BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE AMENDED JOINT APPLICATION OF THE CORONA WIND COMPANIES FOR LOCATION APPROVAL OF THE EXPANSION OF THE CORONA WIND PROJECTS RECONFIGURATION OF THE PROPOSED CORONA GEN-TIE SYSTEM, EXTENSION OF THE CORONA GEN-TIE SYSTEM AND REQUEST FOR RIGHT OF WAY DETERMINATION IN LINCOLN, TORRANCE, AND GUADALUPE COUNTIES PURSUANT TO THE PUBLIC UTILITY ACT, NMSA 1978, § 62-9-3 **ANCHO WIND LLC, COWBOY MESA LLC, DURAN MESA LLC, RED CLOUD WIND LLC, TECOLOTE WIND LLC, AND VIENTO LOCO, LLC,** **Joint Applicants.**	**Case No. 20-00008-UT**

EXHIBIT ACC-5

Pattern

STATEMENT OF ENVIRONMENTAL VALUES

Pattern Energy Group is committed to protecting the environment and this commitment plays a fundamental role in achieving our business objectives. As a renewable wind energy and transmission company, we naturally serve as active stewards of the environment. We believe that renewable energy sources are fundamental to producing energy in a way that respects the integrity of our environment. We consider it our responsibility to produce and transport clean, renewable energy to consumers with the least amount of natural impact. We recognize that our business has potential environmental impacts that are both positive and negative. Our objective is to exceed industry standards and be a leader in the advancement of best practices for the identification, assessment, and mitigation of our environmental impacts. To this end, Pattern strives to:

» Identify and assess potential environmental impacts at all stages of the life cycle of our projects, incorporate them in our decision making, and explore creative mitigations to minimize any adverse impacts.

» Comply with all environmental laws and regulations. Where there are limited regulations, we apply our own more stringent standards.

» Engage relevant stakeholders, including community representatives and national resource agencies, during the planning of our projects.

» Site and design our projects in such a manner as to respect wildlife and their habitat.

» Construct & operate our projects using best practices to prevent pollution and conserve our natural resources.

» Work to continually improve our overall environmental performance and ensure we are stewards of the environment.

Michael M. Garland
Chief Executive Officer

BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE AMENDED JOINT APPLICATION OF THE CORONA WIND COMPANIES FOR LOCATION APPROVAL OF THE EXPANSION OF THE CORONA WIND PROJECTS RECONFIGURATION OF THE PROPOSED CORONA GEN-TIE SYSTEM, EXTENSION OF THE CORONA GEN-TIE SYSTEM AND REQUEST FOR RIGHT OF WAY DETERMINATION IN LINCOLN, TORRANCE, AND GUADALUPE COUNTIES PURSUANT TO THE PUBLIC UTILITY ACT, NMSA 1978, § 62-9-3	)	**Case No. 20-00008-UT**
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Joint Applicants.	)	

EXHIBIT ACC-6

Building Wildlife-Friendly Wind

As a renewable energy company, Pattern Energy is committed to protecting the environment. We consider it our responsibility to provide renewable energy with the least amount of impact to the environment, especially when it comes to wildlife.

Pattern Energy follows in-depth wildlife protection protocols at all of our wind farms. In fact, we are one of the industry leaders in promoting environmentally-friendly wind energy, while conserving and protecting wildlife. Take a look at some of what we do to ensure that we build wildlife-friendly wind energy.

1. Identify Potential Impacts From the Start

With every new wind farm, we study and identify the wildlife that could potentially be affected by our activities before we move forward with any project.

2. Build Wisely

Once we've selected a specific location to build a wind farm, our team begins conducting studies, consulting with regulatory agencies and other stakeholders, and working with other departments at key stages of development to ensure that we

A. Avoid Impact

If there are certain areas of a site that could significantly affect wildlife, we will try to avoid that area and build around it.

Example: *If there's an eagle nest nearby, Pattern Energy will try to site project turbines away from that nest.*

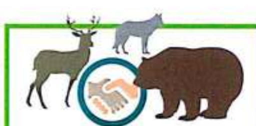
B. Minimize Impact

When avoidance isn't feasible we try to minimize impacts.

Example: *If project areas contain native prairie grassland, we will try to microsite turbines in already disturbed areas such as cropland. This helps to preserve the intact habitat that could be utilized by grouse species like prairie chickens, which are species of habitat fragmentation concern.*

C. Mitigate Impact

When avoidance and minimization isn't enough to reduce significant adverse impacts, we provide compensatory mitigation.



Example: *If impacts are unavoidable, Pattern may provide compensatory mitigation such as the purchase and management of prime habitat for at risk wildlife in the area.*

Example: *If we're in an area where there are endangered bats, we will employ various mitigation measures such as cave gating and operate our turbines in a manner that reduces impacts to bats during crucial migration periods.*

3. Monitor the Area

Our work of protecting wildlife doesn't stop once the site is up and running. We make sure that all on-site employees are mindful of local wildlife and train them in the proper protocol to avoid, minimize and mitigate impacts.

Monitoring is different and specialized for each location. Whether it's sending a biomonitor out to make sure we aren't affecting nearby endangered lizards or physically relocating species so they aren't impacted by the turbines, we employ a diverse set of tools to address specific issues of each project.

At Pattern Energy, we believe that it is fundamental to produce energy in a way that respects the integrity of our natural environment. Through our protocols, we work to continually improve our overall environmental performance so we can protect the environment, especially wildlife, at all of our wind farms.

To learn more about our environmental protocol, contact Rene Braud at rene.braud@patternenergy.com today.

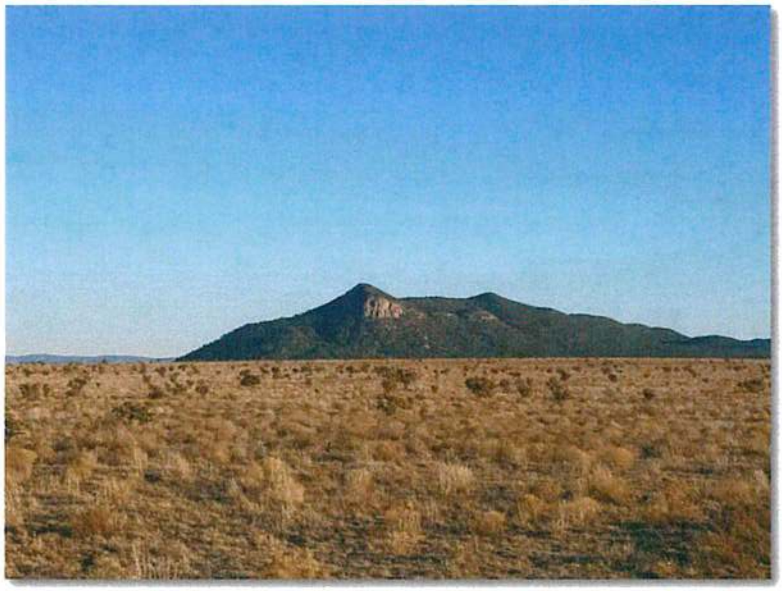
BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE AMENDED JOINT APPLICATION OF THE CORONA WIND COMPANIES FOR LOCATION APPROVAL OF THE EXPANSION OF THE CORONA WIND PROJECTS RECONFIGURATION OF THE PROPOSED CORONA GEN-TIE SYSTEM, EXTENSION OF THE CORONA GEN-TIE SYSTEM AND REQUEST FOR RIGHT OF WAY DETERMINATION IN LINCOLN, TORRANCE, AND GUADALUPE COUNTIES PURSUANT TO THE PUBLIC UTILITY ACT, NMSA 1978, § 62-9-3 **ANCHO WIND LLC, COWBOY MESA LLC, DURAN MESA LLC, RED CLOUD WIND LLC, TECOLOTE WIND LLC, AND VIENTO LOCO, LLC,** **Joint Applicants.**	)))))))))))))))))	**Case No. 20-00008-UT**

EXHIBIT ACC-7

FINAL

Supplemental Avian Protection Plan and Risk Assessment for the Extended Corona 345kV Gen-tie System Corona Wind Projects Torrance County, New Mexico



Prepared for:

Pattern SC Holdings LLC

Pattern

Prepared by:

Lori Nielsen, Grant Gardner, and Brian Barbieri

Western EcoSystems Technology, Inc.
2121 Midpoint Drive, Suite 201
Fort Collins, Colorado 80525

December 12, 2019

WEST Inc.

Confidential Business Information

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Acronyms and Abbreviations

AOU	American Ornithologists Union
APLIC	Avian Power Line Interaction Committee
APP	Avian Protection Plan
BBS	Breeding Bird Survey
BISON-M	Biota Information System of New Mexico
BFD	Bird Flight Diverter
BGEPA	Bald and Golden Eagle Protection Act
CBC	Christmas Bird Count
CFR	Code of Federal Regulations
CIA	Critical Issues Analysis
cm	centimeters
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ft	foot
gen-tie system	generator-tie transmission line
IBA	Important Bird Area
in	inch
km	kilometer
kph	kilometers per hour
kV	kilovolt
m	meter
MBTA	Migratory Bird Treaty Act
mi	mile
mph	miles per hour
NESC	National Electrical Safety Code
NHD	National Hydrography Geodatabase
NMDGF	New Mexico Department of Game and Fish
NWI	National Wetland Inventory
OHGW	overhead ground wire
OPGW	optical ground wire

Pattern	Pattern Energy Group 2 LP
ROW	right-of-way
SFD	Swan Flight Diverter
TNC	The Nature Conservancy
US	United States
USDA	US Department of Agriculture
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
USGS 3DEP	US Geological Survey 3D Elevation Program
USGS PAD-US	US Geological Survey Protected Areas Database of the United States
UV	ultra-violet
WEST	Western EcoSystems Technology, Inc.
WIRS	Wildlife Incident Reporting System

1.0 OVERVIEW

1.1 Introduction

Pattern SC Holdings LLC requested Western EcoSystems Technology, Inc. (WEST) supplement the avian risk assessment and project-specific Avian Protection Plan (APP) initially developed for the Ancho Wind, Cowboy Mesa, Duran Mesa, Gallinas Mountain Wind, Red Cloud Wind, Tecolote Wind, and Viento Loco Projects (collectively the "Corona Wind Projects") located in Guadalupe, Lincoln, and Torrance counties, New Mexico (Nielsen and Gardner 2018). Pattern SC Holdings LLC is a wholly owned subsidiary of Pattern Energy Group 2 LP (Pattern) and the Corona Wind Projects are being developed by Pattern.

The original analysis examined the Corona Gen-tie System, an 81-mile (mi; 130kilometer [km]) 345-kilovolt (kV) transmission line system, relative to potential avian risks from power line operation. This supplemental risk assessment and APP examines a new, exended 30.2-mi (48.6-km) alignment of a 345kV transmission line that connects the Corona Gen-tie System to the Western Spirit Transmission Project in Torrance County (Figure 1.1). The same bird risk parameters initially examined in March 2018 (Nielsen and Gardner 2018) were applied to this supplemental APP and subsequent risk assessment.

For the purposes of this supplemental assessment, the overall "Project" or "Project Area" is defined as more regional, encompassing the Updated Corona Wind Project Area and surrounding areas. The "Study Area" is more specific to Extended Corona Gen-tie System's 345kV transmission line alignment and associated 1-mi-wide (1.6-km-wide) buffer (the Extended Corona Gen-tie System Corridor). The goals of the avian power line risk assessment were to compare proposed line design and operation to potential interactions with both resident and migratory birds, relative to the guidance outlined by the Avian Power Line Interaction Committee (APLIC).

APLIC is comprised of a consortium of large and small utilities across the United States (US) and Canada that have developed and refined guidelines or suggested practices to minimize interactions between birds and power lines. The US Fish and Wildlife Service (USFWS) is a partner with APLIC in developing these guidelines and furthering utility orientation and education. The APLIC guidelines are voluntary and not regulatory driven, but are structured to provide guidance for adhering to the Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act (BGEPA), and Endangered Species Act (ESA).

WEST worked with Pattern to develop this project-specific APP and risk assessment to proactively plan for and minimize potential avian interactions with the Extended Corona Gen-tie System, referencing applicable portions of APLIC and USFWS (2005) *Avian Protection Plan Guidelines*, and incorporating APLIC (2006) *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* and APLIC (2012) *Reducing Avian Collisions with Power Lines: The State of the Art in 2012.* This document incorporates Pattern's commitment with APLIC's guidance and WEST's experience and professional expertise in these areas.

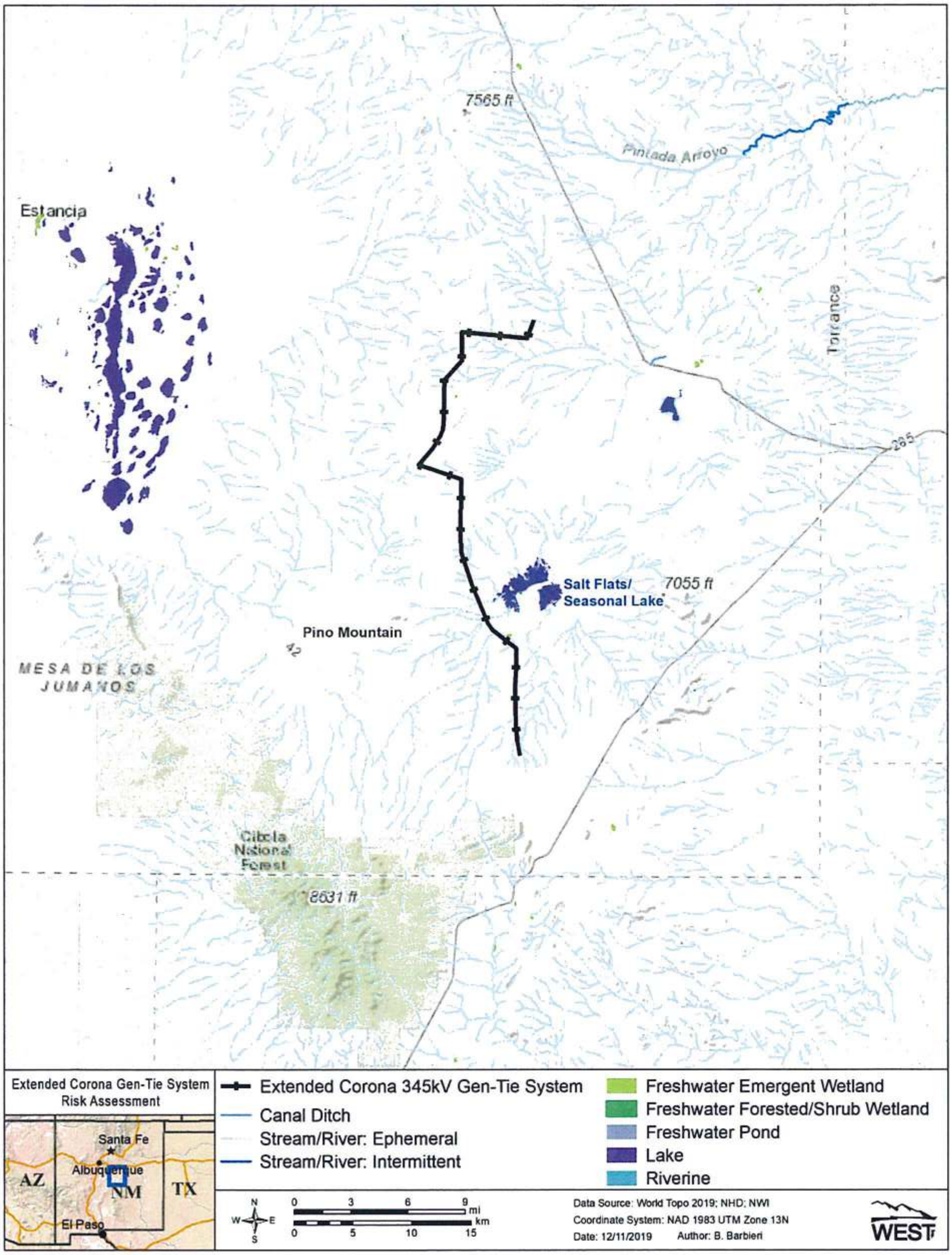

Figure 1.1. Extended Corona 345kV Gen-tie System Alignment.

1.2 Corporate Programs and Policy

1.2.1 Corporate Statement of Environmental Values

Pattern has an established corporate-wide *Statement of Environmental Values*, outlining the company's commitment to protecting the environment, which plays a fundamental role in this APP. Pattern considers it a company responsibility to produce and transport clean, renewable energy to consumers with the least amount of natural impact. Business actions may have potential environmental impacts that are both positive and negative, with the company's objective to exceed industry standards and lead the advancement of best practices for the identification, assessment, and mitigation of potential environmental impacts.

Toward this end, Pattern strives to:

- Identify and assess potential environmental impacts at all stages of a Project's cycle, incorporate them into the decision making, and explore creative mitigations to minimize potential adverse impacts.
- Comply with environmental laws and regulations, applying more stringent standards in the event regulations are limited.
- Engage relevant stakeholders, including community representatives and national resource agencies, during the planning of Pattern's projects.
- Site and design projects to account for wildlife and their habitats.
- Construct & operate projects, using best practices to prevent pollution and conserve natural resources.
- Work to continually improve overall environmental performance as environmental stewards.

1.2.2 Environmental Training and Incident Reporting

On behalf of Pattern, WEST has assisted in developing an environmental training and orientation for field personnel and contractors, focusing on federally and state-protected species that may be encountered within the Corona Wind Project region in addition to other sensitive plant and wildlife species. Environmental orientation includes ensuring awareness of the applicable laws and regulations, identification of various plant and wildlife species of concern, recommended procedures to avoid or minimize potential impacts to these species, and personnel avoidance measures for potentially harmful wildlife. Pattern also maintains a Wildlife Incident Reporting System (WIRS) that outlines the appropriate data recording needs and incident reporting procedures. A final component incorporated into this program involves adaptive management procedures, where applicable.

1.3 Federal and State Regulations

1.3.1 Federal Regulations

Three primary federal laws protect the majority of the birds and their nests in the US. These regulations include:

- Migratory Bird Treaty Act
- Bald and Golden Eagle Protection Act
- Endangered Species Act

Migratory Bird Treaty Act

Under the MBTA[1], it is illegal for anyone (including individuals, companies, or agencies) to "pursue, hunt, take, capture, kill, possess, sell, barter, purchase, ship, export, or import any migratory birds alive or dead, or any part, nests, eggs, or products thereof" except under the terms of a valid permit issued pursuant to federal regulations. Migratory bird species protected by the MBTA are listed in 50 Code of Federal Regulations (CFR) Parts 10 and 21[2]. The majority of bird species in the US are protected under the MBTA except for non-native species (which includes the house sparrow [*Passer domesticus*], European starling [*Sturnus vulgaris*], rock pigeon [*Columba livia*], Eurasian collared-dove [*Streptopelia decaocto*], monk parakeet [*Myiopsitta monachus*], and mute swan [*Cygnus olor*]) and non-migratory species, such as game birds (e.g., turkey, grouse, quail).

Bald and Golden Eagle Protection Act

The two species of eagles native to the US (bald eagle [*Haliaeetus leucocephalus*] and golden eagle [*Aquila chrysaetos*]) have additional protection under the BGEPA (50 CFR Part 22)[3], which states "no person shall take, possess, sell, purchase, barter, offer for sale, transport, export, or import any bald [or golden eagle] alive or dead, or any part, nests or eggs, thereof" without a valid permit to do so. The definition of "take" under BGEPA encompasses "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." "Disturb" is defined as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle; 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior"[4].

Endangered Species Act

Under the ESA (50 CFR Part 17) it is illegal to "import, export, take, transport, sell, purchase, or receive in interstate or foreign commerce any living or dead species federally listed as either

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[1] https://www.fws.gov/birds/policies-and-regulations/laws-legislations/migratory-bird-treaty-act.php

[2] https://www.fws.gov/migratorybirds/pdf/policies-and-regulations/MBTAListofBirdsFinalRule.pdf

[3]http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&sid=9a2c074a271d17db16c4a0fa4ca3d2ba&tpl=/ecfrbrowse/Title50/50cfr22_main_02.tpl

[4] https://www.fws.gov/midwest/midwestbird/eaglepermits/bagepa.html

threatened or endangered." "Endangered" is defined as a species that is in danger of extinction throughout all or a significant portion of its range. "Threatened" is defined as a species that is likely to become endangered within the foreseeable future[5]. The list of federally listed species in the US is provided by the USFWS[6]. The ESA has an established process to assess potential effects to federally listed species, and the project type and location should dictate the type of process that should apply.

1.3.2 State Regulations

States typically have statutes and regulations that broadly protect native wildlife species. In addition to protecting federally listed species within their borders, many states maintain a list for state-listed threatened or endangered species. Note: although upland game birds, such as wild turkey and quail, are not protected under the MBTA, they are regulated by state wildlife laws.

Fish and wildlife in New Mexico are protected under New Mexico Statutes, Chapter 17. New Mexico has the New Mexico Wildlife Conservation Act (NM ST § 17-2-37), which is voluntary and operated through landowner cooperation. Additionally, the New Mexico Department of Game and Fish (NMDGF) maintains a list of state threatened or endangered species at the Biota Information System of New Mexico (BISON-M 2017).

