015, 2016a) completed a habitat assessment of the Plan Area and found approximately 3,843 acres of the Plan Area to be suitable BCVI habitat (Figure 5). As described by Bio-West (2015, 2016a), suitable BCVI habitat within the Plan Area consists of dense under- and mid-story vegetation composed primarily of shin oak along ridgelines and slopes. The remaining 6,919 acres of the Plan Area are not suitable BCVI habitat, as much of this land is devoid of under- and mid-story vegetation (Bio-West 2015, 2016a). SWCA identified shin oak, redbud (*Cercis canadensis*), and sumacs as the most common shrubs within the Plan Area (P. Sunby, SWCA, pers. obs.).

### 3.2.3 Abundance and Distribution

Wilkins et al. (2006) estimates the range-wide BCVI population to include 6,269 males. The counties comprising the BCVI Central Recovery Region (USFWS 2013b) were estimated to contain 288 BCVI males (Wilkins et al. 2006). Wilkins et al. (2006) reports only one documented BCVI male within McCulloch County, Texas.

Bio-West conducted a presence/absence survey for the BCVI, following USFWS protocols (USFWS 2010), across approximately 1,840 acres of the Plan Area during the 2016 breeding season. The survey area covered most areas of suitable BCVI habitat within 900 feet of the proposed Project layout. Areas of suitable BCVI habitat within the Plan Area not covered by the presence/absence survey are considered occupied for the purposes of this HCP. Over the course of the presence/absence survey, Bio-West recorded 1,126 detections of BCVIs within the survey area that Bio-West believes to be associated with approximately 146 individual BCVI territories (Figure 5) (Bio-West 2016b). Based on coordination with the USFWS and in consideration of the BCVI survey data, this HCP assumes that all suitable BCVI habitat within the Plan Area is occupied by the species unless additional data becomes available to refine this assessment which would require and approval by the USFWS.

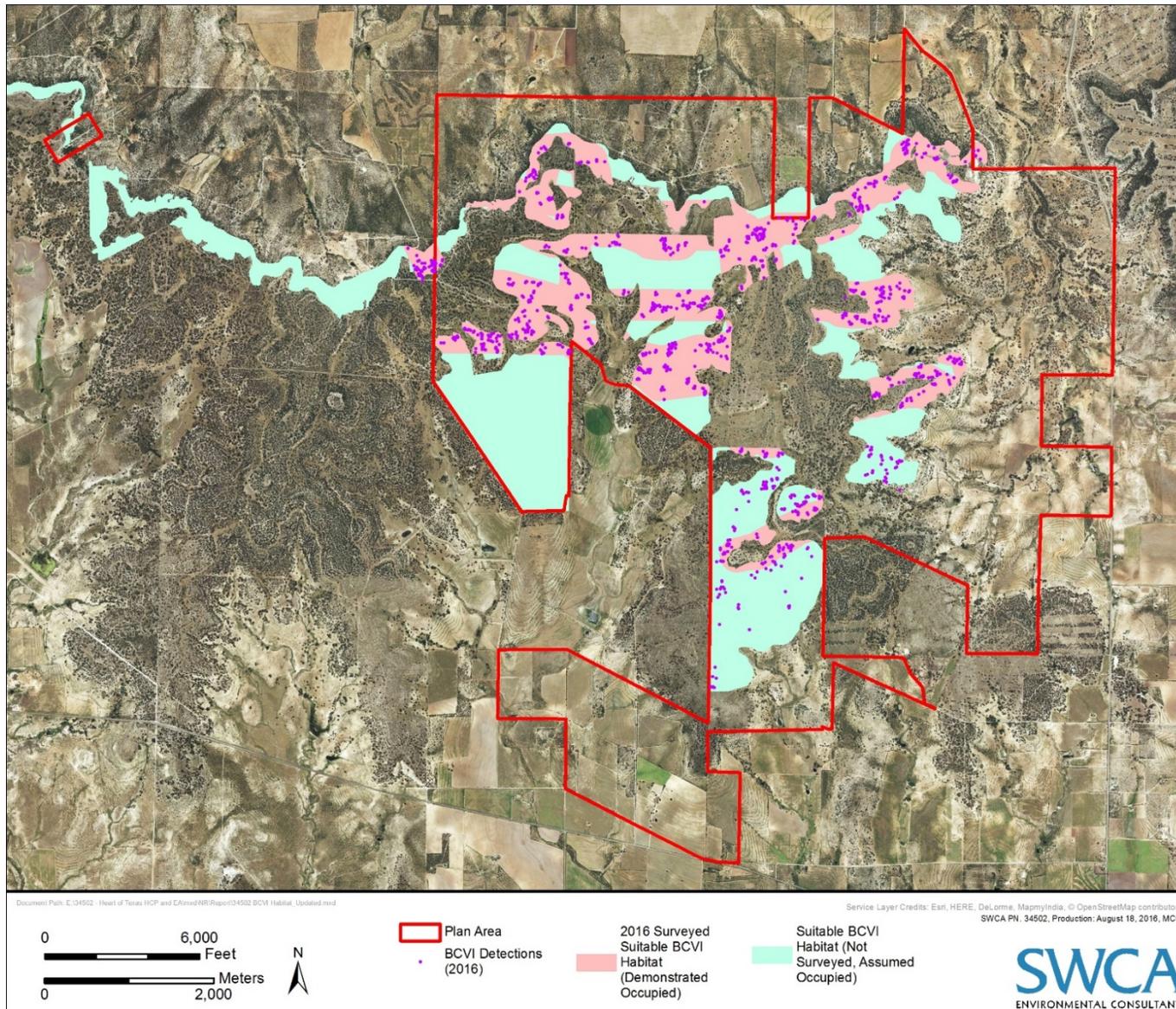


Figure 5. Suitable Black-capped Vireo Habitat within the Plan Area.

## 4.0 COVERED ACTIVITIES AND PERMIT TERM

The “Covered Activities” for this HCP are those activities related to the construction, operation, maintenance, and decommissioning of the proposed Project that may cause take of BCVI. Details and the total acreage of Project construction, operation, maintenance and decommissioning that may cause take of BCVI are described in Section 5 below. Construction, operation, maintenance, and decommissioning activities that are not reasonably certain to cause take of BCVI are not included in the impact summary set forth in Section 5.1.3 and are not included as Covered Activities. Covered Activities also include activities related to the beneficial management and monitoring actions associated with any permittee-responsible conservation lands for the BCVI established as mitigation under this HCP. These Covered Activities include, but may not be limited to: the removal or modification of vegetation; installation and removal of wind turbines and pads; construction of new access roads; upgrade or improvement of existing access roads; installation and removal of collection lines; construction and removal of substations and similar structures; operation and maintenance of the project (including emergency repairs and responses); restoration of soils and vegetation in disturbed areas; and beneficial management and monitoring activities within permittee-responsible conservation lands, if applicable.

The Applicant anticipates implementing the Covered Activities during the first non-breeding season following issuance of the ITP and to continue to implement Covered Activities for a duration of 30 years. Therefore, the Applicant seeks an ITP with a term of 30 years from the date of issuance. It is possible, but not certain, that the Applicant would decommission the Project, remove their facilities, and restore disturbed areas within this duration. If the Applicant has a need to continue Covered Activities for a longer period, the Applicant may request an extension of the ITP term.

If a 10(a)(1)(A) scientific research and recovery permit has been issued for activities that may be needed to manage any permittee-responsible conservation lands established under this HCP then duplicate coverage under the ITP associated with this HCP would not be needed. These management and monitoring activities are beneficial in the long-term to the BCVI although take coverage may be needed in the short-term to complete these activities on conservation lands and, as described in Section 6.3.1, will be consistent with USFWS guidance for the conservation of this species. USFWS guidance for the conservation of the BCVI recommends the following types of management and monitoring activities on conservation lands: managing woody vegetation, controlling deer and exotic game animal populations, controlling brown-headed cowbirds and red-imported fire ants, grazing management, presence/absence surveys, and nest monitoring (USFWS 2013b).

## 5.0 IMPACTS AND TAKE

The Covered Activities will have direct and indirect impacts on the BCVI, affecting either individual birds or habitat, or both. Generally, direct impacts are those that occur at the same time and place as the Covered Activities, while indirect impacts occur later in time or at a distance removed from the Covered Activities. The Covered Activities may directly impact BCVI via habitat loss or collisions with vehicles or facilities. Indirect impacts may occur via habitat modification and fragmentation or noise and activity disturbances. Some of the potential impacts may be long-term, while others are expected to have only a short-term influence on the BCVI. The magnitude of the potential impacts on the BCVI will also vary based on the timing or duration of the activity in relation to the seasonal presence or overall distribution of the BCVI in areas of suitable habitat. The discussion in Section 5.1 evaluates the potential for the Covered Activities to impact the BCVI.

The impacts of the Covered Activities may rise to the level of take, as defined by the ESA and its implementing regulations, via killing, wounding, harassing, or harming BCVI within the Plan Area. It is not possible given the circumstances of the Covered Activities and the ecology of the BCVI to precisely estimate the number of individual BCVIs that may be taken as a result of the Covered Activities. Therefore, Section 5.2 proposes the use of a surrogate measure (acres of suitable habitat subject to direct or indirect impacts) to estimate the amount and extent of incidental take.

Finally, Section 5.3 assesses the impacts of the taking on the status of the BCVI at local, regional, and range wide scales. This assessment provides the basis for establishing a biologically appropriate amount of conservation necessary to minimize and mitigate for the impacts of the taking to the maximum extent practicable.

## 5.1 Potential Impacts

### 5.1.1 Direct Impacts

#### 5.1.1.1 HABITAT REMOVAL

The Covered Activities will remove approximately 122.39 acres of suitable BCVI habitat from the Plan Area during the construction phase of the Project when the Applicant clears vegetation for new or expanded access roads, MV collection cables, turbine pads, and the substation and Gen-tie Line. Some of the vegetation clearing is only needed to facilitate the initial construction of the Project, and the Applicant would accomplish this clearing with a Hydro-Ax or similar machine that causes minimal damage to root systems. The Applicant will restore approximately 91.86 acres of this cleared habitat following initial construction activities and allow suitable BCVI habitat to regrow (see Section 6.2). Therefore, much of the anticipated loss of suitable BCVI habitat will be short-term (approximately 5 years or less). Upon decommissioning of the Project and after the removal of the Project facilities, the Applicant will restore the remainder of the cleared areas and will allow suitable BCVI habitat to regrow. As such, while some of the habitat loss would be long-term, the Applicant does not expect that any habitat loss within the Plan Area will be permanent. Figure 6 illustrates what types of areas are anticipated to experience long-term and short-term habitat losses.

Disturbance of vegetation can be beneficial to BCVI habitat quality. A study by Reemts and Cimprich (2014) found mechanical vegetation removal to be useful when restoring BCVI habitat. Breeding pairs of BCVI were found to be twice as abundant in areas that were affected by mechanical mastication than prior to mastication (Reemts and Cimprich 2014). Much of the habitat present for the BCVI in central Texas is regrowth from disturbances such as fire, browsing, and clearing, consistent with activities that may temporarily disturb vegetation within the Plan Area (USFWS 2013b). The clearing of woody vegetation from temporarily disturbed areas using the prescribed method also is in accordance with TPWD guidelines for the management of BCVI habitat (Campbell 2003). For these reasons, it is expected that BCVI habitat will re-develop in temporarily disturbed areas within a few years and, as identified in Section 6.3, compensatory mitigation for short-term habitat loss is offered at a different rate than is mitigation for long-term habitat loss.

The Applicant would remove this habitat when BCVI are not expected to be present in their Texas breeding grounds (see Section 6.2). For the purposes of this HCP, that period of time is defined as September 1 through March 14. Exception to this seasonal clearing restriction would be made only: 1) after breeding season presence/absence surveys for the BCVI performed in accordance USFWS protocols were to show that BCVI do not occur within 300 feet of the area desired to be cleared, and 2) in the event of an emergency situation to repair or protect the Project facilities. When BCVI are not present, clearing of suitable BCVI habitat related to the Covered Activities would not be capable of causing take

by directly killing or wounding adult or young BCVI or destroying active BCVI nests or eggs. It is possible that habitat removal when the species is not present could cause take through harm; although, this outcome is not certain and depends on the specific circumstances of the activity at the time it is conducted.

If an emergency situation were to demand removal of suitable BCVI habitat during the breeding season, the Applicant will not remove that habitat without first having a permitted biologist search for, and verify absence of, active BCVI nests in that habitat, unless the severity of the emergency did not permit such a search to be conducted. The need to clear suitable BCVI habitat in the breeding season as a result of an emergency without completion of these searches or if such searches demonstrate the presence of one or more active BCVI nests in the area to be cleared is treated as a Changed Circumstance (see Section 8.1.5). The Applicant anticipates that most emergency situations within the Plan Area could be addressed through the use of already cleared areas, rather than require the immediate clearing of any previously undisturbed suitable BCVI habitat. See Section 8.1 (Changed Circumstances) for discussion of how the Applicant would after-the-fact address the need to have cleared BCVI habitat in an emergency situation.

### **5.1.1.2 RISK OF COLLISION**

The use of vehicles in the Plan Area during both the construction and operational phases of the Project creates a theoretical seasonal potential for BCVI to suffer vehicle collision mortality as a result of the Covered Activities. Any such mortality would be a taking via killing or wounding the individual BCVI. Plan Area speed limits within those portions of the Plan Area that contain suitable BCVI habitat would be set at 20 miles per hour (see Section 6.2) during the BCVI breeding season (March 15 through August 31). Adherence to this speed limit is expected to minimize the possibility of any individual BCVI suffering death or injury as a result of collision with Project-related vehicles (Forman and Alexander 1998). Therefore, the use of motorized vehicles while performing the Covered Activities are not expected to cause collision-related direct impacts to BCVI.

It is also possible that individual BCVIs could collide with spinning turbines and, if this circumstance occurred, would cause take. However, the Applicant is not aware of any published records of wind turbines striking BCVI and believes that the risk of any such collision is extremely low. The rationale for this conclusion is presented in Appendix A.

### **5.1.2 Indirect Impacts**

The clearing of woody vegetation and construction of wind energy facilities can cause changes to the environment, and these changes require examination with regard to their potential to harm or harass BCVI. Indirect impacts are generally related to harassment, which may occur over the life of the project. The development of the property presents stressors not previously present that may result in nest abandonment, increase in cowbird presence, changes in territory size, changes in foraging behavior, etc. that may rise to the level of take. Changes to the environment that can be caused by clearing of woody vegetation and construction of a wind energy facility as proposed include: 1) habitat fragmentation and reduction in habitat patch sizes; 2) creation of habitat edges; 3) introduction of noise and human activity; and 4) introduction of shadow flicker. In general, the USFWS considers areas of suitable BCVI habitat within 300 feet of long-term direct impacts to be indirectly impacted. Applying this convention to the Covered Activities, the Applicant would indirectly impact 602.62 acres of suitable BCVI habitat (see Figure 6). How each of these changes might indirectly affect the BCVI and the magnitude of the potential impact is examined below.

### 5.1.2.1 HABITAT FRAGMENTATION

The removal of suitable BCVI habitat in the construction phase would fragment some of the remaining habitat and reduce habitat patch sizes. Fragmentation is of greatest concern when a barrier is created that deters movement between the remaining habitat patches. Barriers to movement can prevent or slow rates of gene flow between individuals of a species, and put a population of a species restricted to an isolated patch of habitat, if sufficiently small, at greater risk of extinction. In some cases, this barrier is distance. In other cases, the barrier may not be distance so much as an intervening stretch of inhospitable habitat that a particular species is unwilling to cross, or is incapable of crossing.

The clearing of vegetation at the width needed to construct a road does not create a barrier to movement for highly mobile animals such as birds (Fahrig and Rytwinski 2009). Thus, it is not surprising that in a three-year study (one year of pre-construction, one year during construction, and one year of post-construction), Kosciuch et al. (2013) found that BCVI did not abandon territories in response to the clearing of vegetation for a wind energy project, but instead realigned territories along areas where vegetation had been cleared during the non-breeding season. This finding is no doubt the result of the scale of vegetation clearing needed to construct a wind energy facility. The clearing performed for construction of a wind energy facility is not wholesale across a landscape as might result from construction of a residential development. Rather, clearing for the most part occurs in linear swaths that causes the loss of a comparatively small amount of habitat in any particular location (e.g., within the home range of any individual BCVI) and leaves the majority of habitat extant on the landscape. Because roads do not provide barriers to bird movement, BCVIs can continue to interact as a local population within their habitat following the construction of a wind energy facility.

The results found by Kosciuch et al. (2013) suggest the studied habitat was not filled to absolute carrying capacity by BCVIs since no birds were displaced as the result of habitat loss. The Kosciuch et al. (2013) results appear most likely to be obtained where suitable BCVI habitat was widespread. An abundance of habitat would seem to increase the likelihood the habitat was not filled to carrying capacity. Vegetation lost to clearing would also represent a smaller percentage overall loss of habitat, thereby increasing the likelihood that the partial loss of habitat would not cause the total amount of habitat available to drop below whatever minimum threshold amount was needed to support the number of birds that occupied the habitat.

In that regard, BCVI habitat is widespread across the Plan Area (see Figure 5) and, as ascertained through review of publicly available aerial photography, also appears to exist on some neighboring properties. A total of 3,843 acres of BCVI habitat have been delineated on the Plan Area and BCVI territories typically range in size from 1 to 10 acres (USFWS 1991). This equates to a potential BCVI population of 384 to 3,843 territories for the Plan Area, if at carrying capacity. This range seems inordinately high for the BCVI in this region of Texas. Note that Wilkins et al. (2006) identified the known BCVI population in McCulloch County as one bird and Maresh (2005) identified it as two birds. While these low numbers reveal the BCVI population of the Plan Area was not known to Wilkins et al. (2006) or Maresh (2005), they also suggest that BCVIs in McCulloch County are localized in occurrence and their populations are largely removed from public roads, since occurrence in proximity to public roads provides the best opportunity for BCVI populations to become known to the public. More recently, the USFWS reports observations of 33 BCVI from McCulloch County between 2009 and 2014; although, additional information about the location and nature of these observations was not provided (Christina Williams, USFWS, pers. comm.). Approximately 146 territories have been documented on the Plan Area from surveys conducted in 2016 (Bio-West 2016b).

Consequently, based on the discussions above, the findings of Kosciuch et al. (2013), and the relative abundance of habitat in the Plan Area, habitat fragmentation resulting from the clearing of vegetation for the proposed Project is expected to be of negligible consequence to the BCVI and no members of the

species are expected to be displaced from the Plan Area as a result of the Covered Activities. Therefore no take is anticipated to occur due to habitat fragmentation.

### 5.1.2.2 CREATION OF HABITAT EDGES

The boundary between two types of habitat is known as a habitat edge. The clearing of closed-canopy woodland creates an obvious edge where the newly opened land meets the remaining stand of woodland. The creation of this type of edge introduces sunlight and wind to woodland that was previously insulated from those forces, with this often affecting the structure, microclimate, and faunal species composition of woodland newly positioned in an edge situation (Báldi 1996). New clearing in more open habitats should naturally have a less pronounced effect on vegetative structure, microclimate, and faunal assemblages since those habitats are already subjected to sun and wind to varying degree. Some researchers have reported decreased shrubland songbird abundance or nesting success near the edges of shrubland habitat (Weldon and Haddad 2005; Schlossberg and King 2008). However, the patches of shrubland habitat used in these studies were bordered by mature forest, not an open habitat such as the edge of a road, and forest animals were believed responsible for the effects noticed within the shrubland songbirds.

Cowbird nest parasitism negatively affects BCVI populations (USFWS 1991). Brittingham and Temple (1983) report that cowbird parasitism rates on forest songbirds decrease in forest interiors with increasing distance from forest edge. It is believed this is because brown-headed cowbirds largely utilize open habitats and are less apt to venture deep into a patch of forest. The findings of cowbird studies conducted in forest habitats are not applicable to the BCVI because BCVI habitat is of relatively short stature and has an open to semi-open canopy layer, causing it to be fully accessible to brown-headed cowbirds. This fact explains why the BCVI is particularly susceptible to cowbird nest parasitism.

In a study that monitored 100 BCVI nests within 164 to 3,280 feet (50–1,000 meters) of turbines, the distance from turbines (and, thus, distance from edges created by clearing for turbine pads) was found to have no effect on BCVI nest parasitism rates or productivity (Gordon et al. 2010). Kosciuch et al. (2013) also found that BCVI would nest successfully and fledge young along the edges of turbine pads. In addition to these two studies, a study on the closely related and ecologically similar white-eyed vireo (*Vireo griseus*) demonstrated nest success was unaffected by distance of nests from turbines (Bennett et al. 2014).

It is undeniable that BCVI populations have suffered as a result of cowbird parasitism. However, rather than being related to distance from cleared edges, BCVI nest parasitism rates are tied to cattle grazing intensity (Kolozsar and Horne 2000; Kostecke et al. 2003). The extent to which BCVIs in the Plan Area suffer from nest parasitism by brown-headed cowbirds is unknown. Lands within the Plan Area are used for grazing cattle, and the number of cattle present in the Plan Area in any given year is not expected to be influenced by construction of the Project. The findings of Kosciuch et al. (2013), Gordon et al. (2010), Kolozsar and Horne (2000), and Kostecke et al. (2003) provide support for determination that clearing of vegetation performed as part of the Covered Activities is not expected to cause BCVIs in the Plan Area to suffer increased rates of cowbird nest parasitism. Thus, because vegetation clearing is also not expected to result in changes in the structure or species composition of adjacent BCVI habitat because of its pre-existing open nature, the Covered Activities are not expected to take any BCVI as a result of habitat edge effects.

### 5.1.2.3 INTRODUCTION OF NOISE AND HUMAN ACTIVITY

Construction activities would introduce noises and increased levels of human activity to the Plan Area. Reduced levels of activity would be experienced during the operational phase of the Project, punctuated by periodic need to perform potentially more invasive activities such as clearing of vegetation from maintained access corridors and similar activities. Operation of the turbines would also produce noise on

a near daily basis. Noise and human activity are known to disturb some species of birds (Slabbekoorn and Ripmeester 2008).

Noise and human activity were not threats examined by Wilkins et al. (2006) in their population status and threat analysis for the BCVI prepared for the USFWS. The Applicant is unaware of any studies performed specifically to address the potential for anthropogenic noise and human activity to adversely impact BCVI. The findings of Kosciuch et al. (2013) and Gordon et al. (2010) suggest that the construction and operation of wind projects do not overtly disturb BCVI. Similar results were obtained by Hale et al. (2014), who found no evidence of displacement of breeding songbirds as a result of construction of a wind energy facility in grassland habitat.

The presence of a substantial population of BCVIs on Fort Hood, an active military base in Bell and Coryell Counties, Texas, demonstrates the species' tolerance of both noise and human activity. The species has also occurred in the past on another active military base, Camp Bullis, in Bexar County, Texas, and SWCA is aware of many examples of the species occurring directly adjacent to heavily traveled roads, including an interstate highway (P. Sunby, SWCA, pers. obs.). The potential for noise and human activity to disturb BCVIs during the operational phase of the Project is considered very low and will be further reduced by scheduling all routine maintenance activities to be performed outside of the BCVI breeding season to the maximum extent practicable (see Section 6.2). For these reasons, it is considered most likely that noise and human activity associated with construction and operation of the proposed Project will not cause any take of the BCVI over the duration of the Project.

It is impossible to conclude that noise and activity generated through performance of the Covered Activities over time would never indirectly impact the species. Indirect impacts are generally related to harassment, which may occur over the life of the project. The development of the property presents stressors not previously present that may result in nest abandonment, increase in cowbird presence, changes in territory size, changes in foraging behavior, etc. that may rise to the level of take. BCVIs are known to construct nests directly adjacent to the edges of roads (P. Sunby, SWCA, pers. obs.) and this behavior does create potential for an actively nesting bird to suffer injury from an especially invasive and persistent activity that had to be performed directly adjacent to a nest as a result of an emergency situation. While such a situation seems unlikely to arise, it also is not unforeseeable. Including coverage for indirect effects to BCVI is consistent with multiple prior HCPs including those listed in section 6.3.2.