1.4 Avian Interactions with Power Lines

As a foundation for this avian risk assessment, WEST has outlined the basic premises specific to bird interactions with overhead power lines, since not all power lines or structures pose a risk to birds. Risks to birds for both electrocution and collision are generally defined by the line's voltage, structure configurations, at-risk bird species potentially present, line or structure location, habitat types in proximity to the line, and other human-related influences in the vicinity of the lines and structures.

1.4.1 Avian Electrocution Risk with Overhead Power Lines

The electrocution risk to birds on power line structures is directly related to the line's voltage, structure configuration, and clearances between structure components, combined with biological and site-specific factors. Other factors that influence avian electrocution risk include line or pole location, bird size, age of a bird, social behavior, habitats (e.g., open versus forested), weather (e.g., precipitation, sun/heat, wind), aerial contaminants (e.g., salt, dust), prey abundance, and propensity of certain bird species to perch or nest on power line structures.

Raptors often use power line structures for hunting perches (Olendorff et al. 1981) and nesting (Boeker and Nickerson 1975; Benson 1981; APLIC 2006), particularly in open habitats. Benson (1981) reported perch height and increased topography are important to eagles and can contribute to the frequency of eagle electrocutions. Birds that commonly forage in and near water, such as bald eagles, ospreys (*Pandion haliaetus*), and great blue herons (*Ardea herodias*), may be at increased risk of electrocution on structures with insufficient clearances. Since water

[5] https://www.fws.gov/endangered/laws-policies/index.html

[6] https://www.fws.gov/endangered/species/us-species.html

increases conductivity, wet outer primary feathers on a bird significantly increases its electrocution risk. Similarly, a saturated wood pole can become grounded, resulting in an increased electrocution risk for birds.

A bird's dimensions are integral in assessing the potential for it to make phase-to-phase (i.e., energized-to-energized) or phase-to-ground (i.e., energized-to-ground or to a neutral) contact with power line infrastructure. These dimensions encompass the horizontal distance between the fleshy part of a bird's wrists on the wings and its height from head to the fleshy part of the tail. Established guidelines to minimize the electrocution risk or exposure to large, perching birds in the US have delineated clearances on power line structures for at-risk bird species. Between potential contact points, a minimum of 60 inches (in; 152 centimeters [cm]) horizontal clearance and 40 in (102 cm) vertical clearance have been recognized for distribution voltages (12.47/7.2kV and 24.9/14.4kV) and sub-transmission voltages (34.5kV to 60kV; APLIC 2006; Figure 1.2). Increased clearances on a power line structure increase the distances between potential contact points, thereby reducing the relative avian electrocution risk.

Power line structure configurations across the landscape are not equal in electrocution risk to birds and can disproportionately affect avian electrocution risk. As an example for distribution voltages in northwestern Colorado, Harness and Wilson (2001) documented 24% of all structures were deadend units within an area that contained 51% of the overall detected raptor mortality, and 17% of all units were transformer banks that reflected 22% of detected raptor mortality. Therefore, two at-risk configurations (totaling 41% of all structure units) resulted in 73% of all raptor fatalities in one study.

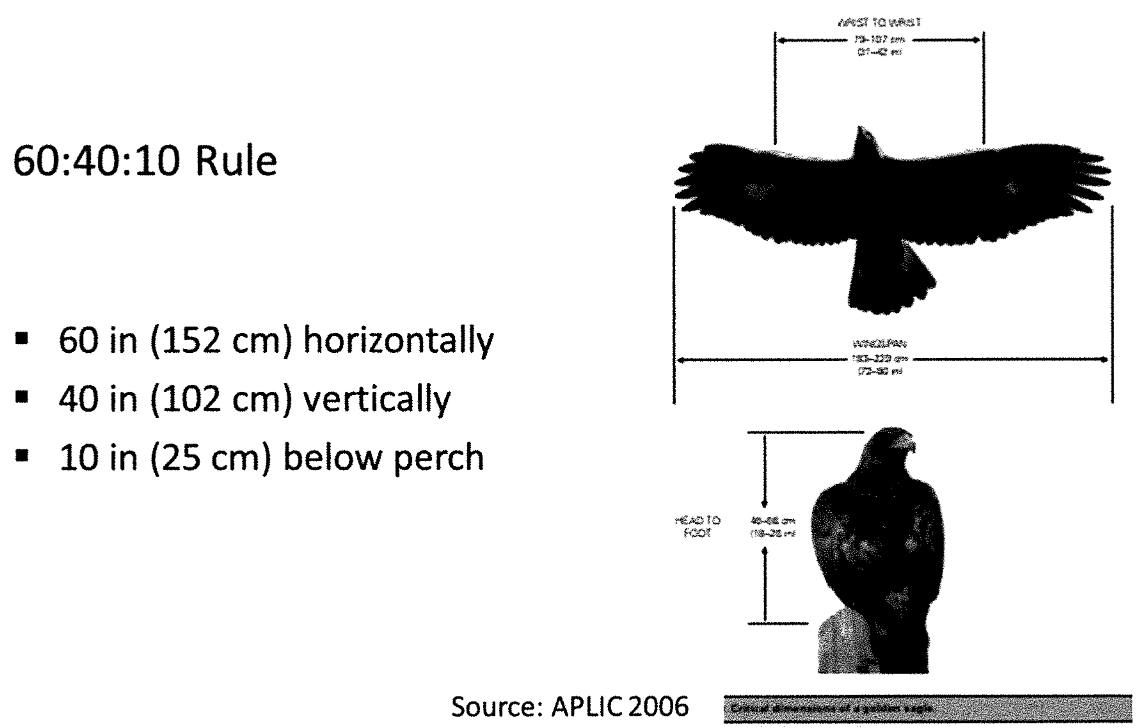

Figure 1.2. Standard recommended clearances for birds on power lines less than 69kV.

As voltage increases over 60kV, additional clearances are necessary beyond the 60 in (152 cm) horizontally and 40 in (102 cm) vertically defined for distribution and sub-transmission voltages to minimize exposure to perching birds (APLIC 2006). Table 1.1 summarizes the recommended phase-to-phase and phase-to-ground clearance for voltages up to 345kV. Power lines ≥161kV typically maintain sufficient distances between phase-to-phase and phase-to-ground contact points, based on clearances established by the National Electrical Safety Code (NESC). Avian electrocution risk <161kV depends on the structure configuration relative to the size of potential bird species present.

Table 1.1. Recommended avian clearances by voltage for phase-to-phase and phase-to-ground contact points.

Phase-to-Phase (+0.2 in [0.5 cm] x 1kV >60kV)			Phase-to-Ground (Phase-to-Phase Voltage/1.732) (+0.2 in [0.5 cm] x 1kV >60kV)		
Line Voltage (kV)	**Horizontal Spacing in (cm)[1]**	**Vertical Spacing in (cm)[1]**	**Nominal Voltage (kV)**	**Horizontal Spacing in (cm)[1]**	**Vertical Spacing in (cm)[1]**
≤60	60 (152)	40 (102)	35	60 (152)	40 (102)
69	62 (157)	42 (107)	40	60 (152)	40 (102)
115	71 (180)	51 (130)	66	61 (155)	41 (105)
120	72 (182)	52 (132)	69	62 (157)	42 (107)
138	76 (191)	56 (141)	80	64 (162)	44 (112)
230	94 (237)	74 (187)	133	75 (189)	55 (139)
345	117 (295)	97 (245)	199	88 (222)	68 (172)

Sources: APLIC 2006; WEST (L. Nielsen and S. Ehmke, pers. comm.) 2019.

[1]Applied formulas versus straight conversion to metric.

In = inches; cm = centimeters; kV = kilovolt.

1.4.2 Avian Collision Risk with Overhead Power Lines

Avian collision risk with overhead lines is not uniform, and determining the relative risk or exposure is generally governed by the type of electrical infrastructure in proximity to bird species or bird groups potentially present, the way birds use the surrounding habitats, and level of human influences (Olendorff and Lehman 1986, Bevanger and Brøseth 2001, Harness et al. 2003, Mojica et al. 2009, APLIC 2012). Site-specific factors include which bird species may be present that are more susceptible to colliding with overhead lines, specific line design, line orientation and placement, topography, surrounding habitats, weather, bird morphology, flight characteristics, and patterns of human use.

Biological variables that influence a bird species' susceptibility to line collision includes bird size and maneuverability, flight characteristics, vision, and behavior (Anderson 1978; Beaulaurier et al. 1982; Faanes 1987; Bevanger 1994; Janss 2000; Bevanger and Brøseth 2001; Harness et al. 2003; Mojica et al. 2009; Rollan et al. 2010; APLIC 2012). Morphological characteristics also influence a bird species' collision risk. For example, birds with high wing loading (ratio of body weight to wing area or how much weight is supported by the wing) are more susceptible to collisions with overhead lines than birds with low wing loading. Additionally, birds with low aspect ratios (ratio of the wing breadth divided by wing length) are more prone to collision than birds with high aspect ratios (APLIC 2012).

Flight characteristics include a bird's altitude and flight speed when approaching an overhead line, which can be important in defining the risk of birds colliding with the lines (Beaulaurier et al. 1982). Species flying low and/or fast have a higher risk of colliding with power lines (Thompson 1978; Meyer and Lee 1979; Faanes 1987), particularly if the birds are preoccupied (e.g., territorial defense, courtship, prey pursuit, predator avoidance; Olendorff and Lehman 1986). Flying in flocks restricts visibility and maneuverability, increasing collision risk (APLIC 2012).

The altitude of migratory birds (several hundred to several thousand feet above the ground) is typically far greater than the height of even the largest transmission line structures in the US (i.e., less than 200 feet [ft; 61 meters (m)]; APLIC 2012). However, the orientation and location of power lines to stopover habitats used by migratory birds, weather, and local habitats all are important (Heck 2007, APLIC 2012). Lines that bisect bird movement corridors between roosting and foraging habitats may increase the avian collision risk or potential exposure (Bevanger 1994, APLIC 2012), particularly near areas that attract migrating waterfowl or waterbirds, such as wetlands, lakes, playas, and rivers.

Proximity of power lines to locations where birds are landing or taking off is important in assessing the potential collision risk or exposure (Faanes 1987, Stehn and Wassenich 2008). During daily movements and migratory stopovers, crossing power lines at low altitudes several times a day puts birds at a greater exposure for potential line collision (Willard 1978), as does flying in low light or during inclement weather (Faanes 1987, Morkill and Anderson 1991, APLIC 2012).

Human activities near power lines may directly affect bird collision rates in areas where the two overlap. Roosting or foraging birds may flush from human presence, particularly pedestrian activities in an area, increasing the collision risk and bird mortality in areas with distribution or transmission power lines (James and Haak 1979; APLIC 2012; Heck et al. 2016). Land use also plays a factor in determining bird use and movement within an area, including locations of infrastructure and human-related activities on the landscape.

Other factors important in assessing avian collision risk include power line configuration. Vertical vs. horizontal conductor design determines the number of horizontal planes flying birds may need to navigate. The smaller-diameter overhead ground wires (OHGW) and/or optical ground wire (OPGW) on transmission structures increases bird collision risk from a reduced visibility to birds.

Based on these factors, species of large, heavy-bodied birds with large wing spans and lower maneuverability have been shown to be more susceptible to power line collisions, such as cranes, herons, swans, pelicans, and geese. Other susceptible species are represented by smaller, heavy-bodied birds that are fast fliers with short, wide wings, such as ducks, rails, coots, and grebes (APLIC 2012).

Limited studies have documented eagles and other raptors colliding with overhead power lines. Raptors are adept flyers and raptor collision incidents with overhead lines occur with much less frequency than collision incidents with other bird species (Bevanger 1994). Raptors possess highaccuracy eyesight, are agile fliers, and typically do not exhibit behavioral or flight characteristics that would increase collision risk with overhead lines; although, they may be more susceptible to overhead line collision when preoccupied or distracted (Olendorff and Lehman 1986, Harness et al. 2003). Although there is a limited number of anecdotal accounts of bald and golden eagle collisions with overhead lines in the US, two studies have documented bald eagle collisions with distribution lines. One study reported bald eagle collisions near a fish cannery in Alaska (Harness et al. 2003); the second study confirmed 21 bald eagle collisions over a 22-year period along approximately 932 mi (1,500 km) of three-phase distribution lines on the Aberdeen Providing Grounds in Maryland (Mojica et al. 2009).

A two-year, pre- and post-construction study of diurnal-migrating raptors crossing the Kittatinny Ridge in New Jersey, within a prominent raptor migration corridor of the Atlantic Flyway, reported a 23% increase in the proportion of raptors flying above the height above ground relative to a 500/230kV transmission line post-construction, with two species (turkey vulture [*Cathartes aura*] and sharp-shinned hawk [*Accipiter striatus*]) showing a significant increase in altitude during the post-construction surveys. These results infer that the line's conductors and marked overhead shield wire were more visually apparent to the migrating raptors and the birds adjusted their flight altitude accordingly (Luzenski et al. 2016).

2.0 EXTENDED CORONA GEN-TIE SYSTEM

The Extended Corona Gen-tie System is a proposed 30.2-mi (48.6-km) single- and double-circuit 345kV transmission line, located in Torrance County that would connect the Corona Gen-tie System to the Western Spirit Transmission Project. The 1-mi (1.6-km) Study Area buffer surrounding the Extended Corona Gen-tie System defines the Extended Corona Gen-tie System Corridor, which is shown in Figure 2.1. As discussed in Chapter 4.0, *Methods and Metrics*. This 1-mi (1.6-km) study buffer was used for the risk analysis, based on a number of studies that have documented bird fatalities along power lines, extending from 197 ft (60 m) to 1 mi (1.6-km) from the power line right-of-way (ROW; Brown et al. 1984, 1987; Faanes 1987; Stehn and Wassenich 2008; Murphy et al. 2009; APLIC 2012).

Representative transmission structures are shown in Figures 2.2 and 2.3. Figure 2.2 depicts a single-circuit 345kV transmission structure with braced-post insulator array and two OPGWs for facility communications supported on davit arms. Figure 2.3 depicts a double-circuit 345kV transmission structure, also with braced-post insulator arrays and two OPGWs. Both horizontal and vertical dimensions are shown for both structure types.

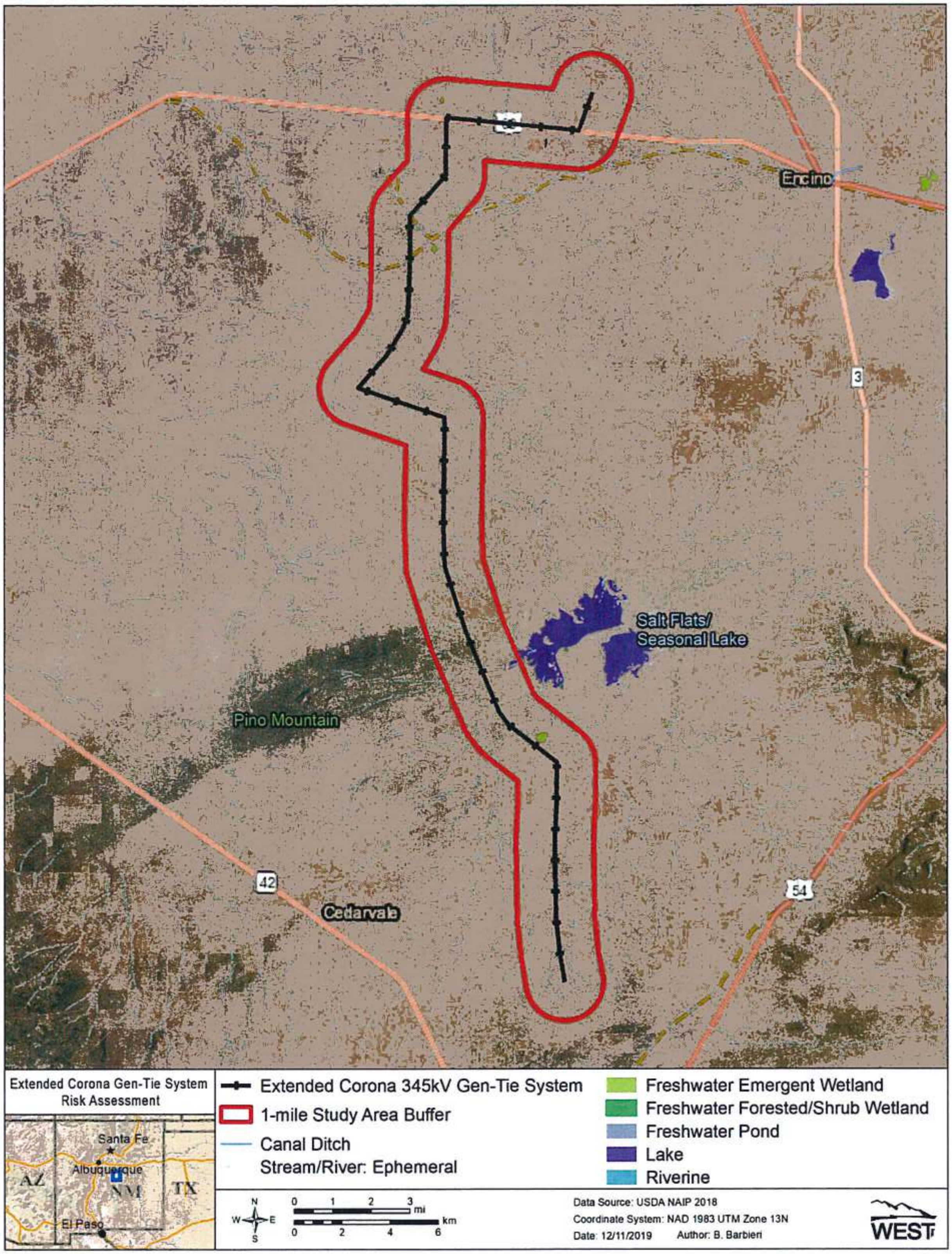

Figure 2.1. Extended Corona 345kV Gen-tie System Corridor with 1-mile (1.6-kilometer) Study Area buffer.

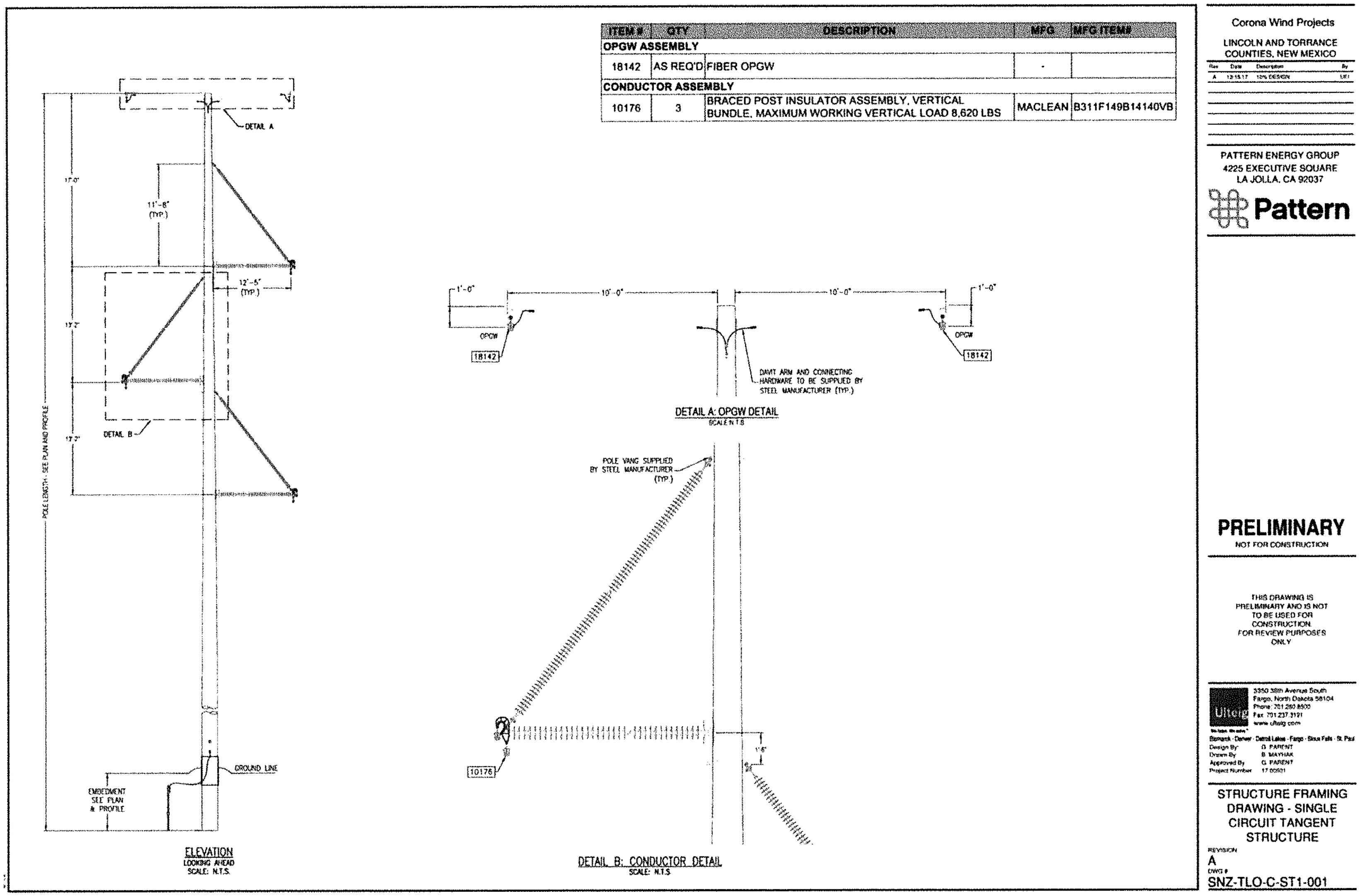

Figure 2.2. Representative single-circuit 345kV transmission tangent structure with braced-post insulator array and two Optical Ground Wires.