#### **5.1.2.4 SHADOW FLICKER**

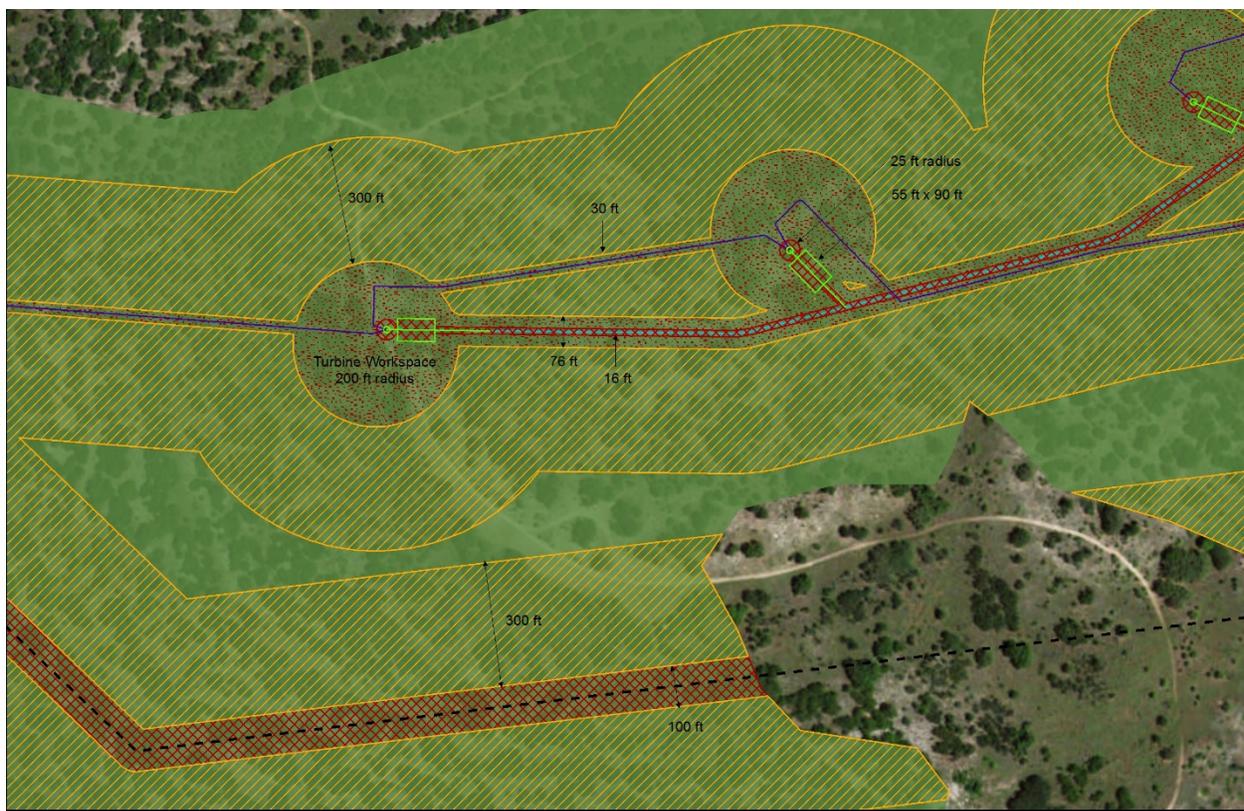
The blades of operating wind turbines would repetitively cast shadows across slices of the landscape, creating an effect known as *shadow flicker*. Lovich and Ennen (2013) identified shadow flicker as a possible source of impact on wildlife. However, the Applicant is unaware of any studies that have been performed that demonstrate shadow flicker is anything more than just a theoretical effect. The impact of shadow flicker, if any, on the BCVI is unknown. As with noise and human activity, the findings of Kosciuch et al. (2013) and Gordon et al. (2010), which involved the study of BCVIs occurring in direct proximity to wind turbines, suggest that shadow flicker is not an important concern for BCVIs. Shadow flicker is not reasonably certain to cause take of BCVI.

### **5.1.3 Impact Summary**

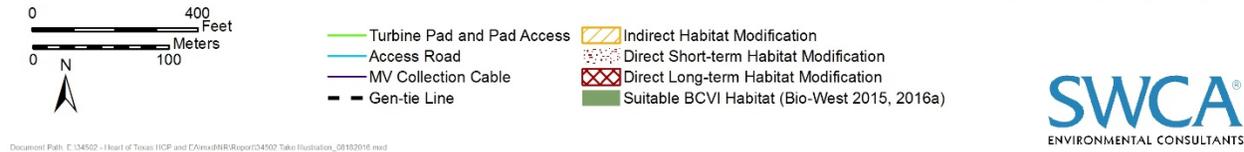
Figure 6 provides an example of how the Applicant mapped direct and indirect impacts associated with the Covered Activities. Distances are summarized in Table 4.

**Table 4.** Typical Impact Zone Dimensions

Proposed Project Impact Zones	Typical Dimensions
<b>Turbine Pads and Work Spaces</b>	200 ft radius (direct short-term modification) 25 ft radius (direct long-term modification) 55 ft x 90 ft (direct long-term modification)
<b>Access Roads</b>	76 ft wide (direct short-term modification) 16 ft wide (direct long-term modification)
<b>MV Collection Cables</b>	30 ft wide (direct short-term modification)
<b>Gen-tie Line</b>	100 ft wide (direct long-term modification)
<b>Indirect Impacts</b>	300 ft from edge of any direct modification



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, SWCA PN, 34502, Production: August 18, 2016, MCC.



**Figure 6.** Schematic of Impact Zones Applied to the Heart of Texas Wind Project.

Approximately 30.53 acres of suitable BCVI habitat would be removed as a result of Project construction and would remain lost until the Applicant decommissions the Project. Another 91.86 acres of suitable BCVI habitat would be removed during the construction phase, but restored and allowed to regrow into suitable habitat after construction is complete. It is expected, but not assured, that suitable BCVI habitat

would regrow in temporarily disturbed areas because the methods used to remove the habitat would cause minimal damage to shrub root systems.

No BCVI would be directly killed or wounded as a result of pre-construction vegetation clearing activities because of seasonal restrictions, but the potential would exist throughout the operational phase of the project for an emergency situation to arise that required the immediate cutting of BCVI habitat, regardless of season. Therefore, operation of the Project carries with it some risk of causing the destruction of active BCVI nests.

Studies performed by Kosciuch et al. (2013) and Gordon et al. (2010) suggest that the construction of wind energy facilities in proximity to BCVI habitat does not result in the displacement of birds, only the reconfiguration of territory boundaries, and does not adversely affect productivity. These studies suggest that construction of the proposed Project is not likely to cause indirect impacts to the BCVI as a result of habitat fragmentation, creation of habitat edges, introduction of noise and human activity, or shadow flicker.

At the same time, the Applicant acknowledges that the conclusions of each of these studies were based on one year of post-construction monitoring, and it is possible that longer-term studies might reveal that presence of wind energy facilities in direct proximity to BCVI habitat does ultimately significantly impair certain aspects of BCVI breeding, feeding, or sheltering behaviors. The Applicant also acknowledges that the lack of several years of comprehensive survey data from the Plan Area makes it difficult to apply with complete confidence the results of the Kosciuch et al. (2013) and Gordon et al. (2010) studies to evaluate the impacts of the Covered Activities.

To address uncertainty in what indirect effects the Covered Activities may cause and consistent with USFWS methodology used in other HCPs that cover the BCVI, the Covered Activities are considered to have potential to harm or harass BCVIs and influence the viability of suitable BCVI habitat within 300 feet of areas cleared for Project construction. For the purposes of this HCP, suitable BCVI habitat occurring within 300 feet of cleared (directly impacted) habitat is assumed to experience indirect impacts that could result in take associated with the Covered Activities.

Table 5 summarizes the acres of suitable BCVI habitat that would be subject to the direct or indirect impacts of the Covered Activities.

**Table 5.** Potential Direct and Indirect Impacts to Suitable Habitat

Impact Type	Acres of Suitable BCVI Habitat
<b>Direct Habitat Loss</b>	122.39
<i>Short-term Loss</i>	91.86
<i>Long-term Loss</i>	30.53
<b>Indirect Habitat Impact</b>	602.62
<b>TOTAL Habitat Impact</b>	<b>725.01</b>

## 5.2 Incidental Take

The Applicant seeks incidental take authorization for the BCVI for impacts to the species that are reasonably certain to result from performance of the Covered Activities. Take is most likely to be realized as harm or harassment caused by loss of habitat or use of vehicles and equipment. The avoidance and minimization measures identified in Section 6.2 are expected to prevent any BCVI from being killed or wounded by Covered Activities performed under normal circumstances. Emergency situations could necessitate the cutting of BCVI habitat during the breeding season, with such cutting then carrying the risk of causing unquantifiable direct impacts to active BCVI nests through the operational phase of the project.

Take is ideally quantified in HCPs in terms of the number of individuals of a listed species expected to be taken by a proposed activity. The USFWS recently released guidance addressing the usage of surrogate measures for quantifying the amount and extent of take in incidental take statements in cases where an exact numerical value was not available (USFWS 2015b). Use of surrogate measures was made subject to demonstration of the following conditions: 1) that it is impractical to establish the numerical number of individual animals to be taken; 2) that the proposed ecological surrogate is rationally linked to actual take of the listed species by the proposed action; and 3) that the surrogate provides measurable guidelines to determine when authorized incidental take would be exceeded (USFWS 2015b).

For this HCP, the Applicant proposes to measure take in terms of the acres of BCVI habitat directly or indirectly affected by the Covered Activities. Use of number of acres of affected habitat to quantify take meets the three conditions for use of a surrogate measure as explained below.

**Condition 1:** *It is impractical to establish the numerical number of individual animals to be taken.* The take of BCVI anticipated as a result of performance of the Covered Activities would be in response to the clearing and modification of regularly occupied habitat. A presence/absence survey conducted during the 2016 breeding season demonstrated that suitable BCVI habitat in the Plan Area is occupied by the species. However, the number of BCVIs present in the habitat proposed for clearing is expected to fluctuate naturally on an annual basis, causing the results of the 2016 survey to perhaps be unusually low or high, either of which would result in a quantification of take unequal to what should most properly be the average condition. Acquisition of survey data sufficient to establish the average number of BCVI present in areas proposed to be cleared would require several years, and waiting for the completion of such a long-term study is not practical from a business standpoint. While it is also possible for individual BCVIs to be directly killed or wounded by collisions with some components of the Covered Activities, the number of BCVI affected by any such collision (which is considered unlikely) is also not practical to determine with accuracy. Fatality monitoring, which requires significant field effort at high cost, documents only a sample of the true number of fatalities; mathematical adjustments to raw count data for detectability result in only an statistical estimate of the number of animals taken. For these reasons, it is impractical to establish an accurate accounting of the number of BCVIs that would be taken by the Covered Activities.

**Condition 2:** *The proposed ecological surrogate is rationally linked to actual take of the listed species by the proposed action.* As indicated, the Applicant is proposing to use the total number of acres of suitable BCVI habitat impacted by the Covered Activities as a surrogate for enumeration of the number of BCVIs taken. The likelihood of BCVI being present in the Plan Area during the Covered Activities is related to the presence of suitable breeding/nesting habitat, such that the species is unlikely to occur in the Plan Area if its nesting habitat is not present. The take of BCVI is expected to occur in response to the clearing and modification of regularly occupied habitat. The clearing of habitat may cause the displacement of many of the BCVIs that previously occupied that habitat (some BCVI, if their territories are only affected slightly by the clearing, may not be displaced), and this displacement may cause intra-

specific competition and deleterious changes in BCVI productivity. The number of BCVI that the Covered Activities may displace is expected to be directly proportional to the amount of habitat cleared. Thus, the use of acres of habitat impacted is directly and rationally linked to the take that would result from the Covered Activities.

**Condition 3:** *The surrogate provides measurable guidelines to determine when authorized incidental take would be exceeded.* The surrogate proposed for use is the number of acres of habitat that the Covered Activities would impact. Habitat occurring in the Plan Area has been delineated, and the amount of habitat directly impacted by the proposed Project will be able to be measured precisely upon completion of construction activities through desktop use of ArcGIS software and digital aerial photography and/or Global Positioning System (GPS) survey data. The amount of habitat indirectly impacted will also be measured in this same fashion by applying the same methods used in this HCP for quantification of indirect habitat impacts. The authorized level of take would also be provided in terms of acres of habitat, and so the proposed surrogate provides a precise method for determining if the authorized level of take is exceeded.

Based on the above, the use in this HCP of the number of acres of habitat predicted to be directly and indirectly impacted as a surrogate for identification of the number of BCVIs predicted to be taken as a result of the Covered Activities meets the conditions set forth by the USFWS (USFWS 2015b), and provides the most practical means of quantifying the impact of the Covered Activities on the BCVI.

A total of approximately 725.01 acres of BCVI habitat is anticipated to be directly or indirectly impacted by construction and operation of the proposed Project. The Applicant requests incidental take authorization of the BCVI in an amount equal to the loss or modification of 725.01 acres of suitable BCVI habitat within the Plan Area. The Applicant is requesting an ITP with a duration of 30 years.

### 5.3 Impacts of the Requested Taking

The Applicant concludes that anticipated impacts of the proposed incidental taking of BCVI would be relatively minor in respect to the status of the species in a local, regional, or range-wide context. The rationale behind this decision is based on: 1) confinement of proposed vegetation clearing activities to non-breeding season when BCVI are absent from the Plan Area, thereby avoiding take of individuals; 2) an expected small number of BCVIs likely to be affected by loss or modification of BCVI habitat within the Plan Area based on the findings of Kosciuch et al. (2013); and 3) siting and micrositing for placement of infrastructures, transmission lines, and roads outside of BCVI habitat.

The USFWS in 2004 identified McCulloch County as containing 62,717 acres of potential BCVI habitat (USFWS 2004). The amount of habitat that the proposed Project would impact totals 725.01 acres. This represents approximately 1% of potential BCVI habitat considered to be present in McCulloch County as of 2004. Not only is this impact a small amount compared to all potentially suitable habitat available in the county, it is not expected to significantly alter the distribution or behavior of BCVI given the findings of Kosciuch et al. (2013).

The portion of McCulloch County containing the Plan Area is located within the “BCVI Central” Recovery Region (USFWS 2013b). Wilkins et al. (2006) reported that the counties comprising the BCVI Central Recovery Region were known to contain at least 288 male BCVIs, including the one or two birds known from McCulloch County. The BCVI surveys conducted in 2016 to support this HCP documented another 146 possible BCVI territories in this region, bringing the total to more than 434 males. Approximately 74 possible BCVI territories identified in 2016 (Bio-West 2016b) intersect with the direct or indirect impact areas of the Proposed Project, representing 17% of the total documented population in the BCVI Central Recovery Region. However, Kosciuch et al. (2013) found BCVIs responded to clearing

for construction of a wind energy facility by re-configuring territory boundaries and without displacement of individuals. Accordingly, construction and operation of the proposed Project is not expected to preclude recovery of the species.

## 6.0 CONSERVATION PROGRAM

Applicants seeking an incidental take permit must demonstrate that they will “minimize and mitigate the impacts of the taking to the maximum extent practicable” (16 USC 1539). The USFWS uses two criteria when determining whether an applicant has met this statutory issuance criteria: “adequacy of the minimization and mitigation program, and whether it is the maximum that can be practically implemented by the applicant” (USFWS and NMFS 1996). The USFWS also acknowledges that “mitigation programs should be based on sound biological rationale; they should also be predictable and commensurate with the impacts they address” (USFWS and NMFS 1996).

### 6.1 Biological Goals and Objectives

The biological goals and objectives of this HCP are to 1) minimize the amount of incidental take by micro-siting wind turbines and other infrastructure outside of suitable BCVI habitat, where practical; 2) minimize the impacts of anticipated incidental take by implementing a variety of on-site conservation measures; and 3) mitigate for any remaining impacts of the taking by permanently conserving BCVI habitat in an amount that considers the relative magnitude of the impacts to the species.

To accomplish these goals and objectives, the Applicant proposes to implement the conservation measures described in the following sections.

### 6.2 Avoidance and Minimization Measures

When the continued existence of the species is not at issue (i.e., no “jeopardy”), the ESA does not require ITP applicants to avoid take to obtain authorization under ESA Section 10(a)(1)(B). Rather, an Applicant is required only to minimize and mitigate the impacts of their taking to the maximum extent practicable. Nevertheless, the Applicant voluntarily reduced the amount of take associated with the Covered Activities by micro-siting the locations of wind turbines and other infrastructure so that the proposed Project would impact as little suitable BCVI habitat as practicable. Reducing the amount of take reduces the impact to the species.

The Applicant will also implement the following measures to further minimize impact to the species:

- Observe seasonal clearing restrictions, except in emergency situations, in areas of suitable BCVI habitat so that habitat is only removed during the non-breeding season between September 1 and March 14,
- Initiate all clearing between September 1 and March 1 to minimize potential harassment of BCVI that may return early,
- Observe speed limits of 20 miles per hour (mph) in areas of suitable BCVI habitat during the BCVI breeding season between March 15 and August 31.
- Allow BCVI habitat removed during construction to regrow where further vegetation or ground disturbance during operation of the facility is not necessary.
- Restrict non-emergency maintenance and repair activities in or adjacent to BCVI habitat that involve heavy equipment or large vehicles to the non-breeding season between September 1 and March 14.

- Train project-related personnel prior to their start of work in the Plan Area to be aware of and properly implement HCP-required restrictions and other conservation measures.

The following sections detail these avoidance and minimization measures and their anticipated conservation benefits.

### **6.2.1 Micrositing**

To the extent practicable, the Applicant microsited the locations of wind turbines and other project-related infrastructure to avoid impacts to suitable BCVI habitat, thereby reducing the amount of anticipated incidental take. Section 10 discusses the alternative site designs considered by the Applicant. Compared to the Maximum Build Alternative, the Applicant reduced the amount of anticipated incidental take by 95 acres.

### **6.2.2 Seasonal Clearing Restrictions**

Construction of the proposed Project will remove 122.39 acres of suitable BCVI habitat. However, except under emergency circumstances, the Applicant will limit clearing activities to times of the year when BCVI are not present in the habitat (i.e., during the non-breeding season). For the purpose of this HCP, the non-breeding season for the BCVI is defined between September 1 and March 14, based on the breeding phenology of the BCVI described by Grzybowski (1995). Observing this seasonal clearing restriction means that the likelihood of directly killing or wounding an individual BCVI is greatly minimized during conduct of the Covered Activities, because the species will not be present in vegetation as it is removed. Initiating all clearing between September 1 and March 1 will further minimize potential harassment of BCVI that may return early.

The Applicant will conduct some Covered Activities during the BCVI breeding season when the species may be present in the Plan Area. BCVI are known to utilize suitable habitat immediately adjacent to roads, particularly narrow and infrequently traveled ranch roads (Cimprich and Kostecke 2006). Therefore, the Applicant will establish a seasonal speed limit of 20 mph for all Project-related personnel using portions of private access roads within the Plan Area with suitable BCVI habitat. This 20 mph speed limit will be in effect during the BCVI breeding season between March 15 and August 31. The Applicant will place signage along private access roads to alert personnel of the restriction. The Applicant expects that the seasonal 20 mph speed limit will reduce the likelihood of killing or wounding a BCVI by way of collision with a vehicle (Forman and Alexander 1998).

### **6.2.3 Post-construction Habitat Restoration**

The Applicant does not require that all areas of suitable BCVI habitat that are cleared during the construction phase of the proposed Project remain clear after construction is complete. The Applicant will allow approximately 91.86 acres of temporarily removed BCVI habitat to regrow following construction of the facility. The Applicant uses industry standard best practices for restoring disturbed vegetation and soils after construction, including:

- removing temporary structures and materials, such as site trailers, pad base, and underground cables;
- ripping soils compacted by vehicles and equipment with a grader and tractor;
- replacing stored top soils onto de-compacted areas;

- broadcast seeding, hydromulching, or drill seeding (as appropriate based on soil type) grasses over restoration areas;
- follow up inspections to confirm compliance with restoration specifications, that typically include 70% seed growth after 2 weeks; and
- punch-list rework to address any areas that do not meet specification.

By stabilizing soils and promoting the growth of native grasses and forbs on temporarily disturbed areas, the Applicant will facilitate the natural regeneration of the woody plants that provides the structural component of suitable BCVI habitat.

Following guidance published by the Texas A&M University AgriLife Extension Service (Brown 2014), the Applicant will treat RIFA mounds within the BCVI habitat restoration areas as these insects are known nest predators of BCVI (USFWS 2007). On a quarterly basis for one year following construction, the Applicant will treat individual RIFA mounds with a selective fire ant bait insecticide that is labeled for use in agricultural sites. After this period, the Applicant expects that grasses should be well enough established to discourage invasion or proliferation of RIFA in restored areas.

This method of BCVI habitat restoration is consistent with the guidelines for BCVI habitat management described by the USFWS (2013b). The USFWS recommends that BCVI conservation providers remove (by prescribed fire or mechanical manipulation during the non-breeding season) trees and shrubs on a 2- to 5-year interval, remove the mulch or slash, and allow the woody vegetation to regrow. The USFWS (2013b) also recommends that BCVI conservation providers control RIFA populations. The BCVI habitat restoration measures proposed by the Applicant are substantially similar to these recommended management activities and the Applicant expects that implementation will provide similar conservation benefit and minimize the impacts of short-term habitat loss.

#### ***6.2.4 Seasonal Restrictions on Non-emergency Maintenance and Repair***

The Applicant will restrict non-emergency maintenance and repair activities that involve heavy equipment or large vehicles (such as road improvements, ROW maintenance, or replacement of damaged equipment) to the non-breeding season between September 1 and March 14. This measure only applies to relevant activities that occur within 300 feet of suitable BCVI habitat. The Applicant may lift this restriction if it demonstrates that BCVI do not use suitable habitat within 300 feet of the limits of the planned activity. This would have to be demonstrated with a presence/absence survey conducted in accordance with USFWS protocols during the same BCVI breeding season as the planned activity. Three hundred feet is the standard distance to which the USFWS believes indirect or off-site impacts may affect the BCVI. This measure minimizes the amount and/or intensity of possible harassment of BCVI from noise or activity disturbances during operation of the proposed project by only conducting non-emergency maintenance and repair activities when and where the BCVI is not present.

#### ***6.2.5 Contractor Training***

The Applicant will train all staff and contractors that either work in the Plan Area or that manage work within the Plan Area to be aware of and properly implement the conservation measures described herein. The Applicant will prepare a training packet for the proposed Project that describes the basic identification and biology of the BCVI, the regulatory status of the BCVI and requirements of the ESA, and the on-site conservation measures described herein (i.e., seasonal clearing restrictions, seasonal speed limits, habitat restoration, and seasonal restrictions on non-emergency maintenance and repair). The

Applicant will provide USFWS an opportunity to review and comment on the training materials prior to use.

The Applicant will deliver the training packet (in hard copy and as a presentation) to all project managers and on-site staff or contractors as soon as practicable prior to the start of construction, and will provide supplemental training as needed to any additional staff or contractors that will work in or direct work in the Plan Area. Training will occur as necessary over the duration of the Covered Activities to orient new personnel to the HCP prior to their start of work in the Plan Area.

## **6.3 Mitigation Measures**

### **6.3.1 Permanent Conservation**

The Applicant will provide permanent conservation for the BCVI to mitigate for the impacts of the proposed incidental take. The amount of permanent conservation is determined by multiplying the amount of suitable habitat acres impacted by the mitigation ratios in Table 5. Mitigation will be in a form consistent with USFWS guidelines for the establishment, management, and operation of BCVI mitigation lands (USFWS 2013b). In general, mitigation will occur in areas of suitable BCVI habitat with demonstrated occupancy that are permanently protected from land uses or activities not compatible with the conservation of the species (at least to the extent that the ability to restrict such uses is within the control of the mitigation provider, e.g., mitigation lands could still be subject to eminent domain or severed land rights). Mitigation lands will be managed to minimize or alleviate other threats and regularly monitored to support adaptive management practices. The delivery of mitigation by the Applicant will involve one or more of the following options, as described by the USFWS (2013b): permittee-responsible mitigation lands, conservation banks, or third party mitigation lands. The Applicant may choose to use one or more of these options to satisfy its mitigation obligations, subject to USFWS approval. The Applicant will implement the required mitigation prior to implementing the Covered Activities.

If the Applicant opts to implement its own permittee-responsible mitigation or work with a third party to implement a specific conservation transaction, the Applicant will coordinate with USFWS to provide the necessary documentation, real estate assurances, and financial assurances specified in the USFWS mitigation guidance (USFWS 2013b) that are necessary to secure USFWS approval for the establishment of a BCVI preserve. Currently, this is the Applicant's preferred mitigation option and the Applicant is currently pursuing a conservation opportunity within the Plan Area. If biological studies and negotiations with the landowner demonstrate that this potential conservation opportunity meets the BCVI mitigation guidelines, the Applicant anticipates coordinating with the USFWS to obtain the necessary approvals for preserve establishment.

If the Applicant opts to purchase BCVI conservation credits from a USFWS-approved third-party conservation bank, the Applicant will negotiate purchase prices and other details of the credit transaction directly with the conservation banker. If necessary to purchase credits from a conservation bank that does not include the Plan Area in its primary service area, the Applicant will coordinate with the USFWS to obtain any required approvals.

### **6.3.2 Mitigation Ratios**

The Applicant will provide mitigation for all suitable BCVI habitat within the Plan Area that is directly or indirectly impacted by the Covered Activities. Consistent with other BCVI HCPs approved by the USFWS, the Applicant proposes mitigation ratios that consider the relative magnitude of impact to the species given the ecological differences between direct vs. indirect impacts; long-term vs. short-term

habitat loss; and whether or not suitable BCVI habitat has demonstrated use by the species. See Section 5 for definitions of direct and indirect impacts and long-term and short-term habitat loss as they apply to this HCP. As described below, the Applicant will consider all areas of suitable BCVI habitat within the Plan Area as presumed occupied (i.e., seasonally utilized by the species), unless survey data from the breeding season immediately prior to clearing demonstrates otherwise. Table 6 summarizes the mitigation ratios for this HCP.