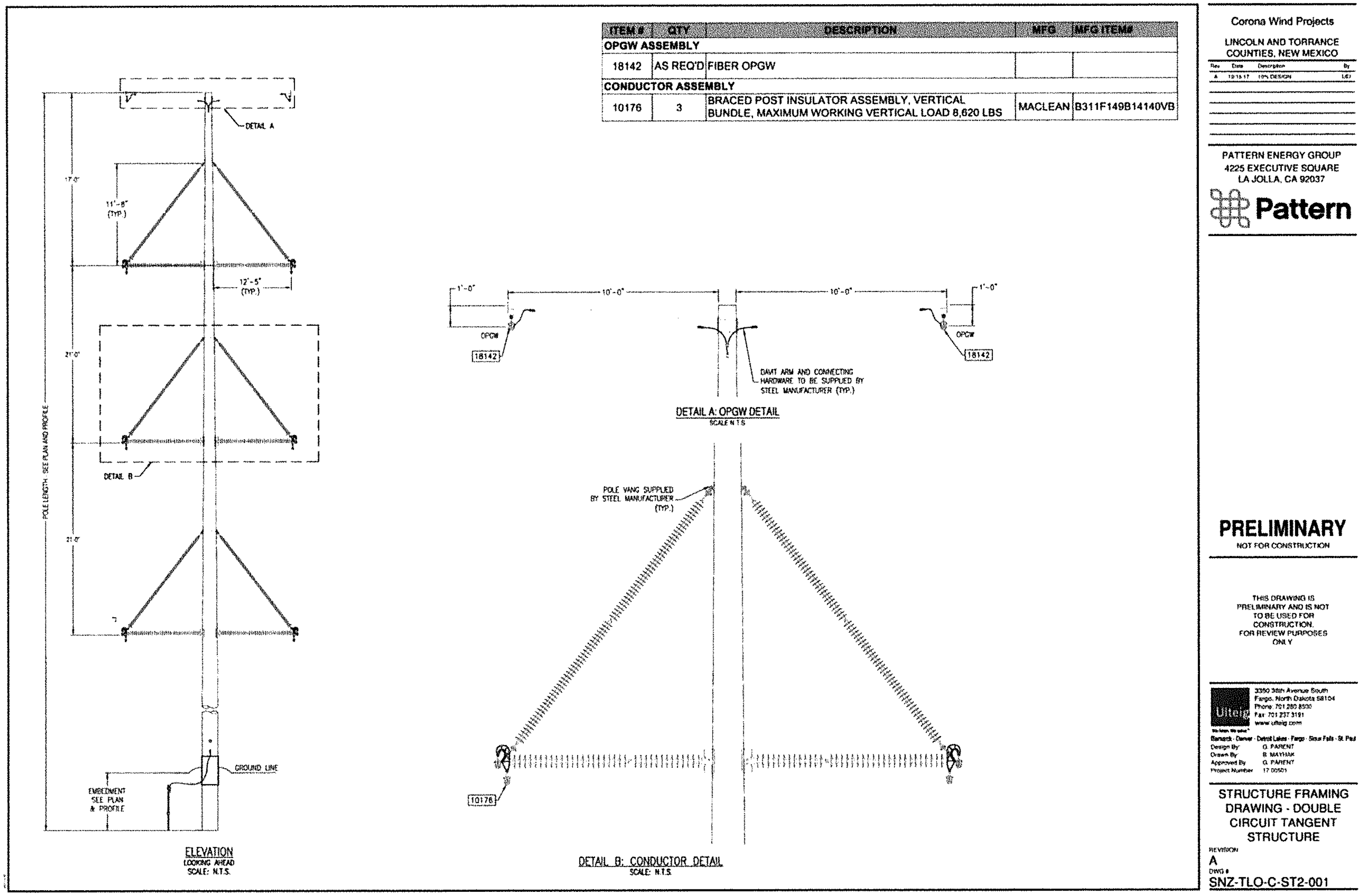

Figure 2.3. Representative double-circuit 345kV transmission tangent structure with braced-post insulator arrays and two Optical Ground Wires.

3.0 PROJECT AND STUDY AREA

3.1 Habitats and Land Use

The Corona Wind Projects and associated Extended Corona 345kV Gen-tie System (connecting the Corona Gen-tie System to the Western Spirit Transmission Project) are located in a relatively flat arid landscape with short grasslands and shrub/scrub interspersed with rocky outcrops, ridgelines, ephemeral drainages, and scattered playas. The Study Area is located within the Southwestern Tablelands Ecoregion (US Environmental Protection Agency [EPA] 2016), with common vegetation including grama grasses (*Bouteloua gracilis*), buffalo grass (*Bouteloua dactyloides*), junipers (*Juniperus* spp), piñon pine *(Pinus edulis*), and Gambel oak (*Quercus gambelii*). Land use is primarily open range livestock grazing. Representative photos of these regional habitats and topography are provided in Figures 3-1 through 3-4.

3.2 Avian Species Assessed

A Critical Issues Analysis (CIA) was prepared for each of the Corona Wind Projects. These CIA reports characterized regional biological resources, with applicable information incorporated into this risk assessment for the Extended Corona Gen-tie System, where applicable. Based on historical documentation of bird species more susceptible to power line interactions (APLIC 2006, 2012) and to ensure federally and state-listed species are addressed, the following section and summary tables focus on waterbirds, waterfowl, vultures, raptors, corvids, and special status species identified for this region.

Avian studies for the Corona Wind Projects have been conducted in the overall Project Area from January 2017 through November 2019, encompassing the Western Spirit Wind Project. Table 3.1 presents a list of bird species originally identified for the Corona Wind Projects' CIA studies that may potentially occur in the Project Area. Table 3.2 lists the species of waterbirds, waterfowl, vultures, raptors, and corvids (typically examined relative to potential interaction with overhead power lines) documented during the initial field surveys for the Corona Wind Projects in 2017 and the Western Spirit Wind Project from January 2017 through November 2019. These survey data help to characterize potential bird use within the regional Project Area and along the Extended Corona Gen-tie System Corridor, based on species' distribution, known occurrences, and habitat associations.

Figure 3.1. Representative flat grassland habitat.

Figure 3.2. Representative ephemeral playa wetland within grassland habitat.

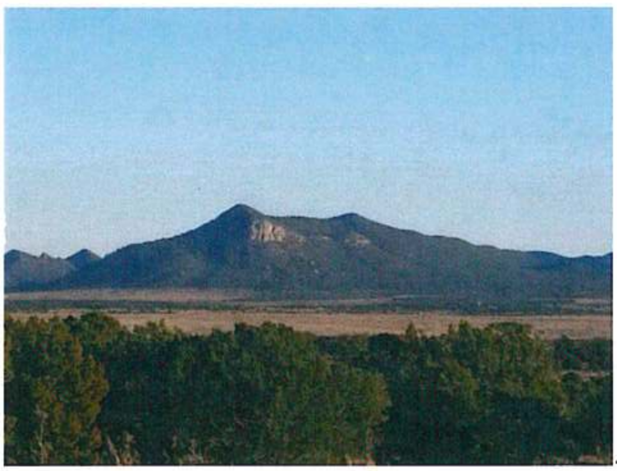

Figure 3.3. Representative piñon-juniper interface with grasslands and forested hills and cliff habitats.

Figure 3.4. Representative ridgeline within grassland and shrub-scrub habitats.

Table 3.1. Avian species including diurnal and nocturnal raptors, vultures, and federally and state-listed species with the potential to occur in or near the Extended Corona Gen-tie System Corridor.

Common Name	Scientific Name	Status[1]	Potential to Occur Along Extended Corona Gen-tie System Corridor[2]
Waterbirds			
Brown pelican	*Pelecanus occidentalis*	SE	NL y
Vultures			
Turkey vulture	*Cathartes aura*		L sp, su, f
Diurnal Raptors			
Osprey	*Pandion haliaetus*		P sp, su, f
Bald eagle	*Haliaeetus leucocephalus*	ST, BGEPA	L w
Golden eagle	*Aquila chrysaetos*	BGEPA	P y
Northern harrier	*Circus cyaneus*		P w
Sharp-shinned hawk	*Accipiter striatus*		P y
Cooper's hawk	*Accipiter cooperii*		P y
Northern goshawk	*Accipiter gentilis*		P y
Common Black hawk	*Buteogallus anthracinus*	ST	NL sp, su
Harris's hawk	*Parabuteo unicinctus*		P y
Zone-tailed hawk	*Buteo albonotatus*		P sp, su
Red-tailed hawk	*Buteo jamaicensis*		P y
Swainson's hawk	*Buteo swainsoni*		P sp, su, f
Rough-legged hawk	*Buteo lagopus*		P w
Ferruginous hawk	*Buteo regalis*		P y
American kestrel	*Falco sparverius*		P y
Merlin	*Falco columbarius*		P w
Prairie falcon	*Falco mexicanus*		P y
Peregrine falcon	*Falco peregrinus*	ST	L y
Nocturnal Raptors			
Barn owl	*Tyto alba*		P y
Great-horned owl	*Bubo virginianus*		P y
Mexican spotted owl	*Strix occidentalis lucida*	FT	P y
Cuckoos and Roadrunners			
Yellow-billed cuckoo	Coccyzus americanus	FT	NL sp, f
Passerines			
Sprague's pipit[3]	*Anthus spragueii*		P sp, f, w
Gray vireo	*Vireo vicinior*	ST	P sp, su
Baird's sparrow	*Ammodramus bairdii*	ST	P sp, f
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE, SE	NL sp, f
Broad-billed hummingbird	*Cynanthus latirostris*	ST	NL sp, su

Sources: Garber and Young 2005, Sibley 2014, BISON-M 2017, LeBeau et al. 2017a, 2017b, 2017c.

[1]Federally endangered (FE), federally threatened (FT), state-endangered (SE), state-threatened (ST), Bald and Golden Eagle Protection Act (BGEPA); all species protected under Migratory Bird Treaty Act (MBTA).

[2]Potential to occur: Likely (L), Possible (P), Not Likely (NL); Seasonality: spring (sp), summer (su), fall (f), winter (w), year-round (y).

[3]At the time the Critical Issues Analyses were generated for the Corona Wind Projects, the Sprague's pipit was a candidate species for federal listing; however, on April 5, 2016, the Sprague's pipit was removed from the federal candidate list.

Table 3.2. Avian species including waterbirds, waterfowl, vultures, raptors, and corvids observed during fixed point bird counts for the Corona Wind Projects and Western Spirit Wind Project from January 2017 through November 2019.

Bird Species	Scientific Name	Corona Wind Projects No. Individuals	Western Spirit Wind Project No. Individuals (Groups)
Waterbirds			
Sandhill crane	*Antigone canadensis*	385	378 (17)
Great blue heron	*Ardea herodias*	1	1 (1)
Least sandpiper	*Calidris minutilla*		1 (1)
Long-billed curlew	*Numenius americanus*	92	38 (10)
Waterfowl			
Green-winged teal	*Anas crecca*	7	2 (2)
Mallard	*Anas platyrhynchos*		2 (1)
Canada goose	*Branta canadensis*		2 (1)
Unidentified duck		8	
Vultures			
Turkey vulture	*Cathartes aura*	915	1,432 (842)
Diurnal Raptors			
Osprey	*Pandion haliaetus*	1	2 (2)
Northern harrier	*Circus hudsonius*	30	60 (60)
Golden eagle	*Aquila chrysaetos*	34	42 (42)
Bald eagle	*Haliaeetus leucocephalus*		2 (2)
Ferruginous hawk	*Buteo regalis*	2	3 (3)
Red-tailed hawk	*Buteo jamaicensis*	122	164 (156)
Swainson's hawk	*Buteo swainsoni*	92	184 (161)
Zone-tailed hawk	*Buteo albonotatus*		1 (1)
Rough-legged hawk	*Buteo lagopus*	2	
Unidentified buteo		6	1 (1)
Prairie falcon	*Falco mexicanus*	10	6 (6)
American kestrel	*Falco sparverius*	112	175 (167)
Merlin	*Falco columbarius*	1	2 (2)
Cooper's hawk	*Accipiter cooperii*	4	8 (8)
Sharp-shinned hawk	*Accipiter striatus*	5	9 (8)
Nocturnal Raptors			
Great-horned owl	*Bubo virginianus*	2	7 (3)
Burrowing owl	*Athene cunicularia*	18	1 (1)
Corvids			
Chihuahuan raven	*Corvus cryptoleucus*	3	5 (3)
Common raven	*Corvus corax*	2,501	3,161 (1,822)

3.3 Bird Species Examined for Collision Risk Assessment

Of the bird species summarized in Tables 3.1 and 3.2, a number of these species are not emphasized as part of this supplemental APP and risk assessment for the Extended Corona Gen-tie System. Specific to electrocution risk, no bird electrocution risk applies to operation of a 345kV transmission line, because of the phase-to-phase and phase-to-ground clearances that far exceed bird dimensions (see Chapter 5.0, *Results*). The following discussions focus on those bird species that may be more at risk of colliding with the overhead lines based on historical studies and reports' if the overhead lines bisect established movement corridors or use areas (APLIC 2012). These groups would include waterbirds, waterfowl, eagles, and federally and state-listed bird species. Important habitats would include those used by either resident birds for nesting or foraging or by migratory birds for stopover foraging or roosting, particularly habitat types and topography that may concentrate bird use and movement.

Most migrating birds in North America tend to migrate in a "broad front" pattern (Greenberg and Marra 2005). Within the Project Area and overall region, habitats that may attract nesting, foraging, and roosting birds would include piñon-juniper woodlands, woodland-grassland interface, ridgelines, rock outcrops, and scattered ephemeral water sources (i.e., drainages, wetlands, freshwater ponds, salt flats, seasonal lakes, playas). The proposed 345kV transmission structures also could provide perch and nesting sites for roosting, foraging, and breeding birds (e.g., golden eagles, other raptors, vultures, corvids), particularly within the grassland and grassland-woodland interface. Migrating birds moving through the area would likely use ephemeral water resources as stopover habitats when seasonally inundated, the native grasslands and shrublands, and scattered woodlands for both foraging and roosting.

Habitats located in or near the Gen-tie System Study Area that may concentrate migratory bird activity would primarily include seasonal water sources and trending ridgelines. The only large water body that occurs in or near the Extended Corona Gen-tie System Study Area is the over 2,000-acre seasonal lake and associated salt flats identified by the USFWS NWI database (USFWS NWI 2019) located on State lands and extending 1-4 mi (1.6-6.5 km) east of the Corona Expansion Gen-tie System Corridor (see Figures 1.1 and 2.1 and Appendix A). Potential use by waterbirds, waterfowl, raptors, and songbirds likely would be limited to the intermittent seasonal wet periods, when the basin is inundated, particularly during spring migration.

3.3.1 Waterbirds and Waterfowl

As shown in Table 3.2, large numbers of sandhill cranes (*Antigone canadensis*) and long-billed curlews (*Numenius americanus*) were recorded moving through the Project Area. Sandhill crane observations were primarily recorded during the fall migration (i.e., October), indicating concentrated migratory movements through the Project Area. Crane flight heights ranged from approximately 60 ft (18 m) to 200 ft (61 m) above the ground. Long-billed curlews also were observed primarily during the fall period.

Sandhill cranes can be susceptible to overhead line collisions, based on their body size, mass, and flight behavior (Brown et al. 1987, Faanes 1987, Stehn and Wassenich 2008, APLIC 2012). However, the risk of colliding with power lines for many waterbirds and waterfowl primarily entails the orientation and location of the lines to high-use areas, such as lakes, wetlands, wet meadows, playas, and agricultural grain fields. The potential for either of these waterbird species to occur along the Gen-tie System Study Area during migration would depend on the level of inundation of regional ephemeral wetlands, freshwater ponds, playas, and seasonal lakes during wet seasons. During wet spring or fall seasons, the likelihood of occurrence could be moderate to high; whereas, during dry seasons, the likelihood of occurrence may be low to none.

The brown pelican (*Pelecanus occidentalis*), a state-endangered species in New Mexico (BISON-M 2017), is not likely to occur in the Project Area or Gen-tie System Study Area (Table 3.1). This species breeds from California and the Mid-Atlantic states southward to South America (American Ornithologists Union [AOU] 1998). The species typically occurs in marine habitats in warmer water where it feeds exclusively on fish, and rarely occurs inland. In New Mexico, brown pelicans are rare yet consistent visitors to the state. Through May of 2012, over 112 reports involving 127 individual birds have been made from 20 of New Mexico's 33 counties, including Lincoln County to the south, with most of the observations reported at large lakes and along major rivers (NMDGF 2012). Observations have been reported year-round; however, they are most frequent in summer through fall. Due to the species' rarity in New Mexico, little is currently known about its habits within the state.

The only water body sufficiently large to attract potential brown pelicans would be the seasonal lake that may encompass over 2,000 acres when inundated (see Figures 1.1 and 2.1 and Appendix A). Although there may be a potential for migratory brown pelicans to use this seasonal lake as a stopover habitat for roosting during migration, the overall potential for brown pelican to occur in this area would be low, only occurring during wet spring or fall seasons, when the lake is inundated.

3.3.2 Vultures

Only one vulture species, the turkey vulture (*Cathartes aura*) occurs in the overall region and Study Area. Although the CIAs identified this species as a low likelihood of occurrence during the spring, summer, and fall for the Corona Wind Projects, a significant number of individuals were documented during the Corona Wind Projects' and Western Spirit Wind Project's fixed point bird count surveys (Table 3.2). A number of international vulture species have been shown to be susceptible to collisions or electrocutions with power line infrastructure; however, few reports of turkey vulture collisions have been documented in the US (APLIC 2012). The potential for turkey vultures to occur within the Study Area would be high, based on documented occurrences of this species in the project region. Given the lack of natural perches in some areas, vultures may also use the transmission line structures for perching.

3.3.3 Raptors

<u>Bald Eagle</u>

The bald eagle is listed as a state-threatened species in New Mexico and also is protected under the BGEPA. Bald eagles are listed as potentially occurring within the region as an occasional winter visitor (Stahlecker and Walker 2010; Table 3.1). Christmas Bird Count (CBC) data reported 62 bald eagles at the Ruidoso CBC location, which occurs approximately 65 mi (104 km) south of the Study Area. Additionally, three bald eagles were reported at the Five Points CBC location, which occurs approximately 60 mi (96 km) west and northwest of the Study Area (Audubon 2017). A review of eBird (2017) data for Torrance County reported a total of 12 bald eagles observed during the late summer, fall, and winter. No bald eagles were observed during the Corona Wind Projects' fixed point count surveys; two bald eagles were recorded during the surveys for the Western Spirit Wind Project (Table 3.2).

Bald eagles most commonly forage near large open lakes, reservoirs, and rivers; however, individuals also may forage over open upland grasslands, woodlands, and woodland edges and along wetlands and livestock ponds, where they may opportunistically prey upon secondary food sources, such as carrion and small- to medium-sized mammals (Buehler 2000). Based on historical occurrence data and habitat associations common to bald eagles, the potential to occur in or near the Gen-tie System Study Area would be low and most likely in the late fall or winter potentially foraging within the dry, upland habitats or along ephemeral wetlands during seasonal inundations and wet periods. The highest likelihood of occurrence would be centered on the large seasonal lake and salt flats located on State lands 1-4 mi (1.6-6.5 km) east of the Corona Expansion Gen-tie System Corridor (see Figures 1.1 and 2.1 and Appendix A) where migratory eagles may be attracted to concentrations of waterfowl or waterbirds as potential prey when the lake contains surface water.

Golden Eagle

The golden eagle also is protected under BGEPA. Golden eagles are listed as possibly occurring in the Study Area year-round. Golden eagles breed within the region, as breeding territories have been historically documented in every county in New Mexico except Lea County in the southeast (Stahlecker et al. 2010). Breeding Bird Survey (BBS) data from the nearby Claunch BBS route (approximately 9 mi [14 km] southwest of the Corona Expansion Gen-tie System Corridor) included four observations of golden eagles over 18 years of surveys (Sauer et al. 2014). Known golden eagle nest sites are shown in Map 1 of 4 in Appendix A.

Golden eagles also winter and migrate through New Mexico (Stahlecker et al. 2010). A review of CBC data from 20 years of surveys reported three golden eagle observations at the Ruidoso CBC location, approximately 65 mi (104 km) south of the Study Area, and 57 golden eagle observations at the Five Points location, approximately 60 mi (96 km) west and northwest of the Study Area (Audubon 2017). eBird (2017) data reviewed at the county level included approximately 115 golden eagle observations within Torrance County, with observations occurring year-round but more concentrated in late summer, fall, and winter. During the avian point count surveys conducted for the Corona Wind Projects and Western Spirit Wind Project, a total of 34 and 42 golden eagles were observed and recorded, respectively (Table 3.2).

Based on this information and documented observations, the potential for golden eagles to occur within the Study Area would be moderate to high year-round, with individuals likely using rocky ridges and outcrops for foraging and transmission structures for perching. Nesting by eagles on the structures would not be likely, given the 345kV structure designs, using a monopole design with the braced-post insulator array (Figures 2.2 and 2.3).

Common Black Hawk

The common black hawk is listed as state-threatened in New Mexico (BISON-M 2017). This neotropical raptor reaches the northern geographic limits of its range in the southwestern US. In New Mexico, the common black hawk is considered an uncommon but regular summer resident (NMDGF 2012). Historically, the species was largely restricted to the San Francisco, Gila, and Mimbres drainages, but, although rare, it is increasing east to the middle Rio Grande Valley, the Hondo Valley, and the middle and lower Pecos Valley (NMDGF 2012). In the Southwest, breeding common black hawks require mature, well-developed riparian forest stands (e.g., cottonwood bosque) that are located near permanent streams where the principal prey of fish, amphibians, and reptiles is available (Schnell 1994).

The common black hawk has been documented as occurring in Lincoln County to the south (BISON-M 2017), and eBird (2017) records show a total of 26 observations in Lincoln County. However, no black hawks were observed during the Projects' fixed point count surveys (Table 3.2). Based on the lack of suitable breeding and primary foraging habitats and historical trends in observations, the potential for the black hawk to occur within the Gen-tie System Study Area would be low to very low.

Peregrine Falcon

The peregrine falcon is a state-threatened species (BISON-M 2017) and is listed as likely to occur in the overall Project Area as an occasional year-round visitor (Table 3.1). Peregrines are known to nest on south-facing cliffs on Carrizo Peak, located approximately 45 mi (72 km) southwest of the Study Area (L. Cordova pers. comm.) and along the Sacramento escarpment above La Luz and Alamogordo, approximately 96 mi (154 km) south of the Study Area. Approximately 80 peregrine falcon observations for Torrance County have been submitted to eBird, with most observations recorded in late summer and fall (eBird 2017).

Peregrine falcons are associated with habitats from sea level to 13,000 ft (4,000 m), including plains, grasslands, shrublands, forests, and deserts (Cade 1982). Peregrine falcons show little preference for specific ecological communities, but their hunting behavior makes them most adapted to open or partially wooded habitats (Ratcliffe 1988). In New Mexico these birds typically nest on cliffs and flat mesas and may hunt in grassland and woodland habitats, but generally these birds occupy areas near bodies of water where concentrations of waterfowl and shorebirds, primary prey species, occur (Garber and Young 2005).

Although no suitable nesting habitat for the peregrine falcon occurs in or near the Extended Corona Gen-tie System Corridor, potential foraging habitat may be associated with the over 2,000-acre seasonal lake and salt flats located 1-4 mi (1.6-6.5 km) east of the 345kV transmission ROW (see Figures 1.1 and 2.1 and Appendix A). Concentrations of migratory waterfowl and waterbirds, when present, may attract foraging peregrine falcons within the region. No peregrine falcons were recorded during the Projects' avian fixed point surveys from January 2017 through November 2019 (Table 3.2).

Mexican Spotted Owl

The Mexican spotted owl (*Strix occidentalis lucida)* is federally listed as threatened and shown to possibly occur year-round within forested mountains and rocky and forested canyons in New Mexico (USFWS 2015). This species occurs from southern Utah and Colorado, south through Arizona, New Mexico, and west Texas into the mountains of central Mexico, typically at elevations between 4,100-9,000 ft (1,250-2,743 m; USFWS 2017). Mexican spotted owls have been known to migrate between 5-31 mi (8-50 km) for short periods over the winter season (USFWS 2017).

The USFWS designated critical habitat for the Mexican spotted owl in Lincoln National Forest (Habitat Unit BR-E-4; USFWS 2004), approximately 40 mi (64 km) south of the Study Area. The USFWS also designated critical habitat in Cibola National Forest in western Torrance County (Habitat Unit BR-E-5) approximately 40 mi (65 km) west of the Study Area (USFWS 2004). However, the Extended Corona Gen-tie System Study Area occurs outside the elevational and ecological range for this species. Based on occurrence data and habitats, there is no potential for the Mexican spotted owl to occur in or near the Gen-tie System Study Area or along the Project Corridor. Additionally, this species is not commonly found on or near power line infrastructure (APLIC 2012).

Other Raptor Species

Substantial numbers of other raptor species were recorded in the Project Area and near the Extended Corona Gen-tie System Study Area. Northern harriers (*Circus hudsonius*), red-tailed hawks (*Buteo jamaicensis*), Swainson's hawks (*Buteo swainsoni*), and American kestrels (*Falco sparverius*) were all relatively common during the Projects' point count surveys conducted January 2017 through November 2019 (Table 3.2). These four species, as well as other raptors, such as great horned owl (*Bubo virginianus*) are relatively common to the overall region but are not known to be susceptible to colliding with overhead power lines (APLIC 2012).

3.3.4 Corvids

Two corvid species (Chihuahuan raven [*Corvus cryptoleucus*] and common raven [*Corvus corax*]) were recorded during the Corona Wind Projects' avian point county surveys conducted from January 2017 through November 2019 (Table 3.2). Of note is the 2,501 and 3,161 common ravens recorded during the Corona Wind Projects' and Western Spirit Wind Project surveys, respectively, which reflect the more arid habitats in and near the Project Area and Extended Corona Gen-tie System Study Area.

3.3.5 Other Federally or State-listed Species

Six other special status species were identified in Table 3.1, one cuckoo and five passerines. However, none of these six bird species is known to be susceptible to colliding with overhead power lines (APLIC 2012). These six species include: the yellow-billed cuckoo (*Coccyzus americanus*), Sprague's pipit (*Anthus spragueii*), gray vireo (*Vireo vicinior*), Baird's sparrow (*Ammodramus bairdii*), southwestern willow flycatcher (*Empidonax traillii extimus*), and broad-billed hummingbird (*Cynanthus latirostris*).

4.0 METHODS AND METRICS

Potential risk factors associated with avian interactions with power lines were applied to the Extended Corona Gen-tie System to assess project-specific risks to birds in both the short term and long term and for both resident and migratory species. WEST conducted a desktop risk assessment, focusing on potential collision risk to specific bird species with the Extended Corona Gen-tie System. As stated, no electrocution risk is associated with a 345kV transmission line, which is discussed further in Chapter 5.0, *Results*.

A primary component of assessing collision risks to birds from power line operation is to compare the engineering components (i.e., line design, line location, voltage class), the biological components (i.e., species likely present, species use, known or potential for bird concentrations, habitat types, topography), and existing human influences (e.g., roads, land uses, development, land ownership). Engineering design and line location for the Gen-tie System were provided by Pattern's Engineering personnel. Existing biological data were used to complete this analysis, encompassing Project-specific reports, regional data, and examination of current and historic aerial imagery. Existing human influences were examined relative to these other components also using current aerial imagery.

4.1 Landscape Features and Habitats

Data layers used to overlay with the aerial imagery and 345kV transmission line alignment of the Gen-tie System included:

- National Wetland Inventory (NWI) data (USFWS NWI 2019)
- National Hydrography Geodatabase (NHD; US Geological Survey [USGS] USGS NHD 2019)
- Existing Roads (US Census Bureau 2019)
- Topography (USGS 3D Elevation Program [USGS 3DEP] 2017)
- Land Ownership (USGS Protected Areas Database of the United States [PAD-US] 2019)
- US Department of Agriculture (USDA) National Agricultural Statistics Service Cropland Data Layer (USDA 2019)
- The Nature Conservancy (TNC) Wildlife Habitat Features Dataset (TNC 2019)

Additional land features were identified during the desktop assessment, based on historical and current imagery, including rocky outcrops, ridgelines, piñon-juniper woodland corridors, ephemeral wetland basins, freshwater ponds, and stock ponds. Historical imagery provided a record of landscape changes important to bird use, such as encroachment of shrub-scrub (i.e., piñon-juniper) into open grasslands or shallow ephemeral wetland basins. Habitats were delineated and ranked in and adjacent to the Corona Expansion Gen-tie System Corridor (1-mi [1.6-km] Study Area along the 345kV ROW alignment).

4.2 Ranking Overhead Collision Risk

Daily movements where birds cross power lines at low altitudes, birds ascending and descending to roost or forage, and birds flying during inclement weather all increase the potential exposure or risk to birds colliding with overhead lines, depending on where the line is located relative to potential bird use areas (Willard 1978, Faanes 1987, Morkill and Anderson 1991, Stehn and Wassenich 2008, APLIC 2012). Specific to the Gen-tie System Study Area, the avian collision risk analysis focused on the proximity and orientation of the transmission ROW to areas of potential bird concentrations; low-altitude movement corridors; and where birds may be landing, taking off, or soaring.

Bird collision risk with overhead lines is based on the relative exposure of birds and will vary among line segments. Although bird collision risk will never be 0%, risk can be ranked by line segments, relative to habitats and land use in proximity to segments and potential for at-risk bird species to use movement paths between potential roosting and foraging areas (i.e., daily movement, migratory stopover but not migratory overflights). As discussed in Section 1.4.2, *Avian Collision Risk with Overhead Power Lines*, the typical altitude of migratory birds is generally several hundred to several thousand feet above the ground during migratory flight. Therefore, the focus for migrating birds is the potential for individuals landing and taking off in proximity to the Extended Corona Gen-tie System Corridor or where low-altitude flights may intersect with the line.

The following ranking categories were applied to the avian collision risk reviews:

- **Rank 1:** line span relative to areas with high habitat quality and/or areas of anticipated high bird use
- **Rank 2:** line span relative to (a) areas of moderate habitat quality or (b) areas of high habitat quality and anticipated moderate bird use
- **Rank 3:** line span relative to (a) disturbed areas or areas of a high level of human influences with areas of moderate to high bird use or (b) moderate habitat quality with areas of anticipated moderate bird use

5.0 RESULTS

5.1 Avian Electrocution Risk

Figures 2.3 and 2.4 depict the single- and double-circuit tangent structure configurations and associated insulator arrays proposed for the 345kV transmission line. As shown in these figures, the dimensions of the 345-transmission line far exceed the clearances needed for 345kV, at 117 in (10 ft; 3 m) horizontal and 97 in (8 ft; 2.5 m) vertical phase-to-phase and 88 in (7.5 ft; 2.2 m) horizontal and 68 in (5.7 ft; 1.7 m) vertical phase-to-ground (see Table 1.1). Therefore, no electrocution risk to perching birds would apply to the 345kV transmission line operation as part of the Extended Corona Gen-tie System.

5.2 Avian Collision Risk

The majority of the 345kV study area is located within The Nature Conservancy's (TNC) delineated "Intact Habitats" for wildlife, based on regional habitat features and agency input, inferring good contiguous wildlife habitat and few cumulative human effects have affected habitats and associated habitat values in this region. In addition to relative habitat value, eagle and other raptor areas also are identified in the region by the TNC (2019; see Appendix A), based on habitat types, historical occurrences, and likelihood to occur.

No designated "critical habitat" or "protected areas;" known bird concentration areas (e.g., foraging, roosting, stopover, wintering); or Important Bird Areas (IBA) are known to occur within 10.0 mi (16.0 km) of the proposed Extended Corona Gen-tie System Corridor. The avian collision risk focused on landscape features and habitats in and adjacent to the Gen-tie System's Study Area. Table 5.1 summarizes the two areas identified and ranked by risk along the ROW. Details for these areas are provided below, relative to the recorded risk factors.

Table 5.1. Results of avian collision risk assessment for Extended Corona Gen-tie System.

Ref. Area No.	Map No.[1]	Rank	Segment Length	Landscape Feature	Comments
1	2 of 3	**3**	1.3 mi (2.1 km)	Lake, salt flats, rolling woodland, Pino Mountain	Line crosses rolling topography with piñon-juniper woodland, bisecting potential bird movement corridor between >2,000-acre lake and salt flats on State lands, extending 1-4 mi (1.6-6.5 km) east of the ROW, and Pino Mountain and eagle/raptor area located 4 mi (6.5 km) west of the ROW.
2	3 of 3	**3**	0.4 mi (0.6 km)	Lake, salt flats, rolling woodland, Pino Mountain	Line crosses State land, bisecting area between series of small, linear rock outcrops extending 0.8 mi (1.3 km) to the west and 30-acre freshwater emergent wetland located 1.6 mi (0.26 km) to the northeast of the ROW.

[1]See Appendix A, including overview maps.

5.2.1 Reference Area Number 1 – Rank 3

This line segment crosses the eastern edge of an east-west trending ridge of rolling topography and piñon-juniper woodland (see Maps 2 and 3 of 4 in Appendix A). An ephemeral lake (>2,000 acres; USFWS NWI 2019) and associated salt flats extend from 1 to 4 mi (1.6 to 6.5 km) east of the ROW (see Figures 1.1 and 2.1 and Appendix A), showing consistent and historical inundation through Google Earth aerial imagery from 1997 through 2016. The piñon-juniper woodland extends from the ROW west for over 45 mi (70 km), with Pino Mountain located approximately 4 mi (6.5 km) west of the transmission line ROW (see Figure 2.1 and Appendix A). Surrounding Pino Mountain, is an area designated as eagle / other raptor habitat by the TNC (2019; see overview maps in Appendix A).

In the spring of 2019, an aerial reconnaissance conducted over this seasonal lake by WEST and Pattern showed a large number of waterfowl on the lake surface. Based on the lake's size and location and associated salt flats, it is assumed this area could attract and concentrate a substantive number of waterfowl, waterbirds, and songbirds during the spring or fall, and possible winter. Additionally, eagles and other raptor species may be attracted to this area for foraging.

The transmission line bisecting these habitats may potentially increase collision risk to area birds, particularly given the extent of the ephemeral lakes, salt flats, and woodland habitats connecting the native habitats from east to west. However, the lower risk of Rank 3 was assigned, based on the distance of the line from potential surface water areas and the arid nature of the habitats immediately surrounding the ROW.

5.2.2 Reference Area Number 2 – Rank 3

The 345kV transmission line ROW crosses a parcel of State land, bisecting a series of small, linear rock outcrops with scattered piñon-juniper, with the ridges extending 0.8 mi (1.3 km) to the west (see Maps 2 and 4 of 4 in Appendix A) and a 30-acre freshwater emergent wetland (USFWS NWI 2019) located 1.6 mi (0.26 km) to the northeast of the ROW (see Appendix A). During wet periods, this ephemeral wetland may attract concentrations of migrant and resident birds (e.g., waterbirds, raptors, songbirds). Birds moving between the playa and the rocky ridges and other habitats to the west may increase collision risk, as birds descend to or ascend from the playa. However, the historical imagery of the surface water for this ephemeral wetland or playa shows surface inundation may have been decreasing since 1997, with a trend toward reduced water availability over the 20-year period. Based on these factors, the risk would be bird collision risk is considered to be low.

6.0 DISCUSSION

6.1 Extended Corona Gen-tie System Avian Protection Plan Implementation

APLIC's suggested practices to minimize bird interactions with electrical infrastructure (2006, 2012) are voluntary, and it is Pattern's prerogative in determining how best to implement this APP and avian risk assessment, in accordance with the company's *Statement of Environmental Values*. Implementing an APP is a balance of proactive program planning, reactive actions on an as-needed basis, and new construction engineering design standards. Because site-specific factors will vary across geographic areas and voltage classes, engineering review and authorization for any potential mitigation approach are integral to successful APP implementation. These recommendations provide Pattern with both short- and long-term planning options to assess where best to mitigate or reduce potential collision risks. WEST has outlined optional mitigation approaches to minimize risks to birds from operation of the Extended Corona 345kV Gen-tie System for Pattern's consideration.

6.2 Relative Risk and Mitigation Options

6.2.1 Relative Risk

As stated, no electrocution risk would apply to a 345kV transmission line, given the NESC clearance standards required.

Bird collision risks with overhead transmission line segments will vary, based on a number of site-specific variables. Although avian collision risk with overhead power lines cannot be totally eliminated (APLIC 2012), assessing the relative exposure of or risk to birds from line operation, given the suite of engineering, environmental, and landscape variables, helps to measure and compare the risks to at-risk bird species potentially present.

Historical imagery examined as part of the desktop assessment provided a record of landscape changes (e.g., reduced surface water inundation in smaller playas) and landscape values (e.g., periodic but consistent surface water availability in the over 2000-acre ephemeral lake located east of the ROW). Incorporating both types of trends into long-term Project planning is important for APP implementation, in order to minimize potential future long-term risks to birds from transmission operation.

The 2,000-acre seasonal lake and associated salt flats identified by the USFWS NWI database (USFWS NWI 2019) located 1-4 mi (1.6-6.5 km) east of the ROW would provide the greatest regional value to birds when inundated with surface water (see Figures 1.1 and 2.1 and Appendix A). Although potential use by waterbirds, waterfowl, raptors, and songbirds likely would be limited to the intermittent seasonal wet periods, when the basin is inundated, a large number of birds may periodically use this area for foraging and roosting, particularly during migratory stopover.

6.2.2 Mitigating Long-term Bird Risk

Retrofitting or modifying existing facilities may be warranted when a structure or line segment is determined to have higher avian mortality risk, through either risk assessment results or procedures implemented if a bird fatality is found on the system. One approach to reduce avian collision risk is to mark the overhead shield wire (i.e., OHGW, OPGW) on transmission lines. Although the efficacy of marking devices varies based on a wide range of studies and statistical analyses, increasing a line profile and its visibility has been shown to reduce bird collision risk anywhere from 29% to 96% (Morkill and Anderson 1991, Alonso et al. 1994, Janss and Ferrer 1998, Crowder 2000, Frost 2008, Yee 2008, Murphy et al. 2009, Stake 2009, Ventana Wildlife Society 2009, APLIC 2012, Sporer et al., 2013). APLIC (2012) states spacing intervals of 16-98 ft (5-30 m) are the most commonly used and recommended for line marking devices. Jenkins et al. (2010) further states any line marking device that increases the line appearance 8 in (20.3 cm) in diameter, 4-8 in (10.2-20.3 cm) in length, and spaced 16-32 ft (4.9-9.8 m) apart can reduce the avian collision rate by 50% to 80%. However, site-specific applications of markers to line segments generally depend on the line voltage, configuration, and at-risk bird species potentially present.

The objectives of remedial actions are to reduce the avian mortality risks, while also reducing or preventing system outages and faults caused by bird interactions with electrical infrastructure. Retrofitting to minimize bird risk is determined on a case-by-case basis, depending on site-specific variables and engineering, and ultimately this decision is the prerogative of Pattern, based on engineering considerations, corporate policy, and costs. Retrofit approaches also must meet safety and operational requirements, and potential limitations should be identified (e.g., ice and wind loading, insects, contaminants, tracking on devices).

WEST has provided the following information on line marking options as a potential tool to minimize long-term collision risks. By ranking the two segments identified for the Extended Corona Gen-tie System (Rank 3 level, which is defined as an overall low risk of collision; see Table 5.1), Pattern can determine whether applicable mitigation approaches are warranted, depending on environmental and engineering considerations.

If Pattern determines through their environmental and engineering reviews that line marking is warranted, marking the applicable segments of the Extended Corona Gen-tie System would entail staggered marking of the two overhead shield wires on the 345kV transmission line (i.e., OPGWs; Figure 6.1) by a qualified helicopter crew. Device spacing would be determined on a site-specific basis, given span length, engineering considerations, and which at-risk bird species or group may be present.

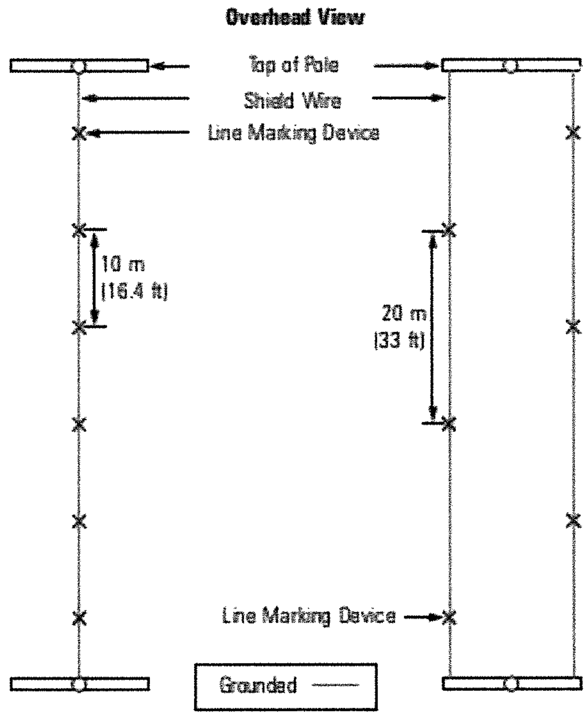

Figure 6.1. Example of line marking on a single overhead shield wire or staggered on two parallel overhead shield wires (source APLIC 2012).