**Table 6.** Mitigation Ratios for the Heart of Texas Habitat Conservation Plan

	Occupied or Presumed Occupied (Unsurveyed) Habitat	Surveyed Suitable Habitat without Demonstrated Occupancy
<b>Direct Habitat Loss</b>		
<b>Long-term Loss</b>	2:1	1:1
<b>Short-term Loss</b>	1:1	0.5:1
<b>Indirect Habitat Modification</b>	0.5:1	0.25:1

BCVI distribution within areas of suitable habitat tends to be clustered without respect to any specific habitat metric (McFarland et al. 2013). Therefore, the Applicant expects that BCVI will not use some areas of suitable BCVI habitat within the Plan Area. To determine the approximate distribution of occupied BCVI habitat within the Plan Area, the Applicant conducted a presence/absence survey for BCVI using spot mapping methods and following the protocols established by the USFWS. Bio-West conducted a presence/absence survey for the BCVI, following USFWS protocols (USFWS 2010), across approximately 1,840 acres of the Plan Area during the 2016 breeding season. The survey area covered most areas of suitable BCVI habitat within 900 feet of the proposed Project layout. Areas of suitable BCVI habitat within the Plan Area not covered by the presence/absence survey are considered occupied for the purposes of this HCP. Over the course of the presence/absence survey, Bio-West recorded 1,126 detections of BCVIs within the survey area that Bio-West believes to be associated with approximately 146 individual BCVI territories (Figure 5) (Bio-West 2016b). Based on coordination with the USFWS and in consideration of the BCVI survey data, this HCP assumes that all suitable BCVI habitat within the Plan Area is occupied by the species unless additional data becomes available to refine this assessment which would require and approval by the USFWS. If for some reason, the Applicant chooses to complete additional presence/absence surveys, it will coordinate with the USFWS on the areas to be surveyed and how the results of the survey affect the mitigation amount. In the absence of additional surveys the Applicant will consider all areas of unsurveyed suitable BCVI habitat to be presumed occupied.

The Applicant's proposed impact and mitigation approach is generally consistent with other approved HCPs for the BCVI, including:

- “Final Habitat Conservation Plan for Maintenance and Construction Activities for the Oncor Electric Delivery Company LLC” (Atkins 2011):
  - Direct impacts include habitat removal mitigated at 2:1
  - Indirect impacts extend 300 feet from the edge of direct habitat removal and mitigated at 1:1
  - Occupancy and presumed occupancy is established at the patch level; the number of presence/absence surveys needed to demonstrate absence is not defined
- “LCRA Transmission Services Corporation Competitive Renewable Energy Zone Transmission Lines Final Habitat Conservation Plan” (SWCA 2012):

- Direct impacts include habitat removal mitigated at 3:1
- Indirect impacts extend 300 feet from the edge of direct habitat removal and mitigated at 0.5:1
- Impacts and mitigation based on areas of suitable habitat without regard to occupancy.
- “Southern Edwards Plateau Habitat Conservation Plan” (Bowman Consulting Group et al. 2015):
  - Direct impacts include habitat removal mitigated at 2:1
  - Indirect impacts extend 300 feet from edge of direct impacts and mitigated at 0.5:1
  - Patches of suitable habitat determined to not be occupied after 1 year of presence/absence surveys are considered “indirectly impacted” even if such habitat would be permanently removed.

### **6.3.3 Amount of Mitigation**

The Applicant will apply the mitigation ratios in Table 6 to the acres of impacted BCVI habitat (see Table 5) to calculate the amount of permanent BCVI conservation needed to mitigate for the impacts of take. On the basis of the 2016 presence/absence survey results (Bio-West 2016b) and in coordination with USFWS, this HCP considers all suitable BCVI habitat within the Plan Area to be occupied by the species. With this understanding and without additional survey data to refine estimates of occupied habitat, the Applicant would provide up to 454.23 acres of permanent BCVI conservation. The actual amount of mitigation provided by the Applicant will depend on the final layout of the Project (i.e., additional micro-siting may reduce impacts and corresponding mitigation). The Applicant will report to the USFWS the final mitigation amount as described in Section 7.2. The Applicant will implement this mitigation using one or more of the options described in Section 6.3.1 prior to the conduct of Covered Activities.

As described in Section 9.0, the Applicant has decided to secure extra mitigation acres to address the Changed Circumstances regarding short-term vs. long-term habitat losses (Section 8.1.3) and emergency responses (Section 8.1.5) instead of setting aside funds or letters of credit to demonstrate funding assurances for these aspects of HCP implementation. This results in an extra 110.22 acres of additional mitigation. Therefore, the Applicant anticipates providing 564.45 total mitigation acres (i.e., 454.23 acres of mitigation for the impacts of the taking, plus 110.22 acres of mitigation to address Changed Circumstances) as part of implementing this HCP.

## **6.4 Monitoring and Adaptive Management**

### **6.4.1 Monitoring**

HCPs must specify the measures that the permittee will take to monitor the impacts of the authorized taking (50 CFR 17.22(b)(1)(iii)(B)) and the USFWS advises that HCP monitoring programs address both compliance monitoring and effects and effectiveness monitoring (USFWS 2000). Compliance monitoring is intended to verify that the ITP permittee is carrying out the terms of the HCP and ITP, while effects and effectiveness monitoring helps determine if the conservation program works as anticipated.

#### **6.4.1.1 COMPLIANCE MONITORING**

With respect to compliance monitoring, the use of impacted BCVI habitat acres as a proxy for measuring take of individual BCVIs substantially simplifies the verification of whether or not the Applicant has exceeded its authorized amount of incidental take. Therefore, the Applicant will accomplish compliance monitoring largely through reporting to the USFWS (see Section 7).

#### **6.4.1.2 EFFECTIVENESS MONITORING**

One assumption of the conservation program is that some areas of habitat loss will be short-term, with the expectation that suitable BCVI habitat will regrow over time. USFWS guidance for BCVI habitat management states that BCVI habitat regeneration after a fire disturbance may take 2 to 5 years (USFWS 2013b). The Applicant applied a lower mitigation ratio to areas of short-term disturbance on the basis of this reasonable expectation. To verify that this expectation holds true, the Applicant will evaluate BCVI habitat conditions the fifth year following implementation of the post-construction habitat restoration measures. The habitat evaluation will determine whether or not restored conditions meet the definition of suitable BCVI habitat described in Campbell (2003).

The Applicant will report the results of the habitat evaluation to USFWS in its annual report (see Section 7). The implications of the habitat evaluation on possible changes to the conservation program are discussed as a changed circumstance (see Section 8.1).

#### **6.4.1.3 ADDITIONAL MONITORING**

Additional monitoring will occur at the mitigation site in accordance with the management plan associated with the mitigation option pursued.

### ***6.4.2 Adaptive Management***

The USFWS published the final five-point policy guidance on June 1, 2000, as an addendum to the HCP Handbook (USFWS 2000). This policy established the USFWS's intent, where appropriate, to include adaptive management principles in the operating conservation program for an HCP to address uncertainty regarding natural resource management. To address uncertainties with HCP development, the USFWS encourages utilization of adaptive management programs. The USFWS defines adaptive management as "...a method for examining alternative strategies for meeting measureable biological goals and objectives, and then, if necessary, adjusting future conservation management actions according to what is learned."

The Applicant prefers to implement its own permittee-responsible mitigation and will address adaptive management in the land management plan prepared for any such mitigation lands, which will be subject to USFWS review and approval (USFWS 2013b). However, the Applicant may opt instead to purchase BCVI conservation credits from an approved third-party conservation bank, in which case adaptive management processes are already built into the operation of the bank and are the responsibility of the conservation banker.

## 7.0 REPORTING

### 7.1 BCVI Presence/Absence Survey

Bio-West performed presence/absence surveys for the BCVI within the Plan Area to USFWS protocols in the 2016 breeding season. Bio-West will report its findings to the USFWS in accordance with the terms and conditions of its ESA Section 10(a)(1)(A) scientific permit. If additional surveys are performed, the Applicant will report the results of these surveys to the USFWS by August 1 of the same year.

The Applicant has submitted to the USFWS for its review and approval a delineation of BCVI habitat patches shown to be occupied by the species on the basis of these survey results. Currently, the USFWS believes all suitable habitat in the Plan Area to be occupied (Charlotte Kucera, USFWS, pers. comm. to Danny Splettstosser, RES, via email on August 8, 2016). If future surveys warrant revising this assessment of habitat occupancy, the Applicant will work with the USFWS to appropriately account for the additional information. Areas of suitable BCVI habitat that have not been surveyed will be considered occupied.

### 7.2 Pre-construction Notification

The Applicant will notify the USFWS in writing to the Austin Ecological Services Field Office of the initiation of Covered Activities at least 10 business days prior to the start of work. With the notification, the Applicant will provide the USFWS documentation confirming that:

1. final construction plans are consistent with the take assessment in Section 5;
2. the Applicant has implemented the required contractor training;
3. the Applicant has secured permanent conservation for the BCVI in the amount specified in Section 6.3; and
4. the Applicant remains committed to implement all other avoidance and minimization measures specified in Section 6.2.

### 7.3 Annual Reporting

The Applicant will provide the USFWS Austin Ecological Services Field Office a report of HCP-related activities by February 28 of each year over the duration of the ITP term. This annual report will document the implementation of Covered Activities, the outcome of monitoring activities described in Section 6.4.1, and any measures taken in response to changed circumstances during the preceding calendar year. The content of the report will largely depend on the form of permanent BCVI conservation implemented as mitigation. The Applicant expects that annual reporting will be minimal if the Applicant relies on a USFWS-approved third party to implement the mitigation.

### 7.4 Permit Renewals

The Applicant requests an ITP with a term of 30 years from issuance. In the event that the Applicant desires to continue operating the proposed project beyond that timeframe, the Applicant may request ITP renewal to extend the ITP term. To request an ITP renewal, a permittee must (USFWS and NMFS 1996):

- have complied with the terms and conditions of the original permit, including reporting requirements;
- file a written request for a permit renewal with the USFWS at least 30 days prior to the permit expiration date that references the permit number;
- certify that all statements and information presented in the original permit application are still correct or include a list of changes; and
- provide specific information concerning the amount of incidental take that has occurred under the original permit and the amount of incidental take that remains unused.

If the Applicant files such a request at least 30 days prior to the permit expiration date, then the ITP will remain valid while the USFWS processes the request. If the Applicant fails to file a request at least 30 days prior to permit expiration, then the ITP will become invalid on the original expiration date.

## 8.0 NO SURPRISES RULE

An important incentive for an Applicant developing an HCP are the assurances provided by the USFWS's "No Surprises" rule (50 CFR §§ 17.22, 17.32, 222.2). Under the No Surprises Rule, the USFWS assures incidental take permittees that, so long as an approved HCP is being properly implemented, no additional land use restrictions or financial compensation will be required of the permittee with respect to the covered species, even if unforeseen circumstances arise after the permit is issued indicating that additional mitigation is needed.

The No Surprises Rule recognizes that the permittee and the USFWS can reasonably anticipate and plan for some changes in circumstances affecting a species or geographic area covered by an HCP (e.g., a predictable natural catastrophic event in areas prone to such events). To the extent that the HCP provides for changed circumstances, the permittee must implement the appropriate measures in response to the changed circumstances if and when they occur.

This section describes the changed circumstances anticipated by the Applicant and the USFWS, indicates the responses to those changed circumstances agreed to by the Applicant and the USFWS, and explains the USFWS's assurances to the Applicant with respect to any unforeseen circumstances.

### 8.1 Changed Circumstances

The No Surprises Rule defines "changed circumstances" as "circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the USFWS and that can be planned for (e.g., the listing of new species or a fire or other natural catastrophic event in areas prone to such events)" (50 CFR §§ 17.3).

The HCP must identify provisions to compensate for negative impacts to covered species from changed circumstances in order to qualify for No Surprises Rule assurances. If circumstances change, the permittee must implement any provisions included in the HCP and/or ITP that address such circumstances.

The following sections describe the changed circumstances that the Applicant and the USFWS can reasonably anticipate and for which responses can be planned. The responses provided for each changed circumstance represent an opportunity for the Applicant and the USFWS to reevaluate the effectiveness of the conservation program and adjust priorities, reallocate resources, or otherwise modify how the HCP is implemented.

#### 8.1.1 New Species Listings

Upon occasion, the USFWS adds species to the federal list of threatened and endangered species or creates or modifies designations of critical habitat. It is possible that the USFWS could list a species that occurs within the Plan Area or designate critical habitat within the Plan Area after ITP issuance. USFWS publication of a Final Rule in the Federal Register will signify the occurrence of this changed circumstance. The Applicant has the ability to discuss this circumstance with the USFWS at any time prior to the publication of a Final Rule, including upon publication of a proposed rule. The Applicant will evaluate if the Project, with consideration of the avoidance and minimization measures already included in the HCP's conservation program, is sufficient to avoid take of the newly listed species or adverse modification of critical habitat. If the Applicant determines that incidental take of the newly listed species is likely, the Applicant will coordinate with the USFWS to obtain authorization for incidental take of the newly listed species either by amending this HCP or by preparing a new HCP.

### **8.1.2 Change in Project Design**

The proposed layout of the Project shown in Figure 2 provides the basis for the calculation of direct and indirect impacts to BCVI habitat and the amount of authorized take. However, the Applicant has not yet finalized the design and layout of the project and the precise locations of turbines, access roads, MV collection cables, substation, and Gen-tie Line may be subject to minor changes. For example, the Applicant could shift the location of a wind turbine based on the results of the presence/absence surveys to avoid impacts to a patch of occupied BCVI habitat. The Applicant could also determine that a slightly different spacing of turbines is necessary to appropriately install the specific type of equipment procured for the Project.

If the Applicant changes the layout of the proposed Project, it will reassess the extent of direct and indirect impacts to suitable BCVI habitat and determine if the extent of anticipated take is within the limits authorized by the ITP. If the recalculated amount of take is less than the amount authorized by the ITP, then the Applicant will provide the USFWS documentation of the new take assessment and adjusted mitigation. The Applicant does not anticipate an increase in impacts from changes in Project design, and is requesting the maximum amount of take possible at this time. However, if the recalculated amount of take is greater than the amount authorized by the ITP, then the Applicant will either adjust the Project design to ensure that authorized take is not exceeded or it will coordinate with USFWS to amend the ITP and increase the take authorization. Increasing the amount of take authorized by the ITP would be a major permit amendment. Under this changed circumstance, the Applicant will also recalculate the amount of mitigation required to compensate for the impacts of its taking using the mitigation ratios described in Section 6.3.

### **8.1.3 Habitat Restoration Measures Prove Ineffective**

The Applicant will evaluate BCVI habitat conditions in areas classified as undergoing short-term habitat loss during the fifth year following implementation of the post-construction habitat restoration measures. If the results of this habitat evaluation demonstrate that suitable BCVI habitat (as defined by Campbell 2003) has not regenerated over all or portions of the restoration area, the Applicant will either provide additional BCVI mitigation for those areas that failed to regenerate or request an extension of the evaluation period from the USFWS. A request for extension of the evaluation period from USFWS will include the biological rationale for why additional time is required to restore the area and will estimate that amount of additional time required. Upon consideration of the specific circumstances, the USFWS may grant an extension of the evaluation period, require the Applicant to provide additional mitigation, or a mixture of the two approaches depending on the circumstances present in each restoration area. The form of any additional mitigation will be consistent with the specifications in Section 6.3 and the amount of additional mitigation will make up the difference between the mitigation ratios for short-term and long-term habitat loss for only those areas that failed to regenerate as a result of the Applicant activities. The Applicant will provide any additional mitigation within 1 year of notification by USFWS that this changed circumstance has occurred.

### **8.1.4 Collision Fatality**

To date, there have been no documented fatalities of a BCVI at a wind power facility. However, it is possible, although unlikely, that a collision fatality of a BCVI will be recorded at a wind power facility in the future. If the USFWS receives confirmation of a BCVI collision fatality at a wind power facility (either as a result of the implementation of the Applicant's BBCS or another source), the USFWS may notify the Applicant and request coordination to determine if additional take authorization for the proposed Project is warranted. If, in consideration of this new information, the Applicant determines that

take from collision with wind turbines is reasonably certain to occur, the Applicant will work with the USFWS to determine if the anticipated taking is within the limits of authorized take in the ITP or amend the ITP to increase the amount of incidental take authorization. Any such amendment will be a major amendment to the ITP. In this event, the Applicant will also work with the USFWS to determine whether or not an adjustment to the Applicant's monitoring program is warranted to keep the effort commensurate with the impacts of the Covered Activities on the BCVI.

### **8.1.5 Emergency Responses**

Emergency situations or an unplanned natural disaster may arise within the Plan Area that may have significant health and safety consequences or cause significant damage to the Project facilities. Such situations may arise from changed circumstances including wildfire, tornados, lightening, flooding, equipment failure, or similar sources; or may arise from unexpected delays in the coordination of Project approvals or resources where clearing of actively used habitat for the BCVI must be removed during the breeding season. The response to any such situation may include immediate vegetation removal to access damaged equipment or create fire breaks or other defensible spaces. It is impossible to quantify or anticipate the location, extent, timing, or duration of any necessary emergency responses, but it is possible that emergency responses could occur in areas of suitable BCVI habitat during the BCVI breeding season when the species is present in the Plan Area. If an emergency situation occurs during the BCVI breeding season and requires a response that would damage suitable BCVI habitat, a changed circumstance will have occurred if; 1) the Applicant is unable to conduct a search for active BCVI nests in areas of suitable BCVI habitat within the response area before implementing the emergency response action; or 2) the Applicant discovers one or more active BCVI nests within the response area. Therefore, the emergency response could directly take the BCVI by significantly disrupting breeding activities (i.e., loss of individual BCVI in an active nest).

The Applicant will take every action necessary to resolve an emergency situation promptly to ensure that human safety and health, and the Project, are protected. Whether or not a situation is in fact qualified as an emergency will be at the discretion of the Applicant. The Applicant will utilize existing access roads, other disturbed areas, or areas outside of suitable BCVI habitat where practicable during emergency responses to minimize the damage to previously unmodified suitable BCVI habitat. If suitable BCVI habitat is to be removed during an emergency response the Applicant will engage a permitted biologist to search for and verify the absence of active BCVI nests in that habitat, unless the severity of the response does not allow such a search to be conducted. If an emergency requires the removal of suitable BCVI habitat before such a search can be implemented or if the response would remove an active BCVI nest, the Applicant will notify the USFWS within 48 hours that this changed circumstance has occurred.

Within 30 days of determining that this changed circumstance occurred, the Applicant will submit to the USFWS in writing a report to document the emergency situation and the response. The report will describe the nature of the changed circumstance and the Applicant's emergency response (type, location, timing, duration, etc.), explain why an emergency response was needed, and provide details about the extent of the damage to any suitable BCVI habitat or active BCVI nests attributable to either the changed circumstance or the emergency response (or both). Take of the BCVI as a consequence of this changed circumstance will be covered by the ITP. However, the Applicant will coordinate with the USFWS to identify the measures necessary to restore damaged habitat, mitigate for the loss of active nests, and minimize further disturbances to individual BCVIs.

The Applicant will restore damaged habitat in a manner consistent with the measures specified in Section 6.2.4 and will implement the other measures specified in Section 6.2 to minimize further disturbance to the BCVI. The Applicant will provide additional mitigation for the loss of each active BCVI nest at level equivalent to the permanent protection of 12 acres of occupied BCVI habitat per nest (i.e., a 3:1

mitigation ratio for the amount of habitat associated with the average size of BCVI territory). Where the Applicant performed an emergency response without first searching for active BCVI nests in the response area, mitigation will be calculated on the assumption that one active nest occurred in every 4 acres of suitable BCVI habitat damaged by the emergency response (i.e., a 3:1 ratio of mitigation for each acre of habitat loss). The form of any such mitigation will be consistent with the specifications in Section 6.3, and will be implemented within one year of the date of this changed circumstance.

## 8.2 Unforeseen Circumstances

“Unforeseen circumstances” are changes in circumstances affecting a species or geographic area covered by an HCP that could not reasonably have been anticipated by plan developers and the USFWS at the time of the conservation plan’s negotiation and development, and that result in a substantial and adverse change in the status of any covered species. The USFWS will have the burden of demonstrating that unforeseen circumstances exist and must base the determination on the best scientific and commercial data available. The USFWS shall notify the Applicant in writing of any unforeseen circumstances the USFWS believes to exist.

The No Surprises Rule states that the USFWS may require additional conservation measures of an incidental take permittee as a result of unforeseen circumstances “only if such measures are limited to modifications within conserved habitat areas, if any, or to the conservation plan’s operating conservation program for the affected species, and maintain the original terms of the conservation plan to the maximum extent possible.” The USFWS shall not require the commitment of additional land, water, or financial resources by the permittee without the consent of the permittee, or impose additional restrictions on the use of land, water, or other natural resource otherwise available for use by the permittee under the original terms of the ITP. No Surprises assurances apply only to the species adequately covered by the habitat conservation plan (i.e., the BCVI), and only to those permittees who are in full compliance with the terms of their plan, permit, and other supporting documents, as applicable.

## 9.0 FUNDING ASSURANCES

The Applicant estimated the costs of implementing the conservation measures, monitoring activities, and administrative tasks described in this HCP. Table 7 summarizes these anticipated costs.

**Table 7.** Estimated Costs for Habitat Conservation Plan Implementation

Conservation Measure	Estimated Cost	Basis and Assumptions
Micrositing	no additional cost	Completed prior to start of Covered Activities
Seasonal Clearing Restrictions	no additional cost	Operational adjustment only
Seasonal Speed Limits (installation of signage)	\$2,000	Purchase of 25, 18x12-inch custom printed safety signs with U-channel posts and mounting hardware (see <a href="http://www.safetysign.com">www.safetysign.com</a> )
Post-construction Habitat Restoration	no additional cost	Restoration is standard practice
Seasonal Restrictions on Non-emergency Maintenance and Repair	no additional cost	Operational adjustment only
Contractor Training	\$3,500	Development of content, two group presentations to staff and contractors, and publication of 100, 5-page color packets
Mitigation	\$1,590,000 - \$4,542,300	Based on application of proposed mitigation ratios for occupied or presumed occupied habitat to the habitat impacts described in Table 5. Anticipated costs of \$3,500 to \$10,000 per acre of BCVI conservation*
Compliance Monitoring, Reporting, and USFWS Coordination	\$30,000	Estimated at \$1,000/year for duration of ITP
Effectiveness Monitoring (Habitat Evaluation)	\$5,000	Based on field investigation of approximately 92 acres of habitat, with data analysis and reporting
Contingency and Adaptive Management – Short-term vs. Long-term Habitat Loss	\$918,600	Estimated cost based on difference between the mitigation costs of short-term and long-term habitat loss for 91.86 acres of suitable BCVI habitat with assumed occupancy, at \$10,000 per acre.
Contingency and Adaptive Management – Emergency Responses	\$183,585	Accounts for the Changed Circumstance that involves emergency responses. Estimated as the cost to establish mitigation at a 3:1 ratio for 5 percent of the anticipated acreage of direct habitat loss (i.e., 122.39 acres x 5% x 3 = 18.36 acres x \$10,000 = \$183,585)
<b>TOTAL HCP COSTS</b>	<b>\$2,732,685 to \$5,684,985</b>	

\* This range of costs is generally based on estimates for conservation easement acquisition and BCVI management provided in the Southern Edwards Plateau Habitat Conservation Plan and anticipated third-party BCVI conservation credit fees.

The Applicant estimates the total cost to implement this HCP, including funds set aside to address contingencies and changed circumstances, will be approximately \$5,684,985. The Applicant acknowledges that this cost estimate represents the high-end of potential costs for implementing this HCP, since most, if not all, of the “short-term” habitat losses will remain so; emergency responses that remove or may remove active BCVI nests are unlikely to occur; and additional micrositing is likely to reduce impacts to BCVI habitat.

The Applicant will incur most of these costs prior to the start of Covered Activities and any incidental take, including all costs associated with the implementation of the mitigation measures. Because the Applicant commits to funding this set of conservation measures prior to conducting the Covered Activities or incurring any incidental take, there is no need for further assurances that funding for these

measures will be provided. If for some reason the funding for these measures is not available, the taking would not occur.

Only the costs associated with installing signage for speed limits, ongoing reporting and coordination, effectiveness monitoring, and contingency funding will occur after Covered Activities have begun and incidental take may have occurred. To assure that the funding for the post-take operational measures is available, the Applicant will set aside \$37,000 in a separate banking account prior to the start of Covered Activities or issue a letter of credit to a third party for that amount.

To assure that additional mitigation for the contingency (i.e., short-term habitat losses becoming long-term habitat losses), Applicant has decided to secure extra mitigation acres to address the Changed Circumstances regarding short-term vs. long-term habitat losses and emergency responses (i.e., 110.22 acres of additional mitigation), instead of setting aside the corresponding funds or letters of credit. The amount of additional mitigation for these contingency and emergency responses may be adjusted based on final the Project design, as described in Section 6.3.3 and Section 8.1.2. The Applicant may repurpose unused acres associated with the restoration of short-term habitat losses or emergency responses if and when these changed circumstances are resolved.

## 10.0 ALTERNATIVES CONSIDERED

Section 10(a)(2)(A) of the ESA requires that HCPs include a description of the “alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized.”

The Applicant evaluated alternative designs for the proposed project with lower levels of anticipated incidental take. The alternatives involve differing numbers, types, and placements for wind turbines across the Plan Area and related changes in the locations of connecting roads, transmission lines, and other infrastructure.

### 10.1 No Take Alternative

The Applicant evaluated a No Take Alternative to the proposed Project wherein all clearing and construction activities associated with the construction of a wind power generation facility in the Plan Area would be located at least 300 feet away from occupied BCVI habitat. Turbines, access roads, MV collection cables, and substations would be placed at least 300 feet from occupied BCVI habitat. The overhead Gen-tie Line would be installed in such a manner that no clearing of occupied BCVI habitat would occur. With this alternative, the Applicant would not prepare an HCP or seek an ITP from the USFWS, nor would mitigation lands be identified, preserved, or managed for the benefit of the BCVI. Consequently, the Applicant would not contribute to the permanent conservation of the BCVI.