6.2.3 Line Marking Options

A variety of devices are available for line marking, specific to birds and reducing bird collision risk with these overhead lines, including "static," "dynamic," and "hybrid" devices. Dynamic devices contain moving parts (e.g., suspension swivels); static devices do not. Hybrid devices do not contain moving parts, but may move in the wind (e.g., rocking motion).

For marking overhead shield wires on a 345kV transmission line, WEST would recommend static or hybrid marking devices that do not contain moving parts, particularly given the line size, line access, and rural areas that may be prone to vandalism (e.g., target shooting). However, as with any line operational decision, wire-marking devices should be assessed based on their respective properties (e.g., static, dynamic, glow-in-the-dark), bird species potentially present (e.g., federally listed species, bird concentrations), and device durability (e.g., wind, ice, ultra-violet [UV] light).

Line marking devices:

- Static or hybrid devices are recommended for a 345kV transmission line's overhead shield wires (including the OPGWs).

- Some OPGW manufacturers restrict devices with clamps for marking OPGW, indicating the warranty will be voided. However, other clamp manufacturers and some research infer damage to the fiber optic cable would not occur. Correct device installation is integral. WEST recommends consulting with the individual OPGW vendors to ensure the device chosen is appropriate for the OPGW cable operation.
- Recommended spacing of line markers vary, depending on anticipated bird species, environmental conditions, line configuration, wire diameter or size, line location, and engineering specifications (e.g., wind and ice loading).

<u>Power Line Sentry - Bird Flight Diverter</u>

The Power Line Sentry Bird Flight Diverter (BFD) is both dynamic and static (i.e., hybrid device) and provides 24-hour glow-in-the-dark properties. Figures 6.2 and 6.3 illustrate both the device and device placement on overhead lines for the Power Line Sentry BFD.

Specifications

- UV resistant
- Florescent reflective yellow prism tap; 24-hour glow tape for improved dawn, dusk, and night visibility
- Withstands over 100 miles per hour (mph; over 161 kilometers per hour [kph]) winds for sustained periods
- Patented "V" shape design for maximum contrast at all angles
- Hotstick or Extended Stick application
- Size: .08-in thick x 6-in wide x 4-in tall (0.2-cm thick x 15-cm wide x 10-cm wide)
- Weight: 4.7 ounces (133 grams)
- Sheds ice
- Will not void OPGW warranty
- To date, devices are known to stay in place and not abrade cable
- Helicopter installation has been shown to be faster than spiral device installation

Figure 6.2. Power Line Sentry Bird Flight Diverter.

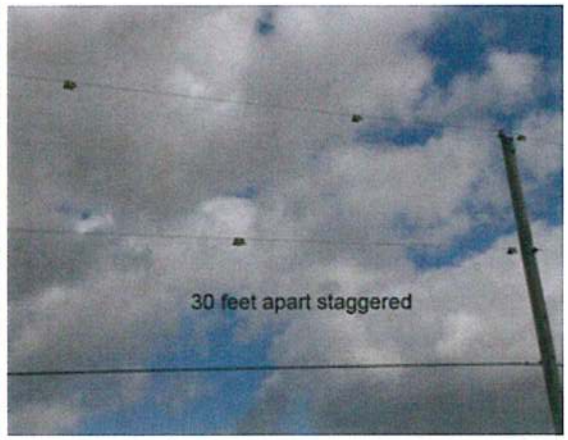

Figure 6.3. Power Line Sentry Bird Flight Diverter installed on overhead lines.

Preformed Products - Swan Flight Diverter

- The Swan Flight Diverter (SFD) is "static" and remains in place on the wire
- Good longevity
- Applications have shown the SFD holds up well to UV; yellow color may fade to gray in time
- SFDs also are advertised to shed ice by rotating with the weight

Specifications:

- Increased conductor profile
- Minimal wind resistance
- Manufactured from gray or yellow high impact PVC with UV protection
- Will not void OPGW warranty
- Engineering review is important
- Helicopter installation is a proven installation method

Figures 6.4 and 6.5 illustrate both the device and device placement on overhead lines for the Preformed SFD.

Figure 6.4. Preformed Swan Flight Diverter.

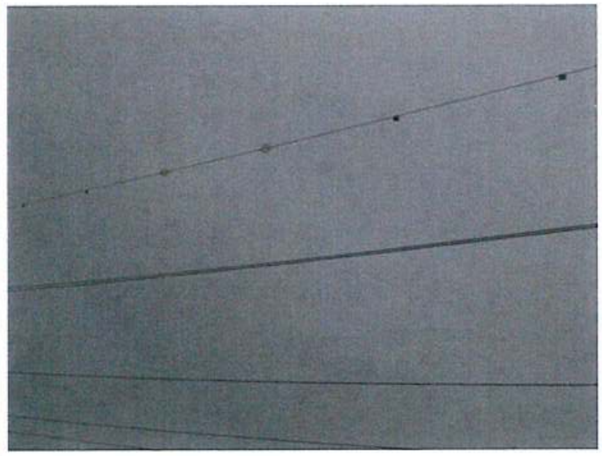

Figure 6.5. Preformed Swan Flight Diverter installed on overhead lines with alternating Power Line Sentry Bird Flight Diverter.

Table 6.1 compares engineering testing conducted on both the Preformed SFD and the Power Line Sentry BFD-075.

Table 6.1. Engineering Testing Results: Preformed SFD versus Power Line Sentry BFD (BFD-075)[1]

Test	SFD (lbs)	BFD-075 (lbs)
Ice loading at 1.2 inches (3 centimeters; vertical)	13.1	1.0
Wind loading at 102 miles per hour (transverse)	10.4	5.0
Average 31 markers vertical ice load	406	31
Average 31 markers transverse wind load	322	155

Source: American Transmission Company.
[1]Metric equivalents not included in table.
lbs = pounds; SFD = Swan Flight Diverter; BFD = Bird Flight Diverter.

6.2.4 Summary

This project-specific APP and avian risk assessment focused on potential bird collision with the overhead wires from operation of the Extended Corona 345kV Gen-tie System. The focus of this APP was to conduct a desktop risk assessment, comparing the proposed Extended Corona Gen-tie System design and location to biological and landscape features for potential interactions with both resident and migratory birds. This risk assessment was conducted according to suggested practices outlined by APLIC (2006, 2012) and per WEST's experience and professional expertise in this area.

No electrocution risk to perching birds would apply to the Extended Corona Gen-tie System, given the phase-to-phase and phase-to-ground clearances for 345kV transmission. As part of the avian collision risk assessment, WEST examined a suite of engineering, environmental, and landscape variables, identifying two Rank 3 line segments that reflect a relatively low collision risk to area birds, depending on environmental factors (e.g., precipitation, seasonal, prey base, etc.).

Because APLIC suggested practices for minimizing avian collision risk with overhead power lines are voluntary (APLIC 2012), WEST provided mitigation options for Pattern's consideration to potentially mark applicable line segments and reduce potential collision risks. Ultimately, it is Pattern's prerogative on how to implement this APP, and if Pattern determines through their environmental and engineering reviews that line marking is warranted along applicable segments of the Extended Corona Gen-tie System, this would entail staggered marking of the two overhead shield wires (OPGWs) by a qualified helicopter crew. Marker spacing would be determined, based on engineering considerations and target bird species.

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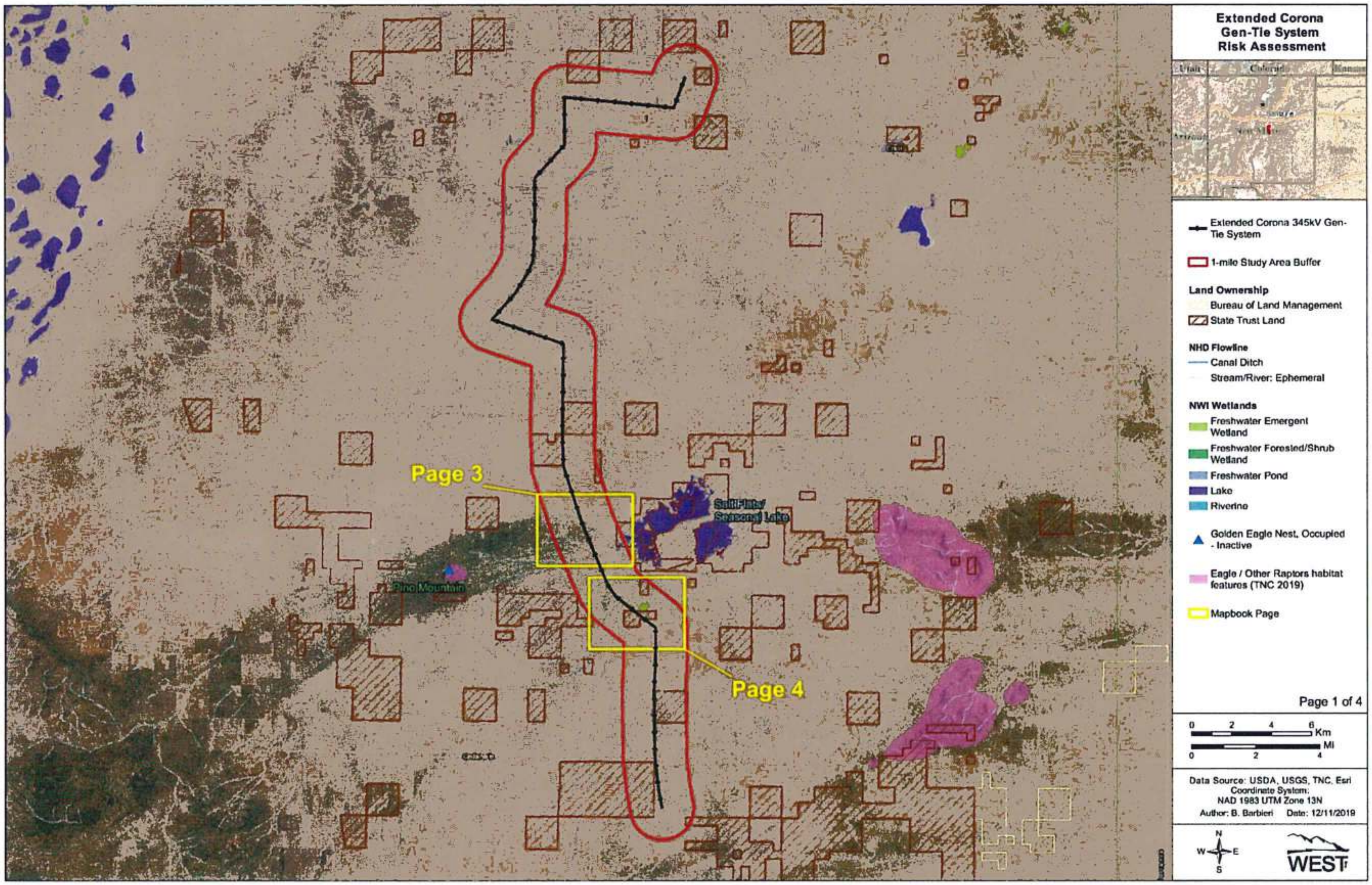
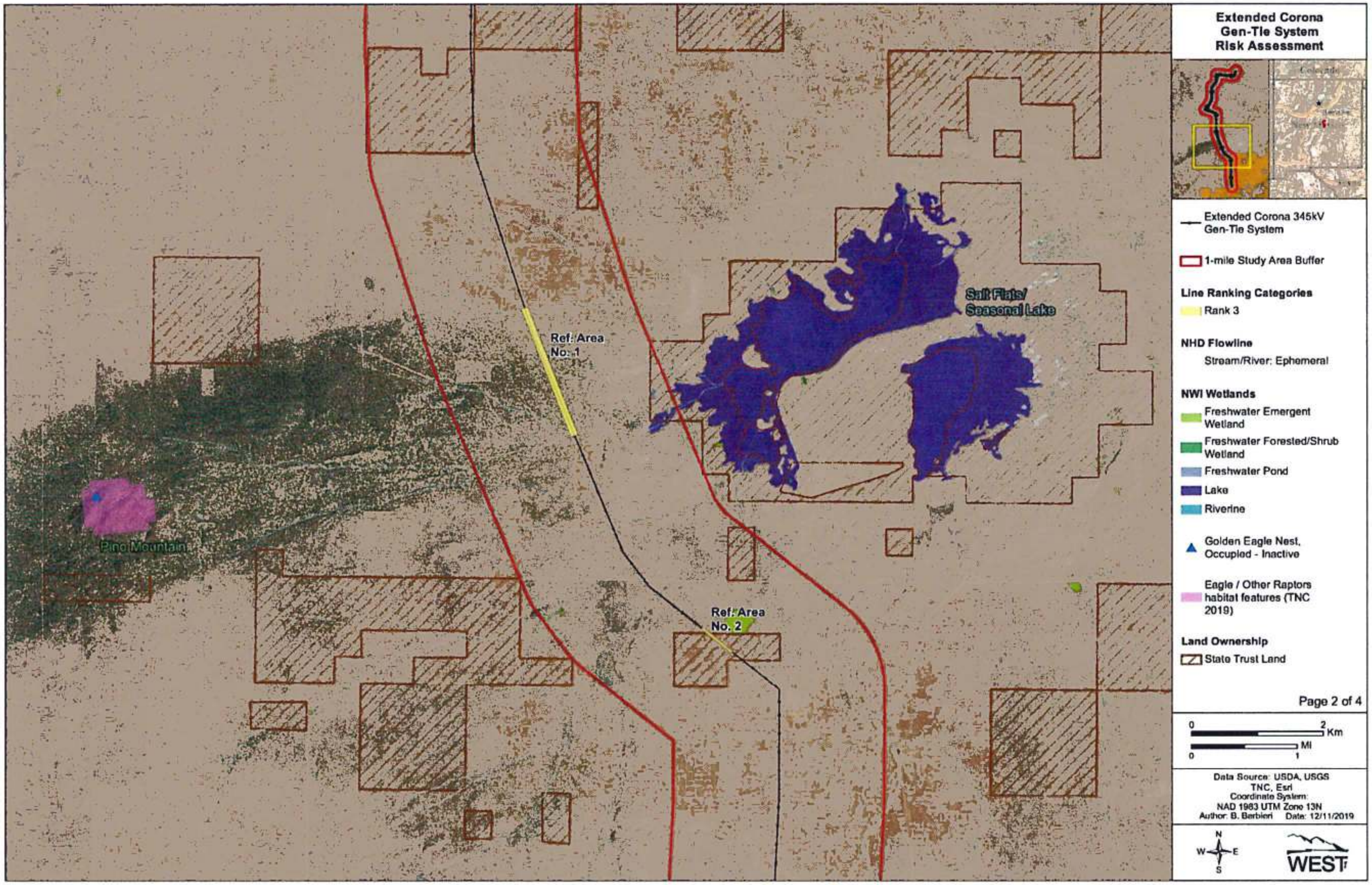
Willard, D.E. 1978. The Impact of Transmission Lines on Birds (and Vice Versa). Proceedings on Impacts of Transmission Lines on Birds in Flight. M. L. Avery, ed. FWS/OBS-78/48.

Yee, M.L. 2008. Testing the Effectiveness of an Avian Flight Diverter for Reducing Avian Collisions with Distribution Power Lines in the Sacramento Valley, California. California Energy Commission, PIER Energy-Related Environmental Research Program. CEC-500-2007-122

Appendix A. Avian Collision Risk Assessment Results within 1 Mile (1.6 Kilometer) of the Alignment of the Extended Corona 345kV Gen-tie Transmission Line


Extended Corona
Gen-Tie System
Risk Assessment
Page 3
Page 4
Salt Flats/ Seasonal Lake
Pine Mountain
Extended Corona 345kV Gen-Tie System
1-mile Study Area Buffer
Land Ownership
Bureau of Land Management
State Trust Land
NHD Flowline
Canal Ditch
Stream/River: Ephemeral
NWI Wetlands
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine
Golden Eagle Nest, Occupied - Inactive
Eagle / Other Raptors habitat features (TNC 2019)
Mapbook Page
Page 1 of 4
0 2 4 6 Km
0 2 4 Mi
Data Source: USDA, USGS, TNC, Esri
Coordinate System:
NAD 1983 UTM Zone 13N
Author: B. Barbieri Date: 12/11/2019
N W E S
WEST


Extended Corona
Gen-Tie System
Risk Assessment
Extended Corona 345kV Gen-Tie System
1-mile Study Area Buffer
Line Ranking Categories
Rank 3
NHD Flowline
Stream/River: Ephemeral
NWI Wetlands
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine
Golden Eagle Nest, Occupied - Inactive
Eagle / Other Raptors habitat features (TNC 2019)
Land Ownership
State Trust Land
Page 2 of 4
0
2 Km
Mi
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1
Data Source: USDA, USGS TNC, Esri
Coordinate System: NAD 1983 UTM Zone 13N
Author: B. Berbieri Date: 12/11/2019
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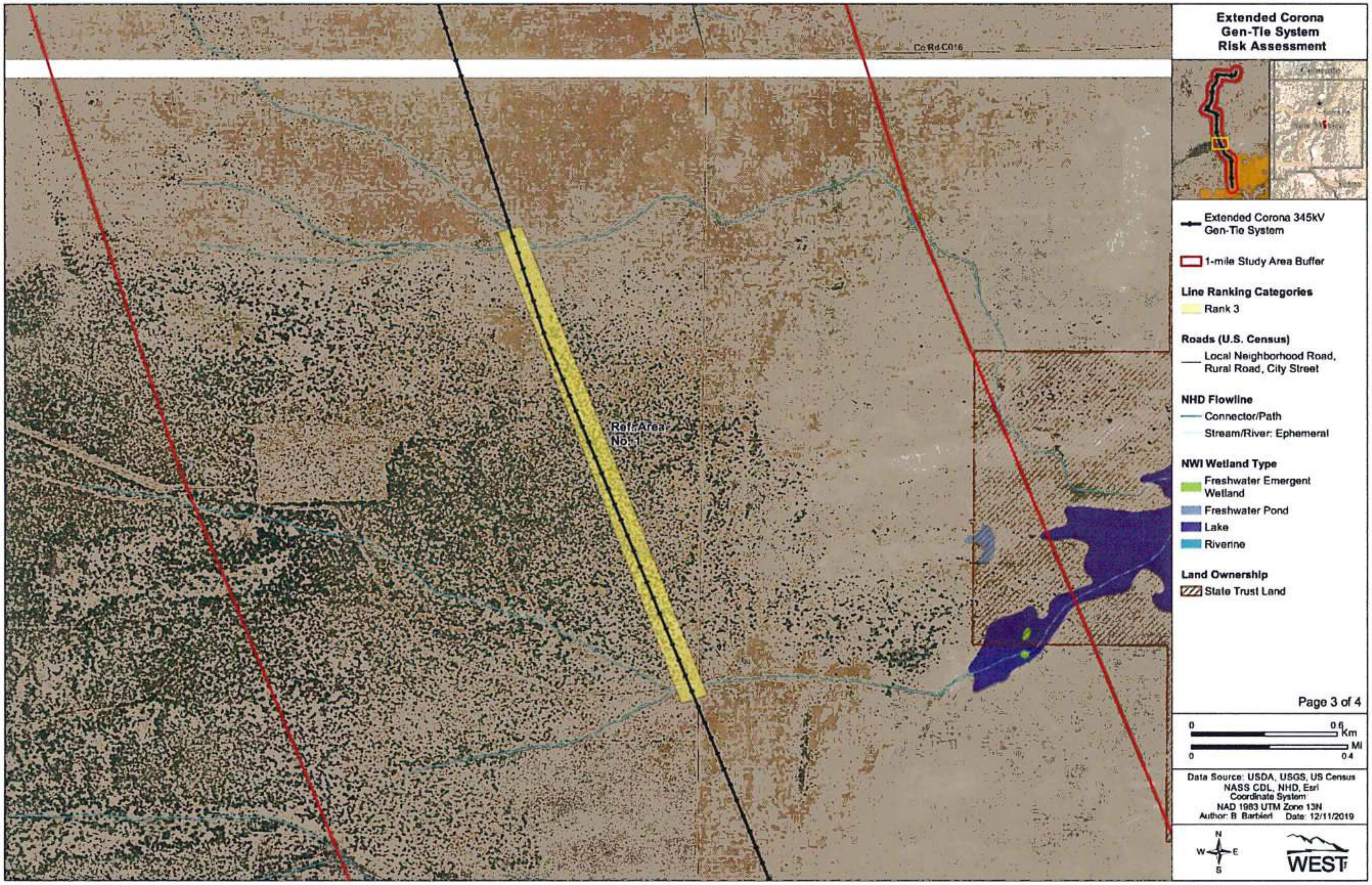
WEST
Ref. Area No. 1
Ref. Area No. 2
Salt Flats/ Seasonal Lake
Pino Mountain