The No Take Alternative would significantly reduce number of wind turbines that could be installed within the Plan Area. The No Take Alternative layout would likely accommodate only 20 to 25 turbines, rather than the up to 70 turbines under the proposed Project. Construction of the Gen-tie Line would require special siting of poles or towers to avoid occupied areas and stringing lines by helicopter, rather than conventional transmission line construction methods. Implementation of this alternative could require at least three years of presence/absence surveys for the BCVI to demonstrate presumed absence of the species in areas of suitable habitat. The significant loss of energy generating turbines, the additional costs to install the Gen-tie Line, and the multiple years of project delay to allow for presence/absence surveys make this alternative unacceptable to the Applicant.

Therefore, the Applicant rejected the No Take Alternative because it is inconsistent with the Applicant’s purpose and need. While the No Take Alternative would avoid take of the BCVI, this alternative would also not provide any of the conservation benefits of the proposed mitigation program and would not contribute to the recovery of the species.

### 10.2 Maximum Build Alternative

The Applicant evaluated an alternate project design that maximized the anticipated power output from the Plan Area, irrespective of the potential for impacts to the BCVI. This Maximum Build Alternative would use approximately 80 turbines and 20 miles of access roads and MV collection cables, compared to the up to 70 turbines and 20 miles of roads and connecting lines for the proposed Project. The layout of this alternative design would impact approximately 820 acres of suitable BCVI habitat, including:

- 90 acres of direct, long-term habitat loss,
- 150 acres of direct, short-term habitat loss, and
- 580 acres of indirect habitat modification.

While the additional turbines would increase the amount of power generated by the proposed facility by approximately 14% (i.e., assuming that each turbine contributes equally to the total amount of power generated), the facility layout would increase greatly increase the amount of take and mitigation. The estimated amount of take would increase by 95 acres (12%) and the corresponding mitigation (assuming that suitable BCVI habitat is occupied) would increase by 60 acres. Assuming that appropriate BCVI mitigation is likely to cost approximately \$10,000 per acre, this alternative would increase the anticipated mitigation costs by more than \$600,000.

The Applicant determined that the potential for additional power generation was insufficient to balance the additional costs of construction, permitting, and mitigation. Therefore, the Applicant rejected the Maximum Build Alternative.

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**APPENDIX A**

**RATIONALE FOR WIND TURBINE COLLISION COVERAGE**

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December 9, 2015

## Rationale for Wind Turbine Collision Coverage

The possibility of BCVI colliding with spinning turbines, albeit far from certain, is possible. Below is the rationale for the Applicant not seeking incidental take coverage for collision mortalities, as is discussed in Section 5.1.1. of the Heart of Texas Wind Project Habitat Conservation Plan.

Erickson et al. (2014) reviewed 4,975 bird fatalities recorded during 116 fatality monitoring studies conducted at 84 wind energy facilities across the United States and Canada. Three of these facilities are in Texas within the range of the BCVI. These include the Barton Chapel facility in Jack County, the Buffalo Gap I facility in Nolan and Taylor Counties, and the Buffalo Gap II facility in Nolan County. No BCVI were identified among the 4,975 fatalities recorded at these or any of the other of the studied facilities. However, the studies did document fatalities for 156 other species of small passerines (songbirds), a group that includes the BCVI. Small passerines accounted for approximately 62.5% (n= 3,110) of total avian fatalities at the studied wind energy facilities (Erickson et al. 2014).

Birds of the vireo family (Vireonidae) accounted for approximately 6.5% (n = 322) of the total avian fatalities (Erickson et al. 2014). Most of these (n = 265; 82.3%) were red-eyed vireos (*Vireo olivaceus*), a species that accounted for approximately 8.5% of all small passerine fatalities. The Vireonidae contains four genera but, of these, only birds of the genus *Vireo* occur in the United States. Birds of the genus *Vireo* can be divided into two groups of species based on behavior (Shopp 2013). One group, which includes the red-eyed vireo, typically occurs in woodlands and utilizes canopy-layer habitats. The other group, which includes the BCVI, generally occurs low to the ground in shrubby habitats.

Nine vireo species were represented among the 322 Vireonidae fatalities reported by Erickson et al. (2014). Of these 322 fatalities, 311 (96.6%) were individuals of species within the woodland group and only four (1.2%) were individuals of species within the shrubby habitat group. Biologists were unable to identify seven vireo fatalities to species, suggesting that none of the unidentified vireos could have been BCVI given the distinctive appearance of this species. As indicated, red-eyed vireo accounted for 265 of the 311 “woodland group” vireo fatalities; the remaining 46 fatalities within the woodland group were distributed among five species in numbers ranging from four to 19 individuals per species.

The red-eyed vireo is a common species that breeds widely across North America (Sibley 2000). Its relative abundance and broad geographic range likely contribute to the comparatively high number of fatalities documented for this species. Of the 84 facilities that contributed to the data reviewed by Erickson et al. (2014), 51 are located within the breeding range of the red-eyed vireo or its migration corridor and provided data on small bird fatalities. Thus, this species has greater exposure to wind energy facilities than do vireo species with more restricted ranges. That said, another common species of woodland vireo, the warbling vireo (*V. gilvus*), has a breeding range in the United States that is as large as or larger than that of the red-eyed vireo (Sibley 2000). A total of 57 facilities that provided small bird data reviewed by Erickson et al. (2014) occur within the breeding range or migration corridor of this species, yet only 19 warbling vireo fatalities were included in that data (Erickson et al. 2014).

The data provided in Erickson et al. (2014) include the total number of turbine searches per fatality monitoring study, when available.<sup>2</sup> The number of turbines searches per study varied widely, from 25 to 7,771. The number

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<sup>2</sup> A *turbine search* is a unit equivalent to one search for avian fatalities around one turbine on one day. Thus, a search for fatalities around one turbine on 10 different days and searches around 10 turbines all on the same day have equivalent efforts of 10 turbine searches.

of turbine searches performed was not available for all 116 fatality monitoring studies, and only 80 of the 116 monitoring studies provided small bird fatality data. Table 1 provides a summary of collision fatalities by selected vireo species as derived from Erickson et al. (2014), with average number of fatalities presented on the basis of: 1) number of facilities present within the breeding range and migration corridor of the species; 2) number of monitoring studies performed at the facilities within the range of the species; and 3) number of turbines searched during the studies performed within the range of the species. Figure 6 provides a graph that plots the number of fatalities for each of the species listed in Table 1 against the total number of turbine searches conducted at facilities within the range of the respective species.

**Table 1.** Summary of Vireo Collision Fatalities by Number of Facilities, Monitoring Studies, and Turbines Searched

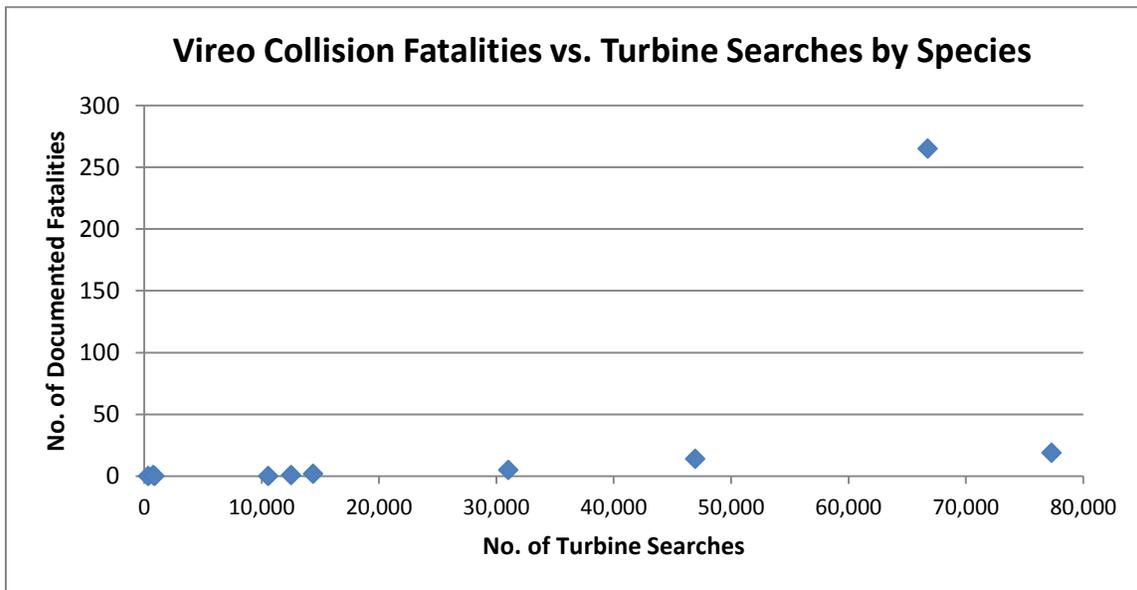
Species	No. of Fatalities	No. of Facilities in Range	No. of Studies in Range	No. of Turbines Searched	Average No. of Fatalities		
					Per Facility	Per Study	Per No. of Turbines Searched
Bell's vireo	1	18	19	12,514	0.056	0.053	0.00008
Black-capped vireo	0	3	3	336*	0.000	0.000	0.00000
Blue-headed vireo	14	28	40	46,949	0.500	0.350	0.00030
Cassin's vireo	5	30	37	31,011	0.167	0.135	0.00016
Gray vireo	1	2	2	768	0.500	0.500	0.00130
Hutton's vireo	0	6	6	10,559	0.000	0.000	0.00000
Plumbeous vireo	0	3	5	894	0.000	0.000	0.00000
Red-eyed vireo	265	51	72	66,751	5.196	3.681	0.00397
Warbling vireo	19	57	78	77,310	0.333	0.244	0.00025
White-eyed vireo	2	6	8	14,397	0.333	0.250	0.00014
<b>Total</b>	307 <sup>†</sup>	--	--	---	---	---	---

\* Only one of the three studies performed in the range of the BCVI identified the number of turbine searches performed.

† Total does not add to 322 because fatalities of Philadelphia vireo, yellow-throated vireo, and unidentified vireos are not included.

As shown in Table 1, the 265 red-eyed vireo fatalities and number of turbine searches conducted within the range of the species equates to an average of 0.00397 red-eyed vireo fatalities/turbine search. Despite a greater number of turbine searches, the warbling vireo numbers equate to an average of 0.00025 fatality/turbine search. This great disparity suggests that some aspect of red-eyed vireo behavior or habitat usage is largely responsible for the rate at which this species suffers collision mortality.

The vireo fatality numbers by species plotted against number of turbine searches as shown in Figure 6 suggests a linear relationship between total number of documented fatalities and number of turbine searches for all vireo species except red-eyed vireo. Space was not available to label all points on Figure 6, but the red-eyed vireo point is readily identified by its exceptional total number of fatalities (n = 265). Because the documented number of non-red-eyed vireo fatalities by species appears to be directly proportional to number of turbine searches, this suggests that most of the difference in the average fatality rate among non-red-eyed vireos as presented in Table 1 demonstrates the result of differences in sample sizes and not differences between species in susceptibility to collision.



**Figure 7.** Vireo Collision Fatalities by Number of Turbine Searches

The Applicant applied the Microsoft Excel LINEST function to identify the slope of line that best fits the data plotted in Figure 6, excluding the data for red-eyed vireo and Hutton’s vireo (*V. huttoni*). See below for a discussion on the rationale for excluding the Hutton’s vireo data. This slope was 0.000257, which the Applicant uses herein as the average documented vireo species fatality rate for species other than red-eyed and Hutton’s vireos in terms of fatalities/turbine search. This equates to 3,891 turbine searches per documented fatality of vireo species other than red-eyed and Hutton’s vireos. This suggests that nearly 4,000 turbine searches may be needed in order to gain reasonable confidence of documenting one fatality of a particular non-red-eyed, non-Hutton’s vireo species.

It is acknowledged that the average 3,891 searches/documented fatality rate was derived using the total number of turbine searches made during all fatality monitoring studies conducted within the range of the various vireo species, and many of those turbine searches were performed in cold weather months when these species would be expected to be outside of the United States. This number was derived to use as a standard against which to compare the number of turbine searches conducted within the range of each individual vireo species. Because the fatality rates presented in Table 1 are all based on total number of turbine searches performed within a range of a particular species, roughly the same magnitude of error should be present in each fatality rate computation and so, this source of error should be of negligible consequence.

The BCVI is one of four species of vireo that occur regularly in the United States for which no collision mortality has been documented (Erickson et al. 2014). The other three species are black-whiskered vireo (*V. altiloquus*), Hutton’s vireo, and plumbeous vireo (*V. plumbeus*). The black-whiskered vireo is a very close relative of red-eyed vireo that occurs regularly in the United States only in coastal habitats of southern Florida (Sibley 2000). None of the facilities that provided data to the review performed by Erickson et al. (2014) was located in Florida, and so the lack of documented mortality for this species is an understandable consequence of geography.