Co Rd C016
Ref. Area No. 1
Extended Corona
Gen-Tie System
Risk Assessment
Extended Corona 345kV Gen-Tie System
1-mile Study Area Buffer
Line Ranking Categories
Rank 3
Roads (U.S. Census)
Local Neighborhood Road, Rural Road, City Street
NHD Flowline
Connector/Path
Stream/River: Ephemeral
NWI Wetland Type
Freshwater Emergent Wetland
Freshwater Pond
Lake
Riverine
Land Ownership
State Trust Land
Page 3 of 4
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Data Source: USDA, USGS, US Census
NASS CDL, NHD, Esri
Coordinate System:
NAD 1983 UTM Zone 13N
Author: B Barbieri Date: 12/11/2019
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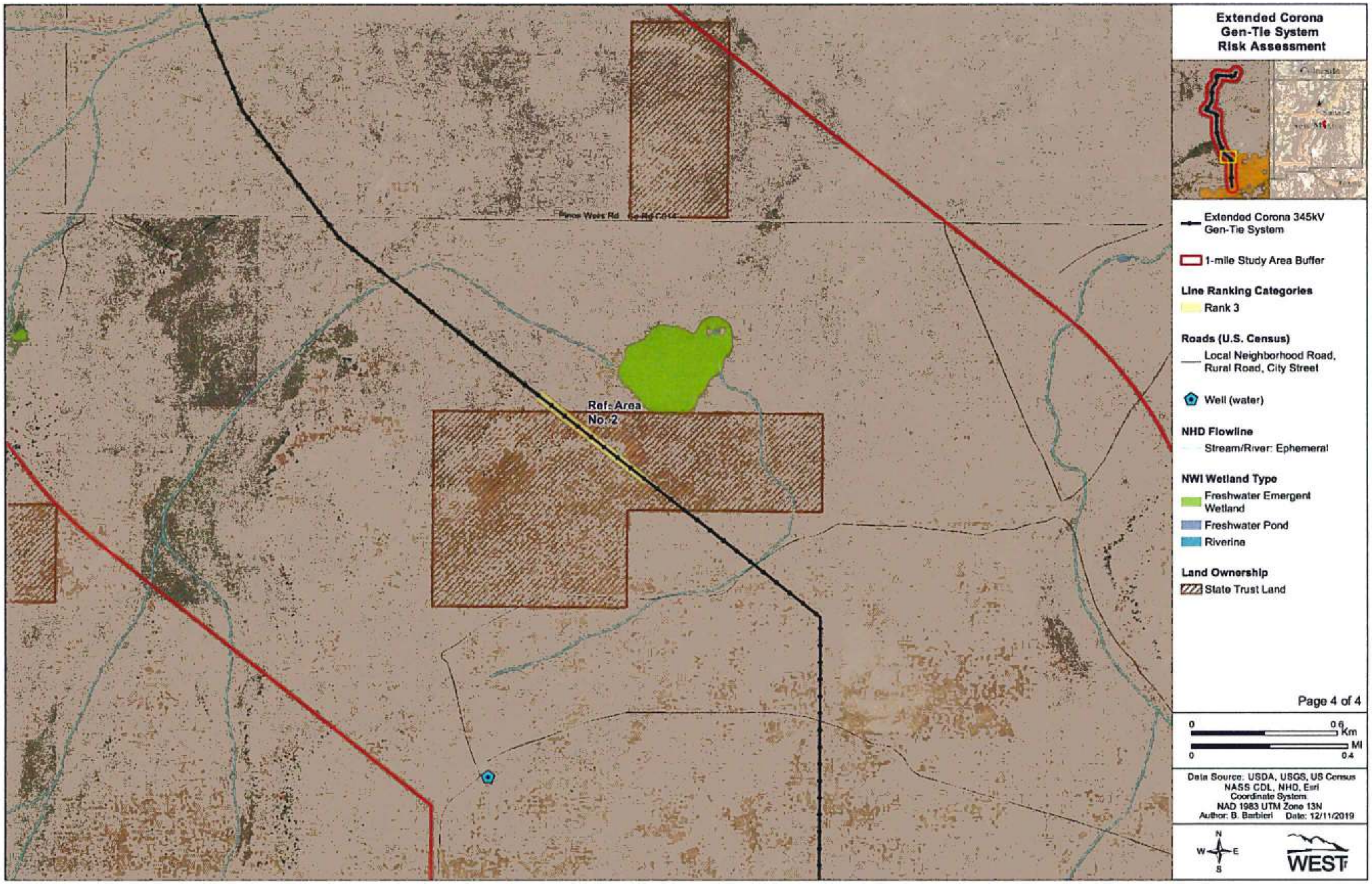
Extended Corona
Gen-Tie System
Risk Assessment
Extended Corona 345kV Gen-Tie System
1-mile Study Area Buffer
Line Ranking Categories
Rank 3
Roads (U.S. Census)
Local Neighborhood Road, Rural Road, City Street
Well (water)
NHD Flowline
Stream/River: Ephemeral
NWI Wetland Type
Freshwater Emergent Wetland
Freshwater Pond
Riverine
Land Ownership
State Trust Land
Page 4 of 4
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0.6 Km
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0.4 Mi
Data Source: USDA, USGS, US Census
NASS CDL, NHD, Esri
Coordinate System
NAD 1983 UTM Zone 13N
Author: B. Barbieri Date: 12/11/2019
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WEST
Ref. Area
No. 2

BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE AMENDED JOINT APPLICATION OF THE CORONA WIND COMPANIES FOR LOCATION APPROVAL OF THE EXPANSION OF THE CORONA WIND PROJECTS RECONFIGURATION OF THE PROPOSED CORONA GEN-TIE SYSTEM, EXTENSION OF THE CORONA GEN-TIE SYSTEM AND REQUEST FOR RIGHT OF WAY DETERMINATION IN LINCOLN, TORRANCE, AND GUADALUPE COUNTIES PURSUANT TO THE PUBLIC UTILITY ACT, NMSA 1978, § 62-9-3	)	**Case No. 20-00008-UT**
ANCHO WIND LLC, COWBOY MESA LLC, DURAN MESA LLC, RED CLOUD WIND LLC, TECOLOTE WIND LLC, AND VIENTO LOCO, LLC,	)	
Joint Applicants.	)	

EXHIBIT ACC-8

Corona Wind Projects - Project Agency Consultation Table
U.S. Fish and Wildlife Agency
U.S. Army Corps of Engineers
U.S. Bureau of Land Management
U.S. Department of Defense
New Mexico State Lands Office
New Mexico Environment Department, Air Quality Bureau
New Mexico Department of Game and Fish
New Mexico Attorney General's Office

BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE AMENDED JOINT APPLICATION OF THE CORONA WIND COMPANIES FOR LOCATION APPROVAL OF THE EXPANSION OF THE CORONA WIND PROJECTS RECONFIGURATION OF THE PROPOSED CORONA GEN-TIE SYSTEM, EXTENSION OF THE CORONA GEN-TIE SYSTEM AND REQUEST FOR RIGHT OF WAY DETERMINATION IN LINCOLN, TORRANCE, AND GUADALUPE COUNTIES PURSUANT TO THE PUBLIC UTILITY ACT, NMSA 1978, § 62-9-3 **ANCHO WIND LLC, COWBOY MESA LLC, DURAN MESA LLC, RED CLOUD WIND LLC, TECOLOTE WIND LLC, AND VIENTO LOCO, LLC,** **Joint Applicants.**	)))))))))))))))))	**Case No. 20-00008-UT**

EXHIBIT ACC-9

EXHIBIT A

LEGAL DESCRIPTION OF REAL PROPERTY OWNED BY BLANCHARD CORONA RANCH, LLC IN LINCOLN COUNTY FORCONDITIONAL INCLUSION IN THE PROPOSED CORONA WIND PROJECTS

Legal Description:

PARCEL 1:

TOWNSHIP 1 SOUTH, RANGE 14 EAST, N.M.P.M., Lincoln County, New Mexico

Section 9:	S/2SE/4
Section 10:	S/2, NE/4, S/2NW/4, NE/4NW/4
Section 11:	ALL
Section 12:	NW/4NE/4, S/2NE/4, SE/4, S/2SW/4
Section 13:	ALL
Section 14:	E/2, SW/4, S/2NW/4, NE/4NW/4
Section 15:	ALL
Section 17:	N/2, N/2S/2
Section 22:	SW/4NE/4, SE/4
Section 23:	ALL
Section 24:	NW/4, N/2SW/4, SE/4, S/2NE/4, NW/4NE/4
Section 25:	ALL
Section 36:	ALL

TOWNSHIP 1 SOUTH, RANGE 15 EAST, N.M.P.M., Lincoln County, New Mexico

Section 7:	S/2N/2, S/2
Section 8:	W/2
Section 17:	ALL
Section 18:	ALL
Section 19:	NE/4, N/2SE/4, E/2NW/4, NE/4SW/4, Lots 1, 2 and 3
Section 20:	W/2, W/2SE/4
Section 21:	SW/4
Section 28:	ALL
Section 29:	E/2, E/2W/2, NW/4NW/4
Section 31:	E1/2SW/4, SE/4, Lots 3 and 4

PARCEL 2:

A non-exclusive easement along the existing roadway across Section 3, Township 1 South, Range14 East, N.M.P.M., Lincoln County, New Mexico, being 25 feet in width, 12.5 feet on either side of the following described centerline:

BEGINNING at the most Northerly point of this easement, a point on thc New Mexico Base Line, where an aluminum cap at the section corner common to Sections 3 and 4, T1S, R14E, N.M.P.M. of the U.S.G.L.O. Surveys bears N 89°52'57" W, a distance of 802.26 feet;

THENCE from the point of beginning and leaving thc base line S 6°21'33" W, 281.74 feet to an angle point;

THENCE S 16°21'29" W, 518.27 feet to an angle polnl;

THENCE S 7°46'40" W, 608.72 feet to an angle point;

THENCE S 6°07'10" E, 276.89 feet to an angle point;

THENCE S 0°13'41" W, 268.13 feet to an angle point;

THENCE S 7°48'25" E, 589.07 feet to an angle point;

THENCE S 19°34'06" E, 761.32 feet to an angle point;

THENCE S 11°15'20" E, 355.74 feet to an angle point;

THENCE S 22°02'48" E, 586.09 feet to an angle point;

THENCE S 27°49'08" E, 1233.78 feet to the South llnc of Section 3, and the end of thls easement, whence an aluminum cap for the section corner common to Sections 3, 4, 9 and 10, T1S, R14E, bears S 89°55'19" W, a distance of 1763.24 feet.

BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE AMENDED JOINT APPLICATION OF THE CORONA WIND COMPANIES FOR LOCATION APPROVAL OF THE EXPANSION OF THE CORONA WIND PROJECTS RECONFIGURATION OF THE PROPOSED CORONA GEN-TIE SYSTEM, EXTENSION OF THE CORONA GEN-TIE SYSTEM AND REQUEST FOR RIGHT OF WAY DETERMINATION IN LINCOLN, TORRANCE, AND GUADALUPE COUNTIES PURSUANT TO THE PUBLIC UTILITY ACT, NMSA 1978, § 62-9-3	)	**Case No. 20-00008-UT**
ANCHO WIND LLC, COWBOY MESA LLC, DURAN MESA LLC, RED CLOUD WIND LLC, TECOLOTE WIND LLC, AND VIENTO LOCO, LLC,	)	
Joint Applicants.	)	

AFFIDAVIT OF ADAM CERNEA CLARK

BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE CORONA WIND COMPANIES' JOINT APPLICATION FOR THE LOCATION OF THE CORONA WIND PROJECTS AND THE CORONA GEN-TIE SYSTEM IN LINCOLN, TORRANCE AND GUADALUPE COUNTIES PURSUANT TO THE PUBLIC UTILITY ACT, NMSA 1978, §62-9-3	)	
ANCHO WIND LLC, COWBOY MESA LLC, DURAN MESA LLC, RED CLOUD WIND LLC, TECOLOTE WIND LLC, VIENTO LOCO LLC,	)	**Case No. 18-00065-UT**
JOINT APPLICANTS.	)	

AFFIDAVIT OF ADAM CERNEA CLARK

STATE OF NEW MEXICO)
) ss.
COUNTY OF SANTA FE)

I have read the foregoing Direct Testimony, and it is true and accurate based on my own knowledge and belief.

[signature]

SUBSCRIBED and sworn to before me this 19 day of December 2019.

[signature]
NOTARY PUBLIC

February 27, 2022
My Commission Expires

PAMELA ORTIZ NOTARY PUBLIC STATE OF NEW MEXICO

BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE AMENDED JOINT APPLICATION OF THE CORONA WIND COMPANIES FOR LOCATION APPROVAL OF THE EXPANSION OF THE CORONA WIND PROJECTS RECONFIGURATION OF THE PROPOSED CORONA GEN-TIE SYSTEM, EXTENSION OF THE CORONA GEN-TIE SYSTEM AND REQUEST FOR RIGHT OF WAY DETERMINATION IN LINCOLN, TORRANCE, AND GUADALUPE COUNTIES PURSUANT TO THE PUBLIC UTILITY ACT, NMSA 1978, § 62-9-3 **ANCHO WIND LLC, COWBOY MESA LLC, DURAN MESA LLC, RED CLOUD WIND LLC, TECOLOTE WIND LLC, AND VIENTO LOCO, LLC,** **Joint Applicants.**	)	**Case No. 20-00008-UT**

DIRECT TESTIMONY OF

GREG PARENT

ON BEHALF OF CORONA WIND COMPANIES

BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE AMENDED JOINT APPLICATION OF THE CORONA WIND COMPANIES FOR LOCATION APPROVAL OF THE EXPANSION OF THE CORONA WIND PROJECTS RECONFIGURATION OF THE PROPOSED CORONA GEN-TIE SYSTEM, EXTENSION OF THE CORONA GEN-TIE SYSTEM AND REQUEST FOR RIGHT OF WAY DETERMINATION IN LINCOLN, TORRANCE, AND GUADALUPE COUNTIES PURSUANT TO THE PUBLIC UTILITY ACT, NMSA 1978, § 62-9-3 ANCHO WIND LLC, COWBOY MESA LLC, DURAN MESA LLC, RED CLOUD WIND LLC, TECOLOTE WIND LLC, AND VIENTO LOCO, LLC, Joint Applicants.	)	Case No. 20-00008-UT

DIRECT TESTIMONY OF

GREG PARENT

ON BEHALF OF THE CORONA WIND COMPANIES

December 20, 2019

Q PLEASE STATE YOUR NAME.

A. Greg Parent, P.E., S.E. The P.E. stands for licensed Professional Engineer and the S.E. stands for licensed Structural Engineer.

Q. BY WHOM AND IN WHAT CAPACITY ARE YOUR EMPLOYED?

A. I am employed by Ulteig Engineers, Inc. as a Senior Engineer in the Transmission and Distribution Department. My business address is -5575 DTC Parkway, Suite 200, Greenwood Village, CO 80111.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. I am providing testimony on behalf of the Corona Wind Companies, who are the Joint Applicants in this proceeding. I support the Joint Applicants' contention that the necessary right-of-way ("ROW") width for the modified portions of the Corona Gen-Tie System should be 180-feet.

In NMPRC Case No. 18-00065-UT the Joint Applicants were granted location approval for the Corona Gen-Tie System with a 180-foot ROW. I testified in support of that approval and conducted the necessary analysis to demonstrate that the 180-foot ROW is both necessary and desirable from a technical and safety perspective. The Commission and all the parties who took a position on this issue agreed.

The Joint Applicants have recently made a determination that the original approved route for the Corona Gen-Tie System needs to be modified ("Reconfigured Corona Gen-Tie System"). The Corona Gen-Tie System is also being extended by approximately 35 miles ("Extended Corona Gen-Tie System"). Together I refer to this overall change in the previously approved Corona Gen-Tie System as the "Updated Corona Gen-Tie System." My testimony presents my analysis of the Updated Corona

Gen-Tie System and the conclusion that the necessary ROW width continues to be 180 feet.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND WORK EXPERIENCE.

A. I have a Masters of Science in Structural Engineering from Lehigh University. I am a licensed P.E. in 18 ~~17~~ states and am also a licensed Structural Engineer in New Mexico, Illinois, Hawaii, Nevada and Utah. I have more than a decade of transmission line design experience and have designed approximately 650 miles of transmission line.

Q. HAVE YOU PREVIOUSLY SUBMITTED TESTIMONY IN ANY OTHER PROCEEDING?

A. Yes. As noted previously, I have submitted testimony and appeared before the Commission in NMPRC Case No. 18-00065-UT. I also submitted testimony in NMPRC Case No. 19-00139-UT on behalf of the Clines Corners Wind Farm LLC.

Q. ARE YOU FAMILIAR WITH THE PROPOSED TRANSMISSION LINE FACILITES WHICH ARE THE SUBJECT OF THIS JOINT APPLICATION?

A. Yes. I worked closely with Pattern personnel in the design of this Corona Wind Farms Project. More specifically, the ROW width calculation for the Corona Gen-Tie Transmission System was performed by Ulteig Engineers, Inc. I supervised this work and met in person and by phone with the Commission Staff's engineers to review my work and calculations that concluded that a 180-foot ROW width was appropriate for this particular transmission line.

Q. HAVE YOU BEEN INVOLVED WITH THE DEVELOPMENT OF THE UPDATED CORONA GEN-TIE SYSTEM?

A. Yes. I was retained to review the modifications that resulted in the Reconfigured Corona Gen-Tie System and determined that even with some alterations in the original route it is still appropriate for the Commission to approve a 180-foot ROW. Additionally, I have reviewed the proposed route for the Extended Corona Gen-Tie System and again concluded that this roughly 35-mile extension should have the same 180-foot ROW as the rest of the Corona Gen-Tie System.

Q. CAN YOU ELABORATE ON THE BASIC DESIGN CONDITIONS YOU EVALUATED IN DETERMINING THAT A 180-FOOT ROW WAS REQUIRED FOR THE UPDATED CORONA GEN-TIE SYSTEM?

A. Yes. Preliminary design considerations include geotechnical soil studies, topographical surveys and wind and weather conditions to determine a range of preliminary specifications for equipment and infrastructure for the proposed location for the proposed transmission and interconnection facilities. The loading conditions for the transmission lines follow the requirements stated in the National Electric Safety Code (NESC-2017). We analyzed the required ROW width for the following load cases:

1. NESC 234.C.1.a (At Rest)
    a. 0 psf wind pressure acting perpendicular to the conductor
    b. 60 deg Fahrenheit ambient temperature.
2. NESC 234.C.1.b (6 psf Wind)
    a. 6 psf wind pressure acting perpendicular to the conductor
    b. 60 deg Fahrenheit ambient temperature
3. NESC 250B – Heavy Loading District Loading without load factors
    a. 4 psf wind pressure acting perpendicular to the conductor
    b. ½" of radial ice

c. 0 deg Fahrenheit ambient temperature

4. NESC 250C – Extreme Wind. The wind load map in NESC 250C matches the basic wind speed map in the American Society of Civil Engineers – Minimum Design Loads for Building and Other Structures - ASCE 7-05. The Corona Wind Project extends over a large region. The extreme wind speed varies over this region. Part of the Corona Wind project is in the 90-mph wind speed region but also extends into a "Special Wind Region". These special wind regions experience higher wind speeds than 90mph. Pattern has determined that the extreme wind speed for these special wind regions should be set at 100mph. For consistency the extreme wind speed for the entire project has been set to 100mph whether it is inside or outside the special wind regions.

   a. 100 mph wind speed (25.6psf) acting perpendicular to the conductor
   b. 60 deg Fahrenheit ambient temperature

Under these conditions, and the aforementioned considerations, we evaluate the clearances, conductor movement, and structure deflection to calculate span lengths and structure types and configurations.

Q. DO YOU BELIEVE THAT THE CRITERIA YOU RELIED UPON IN DETERMINING THE NECESSITY FOR A 180-FOOT ROW ARE REASONABLE WHEN APPLIED TO THE UPDATED CORONA GEN-TIE SYSTEM?

A. Yes. These criteria are appropriate and consistent with the accepted practice within the industry. I have designed approximately a dozen 345kV transmission lines and the right of way widths for those projects ranged between 150ft – 200ft. The variations in right of way width for these projects depended on design spans, structure types and audible noise requirements that were used on each line.

Q. DO YOU HAVE EXHIBITS SUPPORTING YOUR CALCULATIONS THAT WARRANT THE 180-FOOT ROW WIDTH THAT THE JOINT APPLICANTS' REQUEST IN THIS PROCEEDING?

A. Yes. Please see the attached exhibit titled GP-1.

Q. PLEASE EXPLAIN THE INFORMATION CONTAINED IN EXHIBIT GP-1.

A. Page 1 of this exhibit provides the calculations for the NESC required horizontal clearances from the transmission line conductor to building structures for NESC Rules 234B1a, 234B1b. Also provided is the recommended horizontal clearance when the transmission line is subject to 100mph wind speed. The above clearances have been adjusted for an altitude of 7100ft. The following pages of this Exhibit GP-1 illustrate the results of the blowout analysis for three different structure types. The three structure types are as follows:

- Double Circuit Steel Monopole,
- Single Circuit Steel Monopole
- Single Circuit Wood H-Frame.

The actual structure types that will be used on this project have not yet been determined and will depend on material lead times, material costs and construction cost of the different structure types. It is critical that the ROW be wide enough to accommodate any of the above structure types.

To determine conductor blowouts and pole deflections each structure type was modeled using a bundled (2) 954kcmil ASCR "Cardinal" conductor per phase. A 1300 ft design span between structures was assumed. Actual design spans could vary depending on the topography. A design span of 1300ft would likely be a maximum design span. Pole heights were determined to provide adequate vertical clearance under the conductor during maximum operating temperature at mid-span assuming flat terrain.

Each structure type was analyzed under the following four different load cases:

1. NESC Rule 234B1a – [At Rest Condition, 0 psf wind, 60 degF]
2. NESC Rule 234B1b – [6psf Condition, 6 psf wind, 60 degF]
3. NESC Rule 250B – Heavy Region [4psf wind, ½" Radial Ice, 0 degF]
4. NESC Rule 250C – Extreme Wind [100 mph (25.6 psf), 60 degF]

To determine the conductor blowouts and pole deflections, each structure type and each load case was modeled in the transmission line design software PLS-CADD. The results of the required right of way width are illustrated in Exhibit GP-1. The controlling structure type and load case were the single circuit wood H-Frame under NESC Rule 250C – Extreme Wind [100 mph (25.6 psf), 60 degF]. This structure type and load case would require a minimum right of way width approximately 177'-5" wide, which is just shy of the requested 180'-0" Right of Way width. A detailed analysis of the H-Frame structure under the 250C – Extreme Wind case is provided in the last (4) pages of Exhibit GP-1. This structure and load case control the Right of Way width.

Another calculation that was performed was the audible noise volume that would be heard at the edge of the right of way. In 1974, the Environmental Protection Agency (EPA) published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* in which the EPA set 55dBA as the outdoor noise threshold that would prevent activity interference or annoyance. Many utilities I have worked with have a 50dBA noise threshold limit at the edge of the right of way. Page 14 of Exhibit GP-1 shows the calculations of the audible noise for the Single Circuit Wood H-Frame structure. In this analysis the audible noise produced by the transmission line would be 49.61 dBA 90ft from the transmission line center line (90ft x 2 = 180ft ROW). With the transmission line centered in a right of way width of 180ft the audible noise produced is just under the recommended 50dBA limit. From the analysis performed to determine required ROW widths, it is my opinion that a right of way of 180ft is appropriate for this line.

Q. IS THERE A NEED FOR ANY ADDITIONAL PUBLIC HEARING TO RECONSIDER THE APPROVED ROW WIDTH FOR THE UPDATED CORONA GEN-TIE SYSTEM?

A. I am not an attorney and cannot respond in that capacity as to whether a public hearing is required for the Updated Corona Gen-Tie System. However, as a structural engineer who is very familiar with this particular Gen-Tie System, I can see no reason for any further evaluation merely because the route of the Gen-Tie System is being modified and extended. There may be environmental considerations to consider, but from an engineering perspective these modifications have no affect on the need for a 180-foot ROW. The analysis that resulted in the determination that a 180-foot ROW is necessary has not changed. The modifications are not radical to the point that a different outcome would result.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE AMENDED JOINT APPLICATION OF THE CORONA WIND COMPANIES FOR LOCATION APPROVAL OF THE EXPANSION OF THE CORONA WIND PROJECTS RECONFIGURATION OF THE PROPOSED CORONA GEN-TIE SYSTEM, EXTENSION OF THE CORONA GEN-TIE SYSTEM AND REQUEST FOR RIGHT OF WAY DETERMINATION IN LINCOLN, TORRANCE, AND GUADALUPE COUNTIES PURSUANT TO THE PUBLIC UTILITY ACT, NMSA 1978, § 62-9-3	)	**Case No. 20-00008-UT**
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Joint Applicants.	)	

EXHIBIT GP-1

Ulteig Engineering
Project Name: Corona Wind Farm Project
Required NESC Horizontal Clearances - Rule 234B1a & 234B1b
Engineer: Greg Parent
Date: 12-18-2019

Ulteig
We listen. We solve.™

(V_N) = Nominal Opperating Voltage Phase-Phase (kV) $V_N := 345\ kV$

(V_M) = Max Transient Overvoltage Phase-Phase (kV) $V_M := 1.05 \cdot V_N = 362.25\ kV$

(Elev) = Design Elevation (ft) $Elev := 7100\ ft$

(CH_{AR}) = Required Horizontal Clearance At Rest (ft) NESC RULE 234B1a

($CH_{@6psf}$) = Required Horizontal Clearance under 6psf (ft) NESC RULE 234B1b

(CH@100mph) = Recomended Horizontal Clearance under 100mph

$$CH_{AR} := 7.5\ ft + ((50\ kV - 22\ kV)) \cdot \left(\frac{0.4\ \frac{in}{kV}}{12\ \frac{in}{ft}} \right) + \left(\left(\frac{V_M}{\sqrt{3}} - 50\ kV \right) \cdot \left(\frac{0.4\ \frac{in}{kV}}{12\ \frac{in}{ft}} \right) \cdot 1.03^{\frac{Elev - 3300\ ft}{1000\ ft}} \right)$$

$CH_{AR} = 14.369\ ft$

$$CH_{@6psf} := 4.5\ ft + ((50\ kV - 22\ kV)) \cdot \left(\frac{0.4\ \frac{in}{kV}}{12\ \frac{in}{ft}} \right) + \left(\left(\frac{V_M}{\sqrt{3}} - 50\ kV \right) \cdot \left(\frac{0.4\ \frac{in}{kV}}{12\ \frac{in}{ft}} \right) \cdot 1.03^{\frac{Elev - 3300\ ft}{1000\ ft}} \right)$$

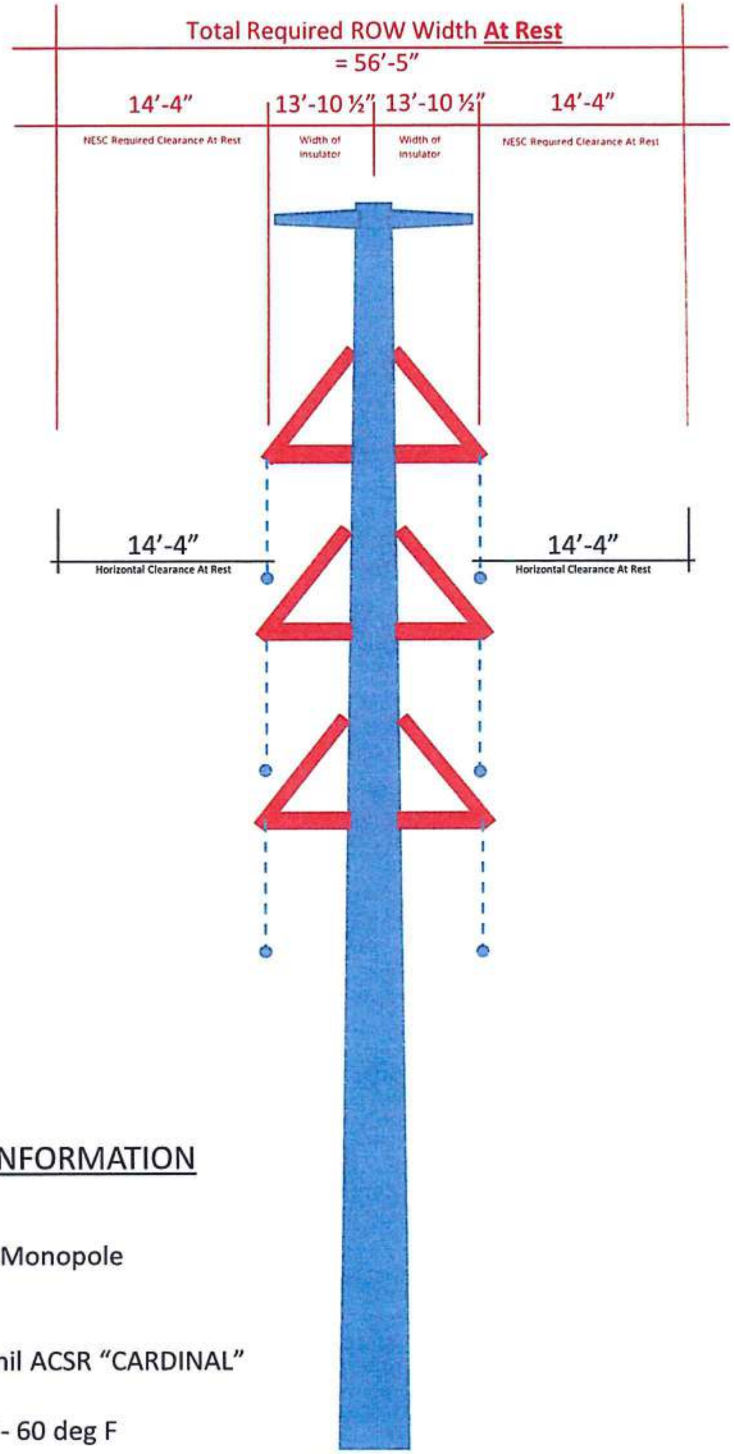
$CH_{@6psf} = 11.369\ ft$

$$CH_{@100mph} := 345\ kV \cdot \frac{0.1\ \frac{in}{kV}}{12\ \frac{in}{ft}} \cdot 1.03^{\frac{Elev - 3300\ ft}{1000\ ft}}$$

Assuming 10kV per inch dielectric constant for air

$CH_{@100mph} = 3.217\ ft$

GREG C. PARENT
NEW MEXICO
24890
12-18-19
PROFESSIONAL ENGINEER



STRUCTURE AND CONDUCTOR INFORMATION

Operational Voltage: 345kV
Structure Type = Double Circuit Steel Monopole
Insulator Type = Brace-Post Insulator
Typical Design Span = 1300ft
Conductor Type = Bundled (2) 954kcmil ACSR "CARDINAL"
NESC Rule Analyzed: 234B1a
Weather Condition Displayed = 0 PSF - 60 deg F

SCALE: NTS

GREG C. PARENT
NEW MEXICO
24890
PROFESSIONAL ENGINEER
12-18-19

CORONA WIND PROJECT

LINCOLN AND TORRANCE COUNTIES, NEW MEXICO

Rev	Date	Description	By
A	04-19-2018	ROW EXHIBITS	UEI
B	12-18-2018	UPDATED CORONA GEN-TIE ROW	UEI

PATTERN ENERGY GROUP
4225 EXECUTIVE SQUARE
LA JOLLA, CA 92037
Pattern

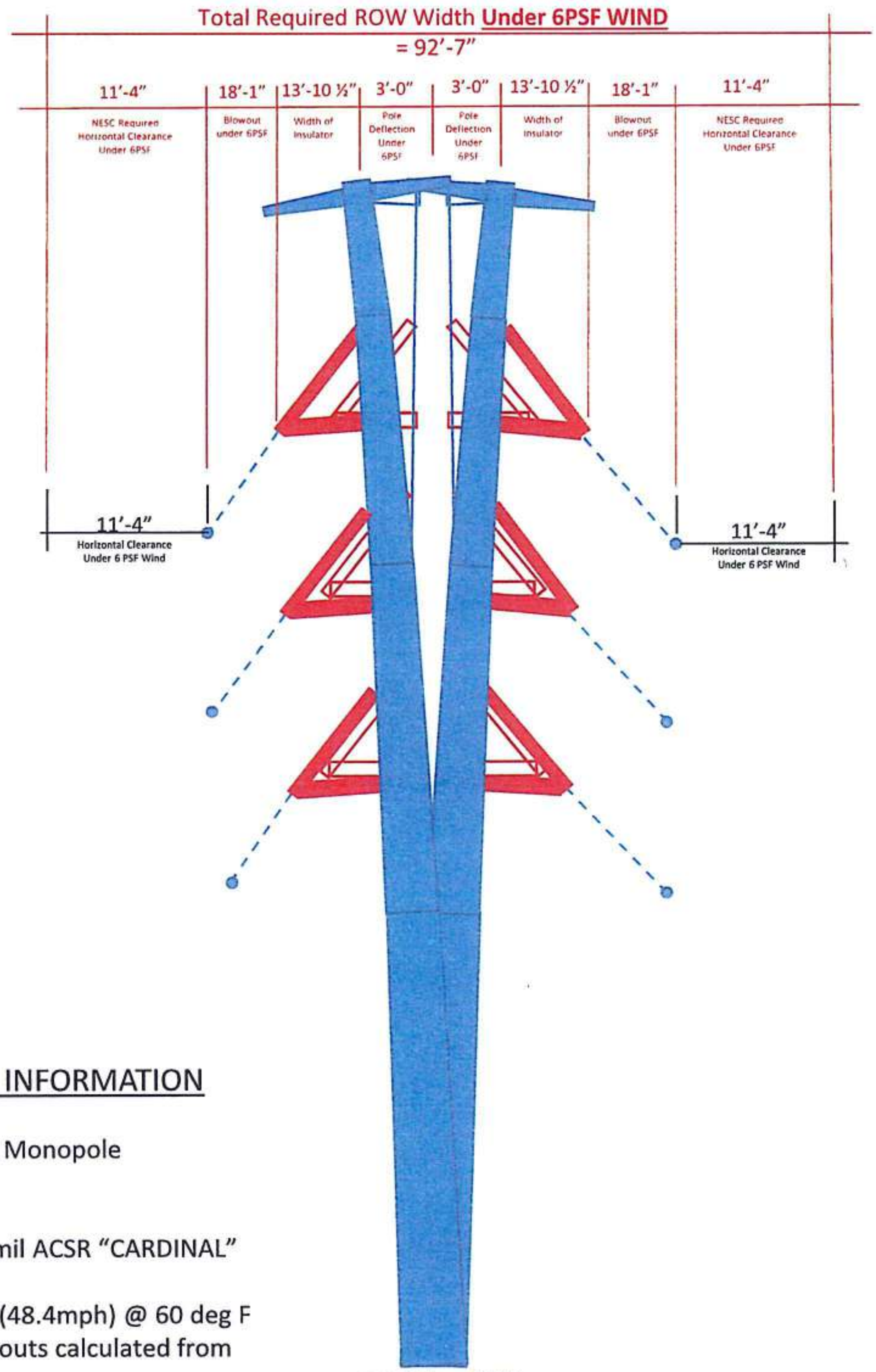
Ulteig
3350 38th Avenue South
Fargo, North Dakota 58104
Phone: 701.280.8500
Fax: 701.237.3191
www.ulteig.com
Bismarck · Denver · Detroit Lakes · Fargo · Sioux Falls · St. Paul

Design By:
Drawn By:
Approved By:
Project Number:

ROW WIDTH EXHIBITS
DC STEEL MONOPOLE

REVISION:
B

COR-TLO-E-ROW-001



SCALE: NTS

STRUCTURE AND CONDUCTOR INFORMATION

Operational Voltage: 345kV
Structure Type = Double Circuit Steel Monopole
Insulator Type = Brace-Post Insulator
Typical Design Span = 1300ft
Conductor Type = Bundled (2) 954kcmil ACSR "CARDINAL"
NESC Rule Analyzed: 234B1b
Weather Condition Displayed = 6 psf (48.4mph) @ 60 deg F
Pole Deflections and Conductor Blowouts calculated from analysis of pole models in PLS-CADD.

GREG C. PARENT
NEW MEXICO
24890
12-18-19
PROFESSIONAL ENGINEER

CORONA WIND PROJECT

LINCOLN AND TORRANCE COUNTIES, NEW MEXICO

Rev.	Date	Description	By
A	04-19-2018	ROW EXHIBITS	UFI
B	12-18-2018	UPDATED CORONA GEN-TIE ROW	UEI

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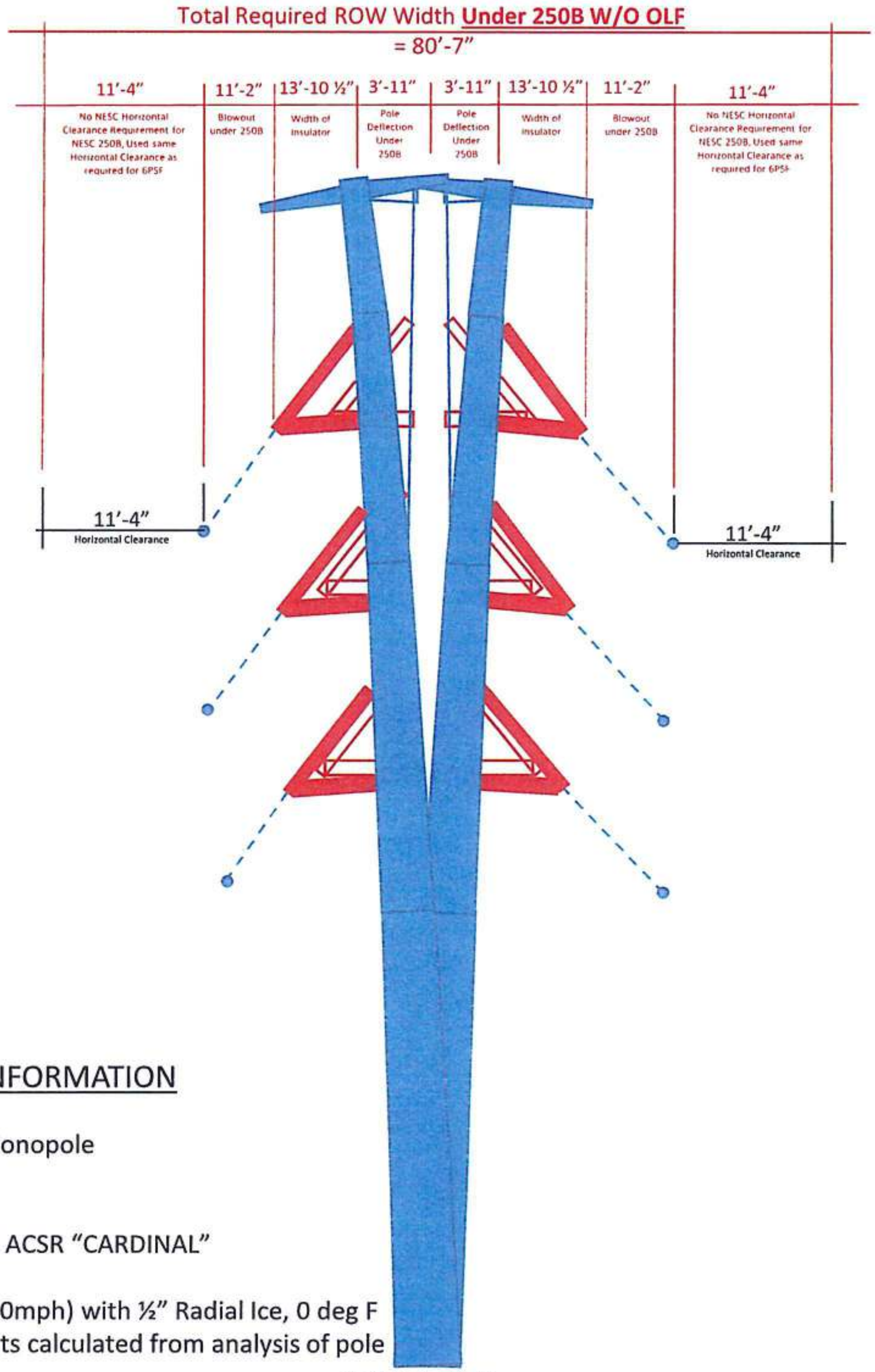
ROW WIDTH EXHIBITS
DC STEEL MONOPOLE

REVISION:
B
COR-TLO-E-ROW-002



STRUCTURE AND CONDUCTOR INFORMATION

Operational Voltage: 345kV
Structure Type = Double Circuit Steel Monopole
Insulator Type = Brace-Post Insulator
Typical Design Span = 1300ft
Conductor Type = Bundled (2) 954kcmil ACSR "CARDINAL"
NESC Rule Analyzed: 250B W/O OLF
Weather Condition Displayed = 4 PSF (40mph) with ½" Radial Ice, 0 deg F
Pole Deflections and Conductor Blowouts calculated from analysis of pole models in PLS-CADD.