The number of turbine searches performed within the range of the BCVI, plumbeous vireo, and Hutton's vireo as shown in Table 1 were 336, 894, and 10,559, respectively. As discussed later, the identified number of turbine searches conducted within the range of the BCVI is improperly low because only one of the three fatality monitoring studies conducted within the range of the species reported the number of turbines searched. Nonetheless, given the discussion above, the lack of documented fatalities among BCVI and plumbeous vireo may largely be the result of sample size, since the true number of turbine searches conducted within the ranges of each of these two species is likely below the number of searches (3,891) identified herein as that which may be necessary to yield confidence of documenting at least one fatality of any particular vireo species, excluding red-eyed and Hutton's. It is noted that plumbeous vireo is one of three sister species that were formerly considered conspecific and collectively known as solitary vireo. As identified by Erickson et al. (2014), a combined 19 collision fatalities have been documented for the other two members of this group, blue-headed vireo (*V. solitarius*) and Cassin's vireo (*V. cassinii*). Given their high degree of similarity, it seems reasonable to assume that individuals within this sister group of species are all equally susceptible to collision mortality.

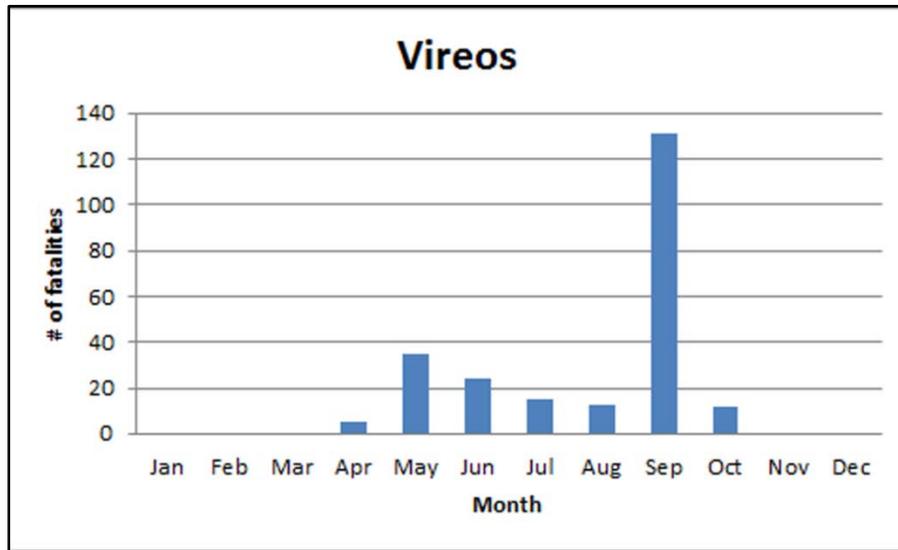
Before discussing the BCVI further, it is worth examining the lack of documented Hutton's vireo fatalities. The number of turbine searches performed within the range of Hutton's vireo (10,559) is nearly three times greater than the number of searches that may be necessary to yield confidence of documenting a fatality of a particular vireo species. This suggests Hutton's vireo may actually have a lower susceptibility to collision fatality than other vireo species, and this is why data for this species was left out of the LINST computation. Hutton's vireo differs from all other vireo species that occur in the United States in that it is not migratory. Figure 7 shows that the bulk of vireo collision mortality as reported by Erickson et al. (2014) occurred in September, when most vireos are traveling southward during fall migration. The next greatest amount of vireo mortality occurred in May, when most vireos are traveling northward in the spring.<sup>3</sup> Erickson et al. (2014) found similar collision fatality patterns for small songbirds as a whole. This suggests a non-migratory species such as Hutton's vireo should have a reduced risk of suffering collision mortality compared to migratory vireo species.

As seen in Figure 7, vireo fatality numbers decreased each month from May through August before spiking in September. It is likely that some migrant vireos were responsible for fatalities recorded in June; however, documentation of fatalities during July and August does indicate that a low rate of vireo collision mortality occurs during the breeding season. The sum of vireo fatalities presented in Figure 7 does not equal the total number ( $n = 322$ ) of vireo fatalities reported by Erickson et al. (2014) because dates of documentation were not available for all fatalities. It is not known from Erickson et al. (2014) which vireo species were responsible for the breeding season fatalities. It is expected that many of the breeding season fatalities were red-eyed vireos given that this species accounted for 82.3% of total vireo mortality.

With regard to the BCVI, fatality monitoring studies conducted within the range of this species as reviewed by Erickson et al. (2014) were performed at three Texas facilities: Buffalo Gap I, Buffalo Gap II, and Barton Chapel. One study from each facility was included in the Erickson et al. (2014) review, with the authors for unknown reasons only able to identify the number of turbines searched during the Buffalo Gap I study. However, Erickson et al. (2014) also reports that the Barton Chapel monitoring study extended for one year and included searches of 10 turbines weekly and 20 turbines monthly. This equates to 760 turbine searches ( $10 \times 52 = 520$ ;  $20 \times 12 = 240$ ). Our review of the Buffalo Gap II monitoring study report (Tierney 2009) indicates that 36 turbines were included in the study, and each was surveyed once per month for 10 months. This suggests that biologists performed about

<sup>3</sup> May fatality numbers were about one-quarter of the September numbers. This difference is likely attributable in large part to the fall vireo population being swollen by breeding season productivity, with many of those birds then lost over the winter to predation, disease, and other causes, such that far fewer birds exist to have potential to be struck by turbines in the spring than in the fall.

360 turbine searches for the Buffalo Gap II study. Thus, instead of 336, the number of turbine searches performed within the range of the BCVI may be closer to 1,456 (336+760+360=1,456). While considerably greater than 336, this number is still less than the number (3,891) that may be needed to document a vireo fatality in cases where vireo fatality may have potential to occur.



**Figure 8.** Vireo Collision Fatalities at Wind Energy Facilities, by Month (taken from Erickson et al. 2014)

Figure 7 indicates that vireos are at far greater risk of collision during migration periods than during the breeding season. This likely is especially true for the BCVI, because members of this species usually stay close to the ground in shrubby vegetation, even when flying between trees or bushes. The flight style of BCVIs when moving through their habitat is described as rarely sustained, quick, and nervous (Drake 2000). For this reason, any BCVIs occurring in proximity to wind turbines in the Plan Area would be expected to remain below the rotor-swept zone when present in the area during the breeding season.

Exceptions to the low-flying behavior of BCVIs could occur in the spring when the birds are arriving back on their breeding grounds, and again in fall when the birds depart for their winter range. Little is known about the migratory behavior of the BCVI. This species is assumed to be a nocturnal migrant, since the majority of passerines are nocturnal migrants (Gauthreaux 1991). Benefits of flying at night are believed to include greater stability of the atmosphere, reduced water loss as a result of lower temperatures, and decreased risk of predation by raptors (Gauthreaux 1976; Kerlinger 1995; Wiedner et al. 1992). Most passerines that migrate at night have been detected to fly at heights of 1,046 to 2,122 feet (ABR, Inc. 2005; Mabee and Cooper 2004; Woodlot Alternatives, Inc. 2005). This is well above the rotor-swept zone of wind turbines. While this suggests that migrant birds should not be at risk of collision with turbines, as shown above, vireo collision fatality rates are greatest during the fall and spring migration periods. The same is true for small passerines as a whole, with most small passerine collision mortality at wind energy facilities occurring in the months of September, October, and May (Erickson et al. 2014).

Birds are believed more likely to migrate during times of clear weather, although nearly 12% of neotropical migrants were documented flying in precipitation and the number of birds migrating during inclement weather has been underestimated (Wiedner et al. 1992). Inclement weather such as fog, wind gusts, and thunderstorms were thought to have caused 93% of bird collisions at a wind energy facility in southwestern Minnesota (Johnson et al. 2002). Given the relatively great height at which most birds fly when migrating, turbine collision risk for migrant

small passerines thus appears greatest when the birds are taking off, landing, or when birds are forced to fly low, or get grounded, by inclement weather.

It is not known how BCVIs arrive at and later depart from the Plan Area. Their homing instincts could be proficient enough that they arrive by dropping down directly into the same habitat they had used the previous year. If so, birds that use habitat proximate to wind turbines would be at risk of collision, particularly if the birds were confronted by poor visibility upon arrival. If BCVI homing instincts are not as highly attuned, it could instead be that the birds simply drop down somewhere in the general area and then find their territory after traversing the landscape at shrub level. This method would carry less risk of collision for birds using habitat near turbines because then there would be a chance of them landing away from any turbines. However, this method would increase the risk of collision for birds that use habitat located at greater distance from turbines because then chance would exist for them to drop to the ground near a turbine instead of dropping directly into their remotely located habitat.

The risk of collision for BCVIs departing the Plan Area in fall should be much lower on a year-to-year basis than for BCVIs arriving back to the area each spring. In spring, birds leaving their final stopover cannot be certain of the weather they will encounter upon arrival in the Plan Area. In fall, however, it is expected that birds would not choose to start a migratory flight when visibility is poor. Rather, birds should wait out bad weather and leave once conditions become suitable for flight. And, once BCVIs have left the Plan Area and have reached a height above that of the rotor-swept zone, their exposure to turbine collision risk in the United States ends. This is a very different condition than that faced by more northerly breeding species such as the red-eyed vireo. Red-eyed vireos that nest in the northern United States or Canada may take off and land on multiple occasions while migrating across North America, thus compounding their exposure to collision risk. BCVIs that depart in fall from the Plan Area probably do not land again until they are in Mexico, thus rendering them incapable after a safe departure of being detected during fatality monitoring studies conducted in the United States.

It is possible that each year some of the BCVIs that nest in habitat in the Plan Area abandon that habitat prior to heading south for their wintering grounds. Graber (1961) found that most BCVI families stayed within their territories until migration, but he also documented families moving into more heavily wooded areas or closer to water. All age classes of BCVIs have been known to exhibit within-season movements and post-breeding dispersal. First-year males are seemingly more mobile, although older males have been documented moving up to 3 miles within a season (Grzybowski 1995). Any BCVIs that moved away from the proximity of Project wind turbines after nesting should then not be at risk of collision when lifting off for departure to their wintering grounds.

Ultimately, given the increasing number of wind energy facilities on the landscape, the multi-decade duration of facility operations, and that all flying species of birds have at least some minimal level of susceptibility to collision with wind turbines, it is expected that a BCVI will eventually be documented to have collided with a wind turbine. But, where such a collision will be recorded cannot be known. Results of fatality monitoring studies conducted to date as reviewed by Erickson et al. (2014) suggest that vireos are much more likely to be killed during migration than during the nesting season. Consequently, it appears that the potential for a BCVI to be killed by collision may be greater for those birds that occur in the northern part of the breeding range (e.g., Oklahoma) than it is for birds occurring in central Texas, since BCVIs that nest in the northern portion of the breeding range can be expected to make more stops while migrating than those birds that occur farther to the south. This also implies that the potential to cause BCVI collision mortality is extended to all wind energy facilities located within the general breeding range and migration corridor of the species, since it cannot be known where or when a migrating BCVI could choose to land or be grounded by inclement weather. At the same time, while the potential to cause BCVI collision mortality is owned by all such wind energy facilities, given the number of variables involved, it cannot be concluded that BCVI collision mortality is reasonably certain to occur at any specific facility.

In summary, no BCVI collision mortality has been documented to date at any wind energy facility, and this includes at three Texas facilities constructed in close proximity to BCVI habitat. Lack of documented fatalities can be attributed to BCVI behavior and habitat usage, and perhaps also to the comparatively low abundance of the species and the few wind energy facilities located within the range of the species that contributed to the data reviewed by Erickson et al. (2014). Construction of the proposed project would create a collision risk for the BCVI, but that risk on a daily basis during the breeding season is believed to be extremely low. Some of the BCVI that occur in the Plan Area can be expected to face an elevated risk of collision for a very brief period of time on the one day in spring when they descend through the rotor-swept zone to the ground upon conclusion of their flights back from their wintering grounds. Individual BCVIs may also experience an elevated level of risk of collision when leaving the Plan Area for their wintering grounds, but because it is expected the birds would depart under conditions suitable for flight, the risk of collision when departing in fall should be less than the level of risk in spring, when the birds may be forced to descend through the rotor-swept zone under inclement conditions.

Overall, the risk of collision of an individual BCVI with a wind turbine is very low and the Applicant does not expect that a collision is likely to occur. The best available data on collision risk (e.g., the results of fatality monitoring studies conducted to date) have failed to document any BCVI collision mortalities at wind energy facilities, even those facilities that have been constructed in direct proximity to BCVI habitat.