SCALE: NTS

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LINCOLN AND TORRANCE COUNTIES, NEW MEXICO

Rev.	Date	Description	By
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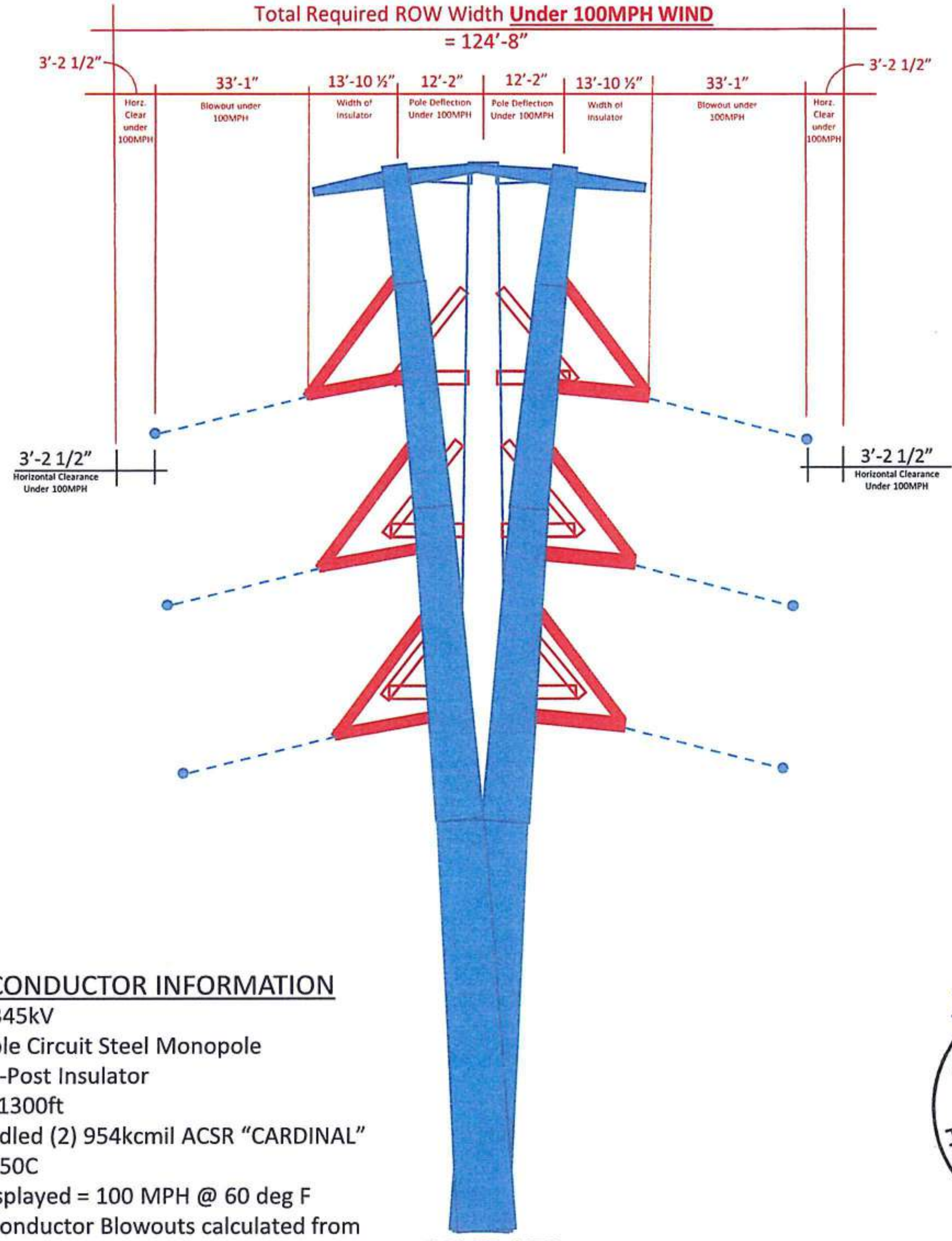
ROW WIDTH EXHIBITS
DC STEEL MONOPOLE

REVISION:
B
COR-TLO-E-ROW-003



STRUCTURE AND CONDUCTOR INFORMATION

Operational Voltage: 345kV
Structure Type = Double Circuit Steel Monopole
Insulator Type = Brace-Post Insulator
Typical Design Span = 1300ft
Conductor Type = Bundled (2) 954kcmil ACSR "CARDINAL"
NESC Rule Analyzed: 250C
Weather Condition Displayed = 100 MPH @ 60 deg F
Pole Deflections and Conductor Blowouts calculated from analysis of pole models in PLS-CADD.

SCALE: NTS

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Rev	Date	Description	By
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ROW WIDTH EXHIBITS

DC STEEL MONOPOLE

REVISION:
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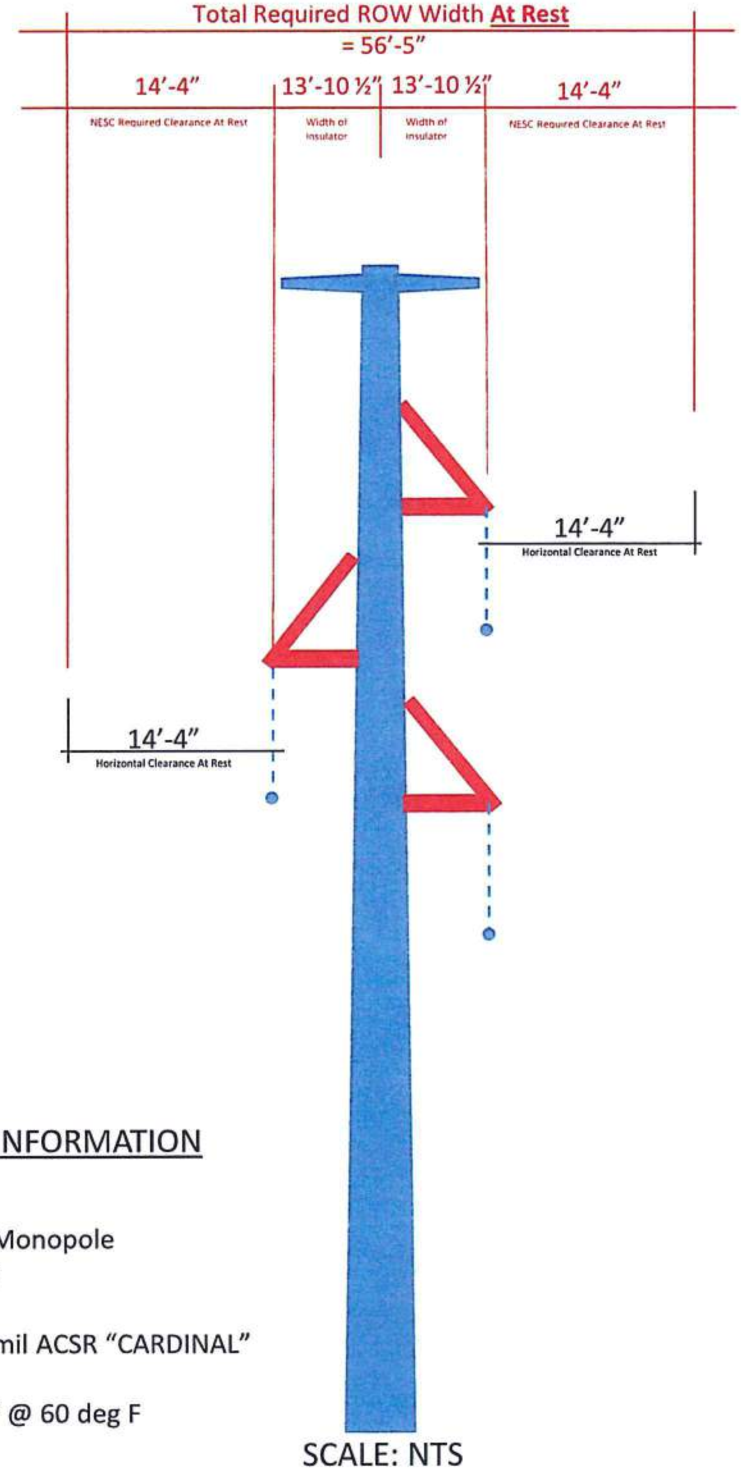
COR-TLO-E-ROW-004



STRUCTURE AND CONDUCTOR INFORMATION

Operational Voltage: 345kV
Structure Type = Single Circuit Steel Monopole
Insulator Type = Brace-Post Insulator
Typical Design Span = 1300ft
Conductor Type = Bundled (2) 954kcmil ACSR "CARDINAL"
NESC Rule Analyzed: 234B1a
Weather Condition Displayed = 0 PSF @ 60 deg F

SCALE: NTS

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LINCOLN AND TORRANCE COUNTIES, NEW MEXICO

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ROW WIDTH EXHIBITS
SC STEEL MONOPOLE

REVISION:
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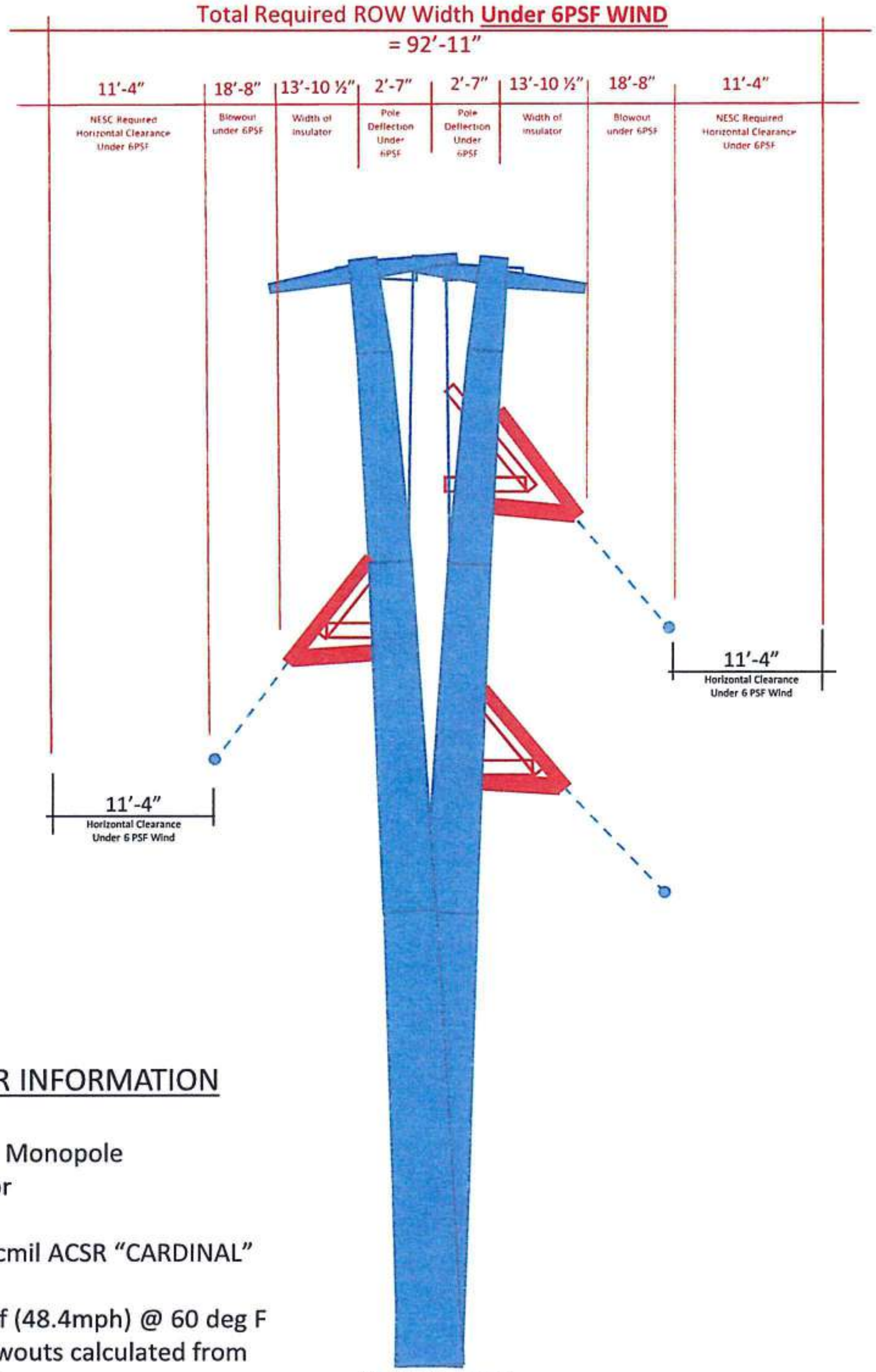

SCALE: NTS

STRUCTURE AND CONDUCTOR INFORMATION

Operational Voltage: 345kV
Structure Type = Single Circuit Steel Monopole
Insulator Type = Brace-Post Insulator
Typical Design Span = 1300ft
Conductor Type = Bundled (2) 954kcmil ACSR "CARDINAL"
NESC Rule Analyzed: 234B1b
Weather Condition Displayed = 6 psf (48.4mph) @ 60 deg F
Pole Deflections and Conductor Blowouts calculated from analysis of pole models in PLS-CADD.

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LINCOLN AND TORRANCE COUNTIES, NEW MEXICO

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A	04-15-2018	ROW EXHIBITS	UEI
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ROW WIDTH EXHIBITS
SC STEEL MONOPOLE

REVISION:
B
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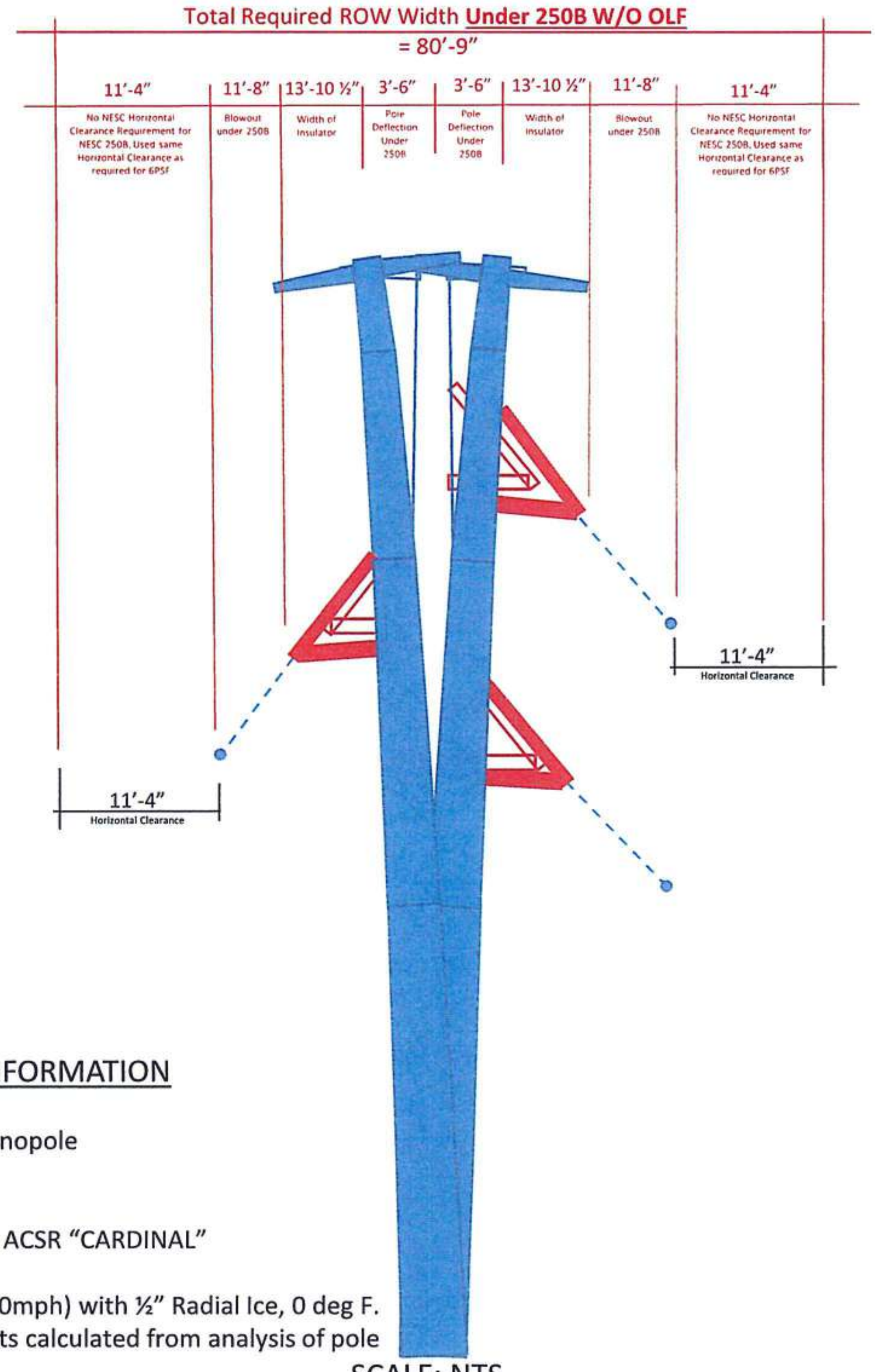

STRUCTURE AND CONDUCTOR INFORMATION

Operational Voltage: 345kV
Structure Type = Single Circuit Steel Monopole
Insulator Type = Brace-Post Insulator
Typical Design Span = 1300ft
Conductor Type = Bundled (2) 954kcmil ACSR "CARDINAL"
NESC Rule Analyzed: 250B W/O OLF
Weather Condition Displayed = 4 PSF (40mph) with ½" Radial Ice, 0 deg F.
Pole Deflections and Conductor Blowouts calculated from analysis of pole models in PLS-CADD.

SCALE: NTS

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CORONA WIND PROJECT

LINCOLN AND TORRANCE COUNTIES, NEW MEXICO

Rev.	Date	Description	By
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ROW WIDTH
EXHIBITS
SC STEEL MONOPOLE

REVISION:
B
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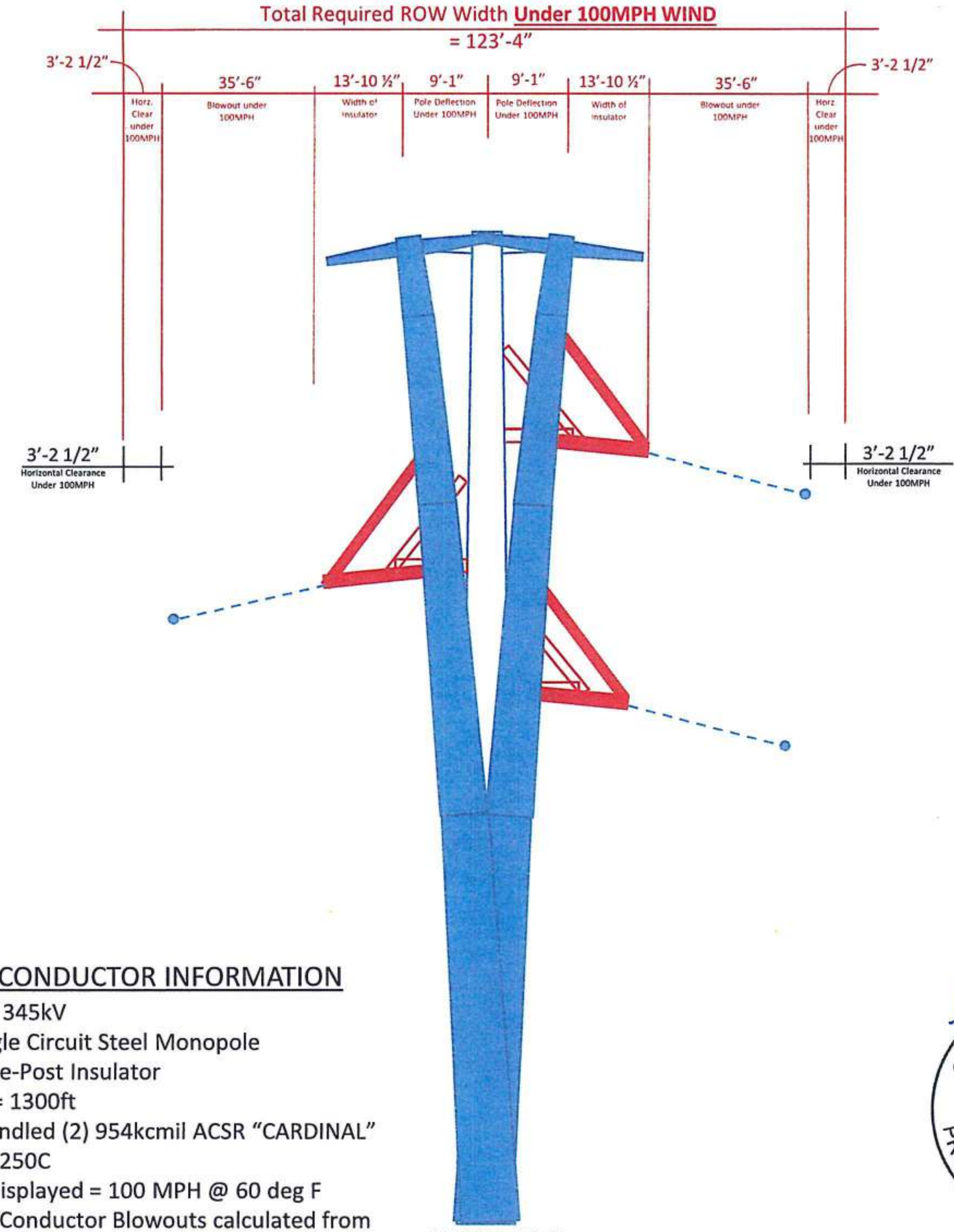

STRUCTURE AND CONDUCTOR INFORMATION

Operational Voltage: 345kV
Structure Type = Single Circuit Steel Monopole
Insulator Type = Brace-Post Insulator
Typical Design Span = 1300ft
Conductor Type = Bundled (2) 954kcmil ACSR "CARDINAL"
NESC Rule Analyzed: 250C
Weather Condition Displayed = 100 MPH @ 60 deg F
Pole Deflections and Conductor Blowouts calculated from analysis of pole models in PLS-CADD.

SCALE: NTS

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LINCOLN AND TORRANCE COUNTIES, NEW MEXICO

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A	04-19-2018	ROW EXHIBITS	UEI
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ROW WIDTH EXHIBITS
SC STEEL MONOPOLE

REVISION:
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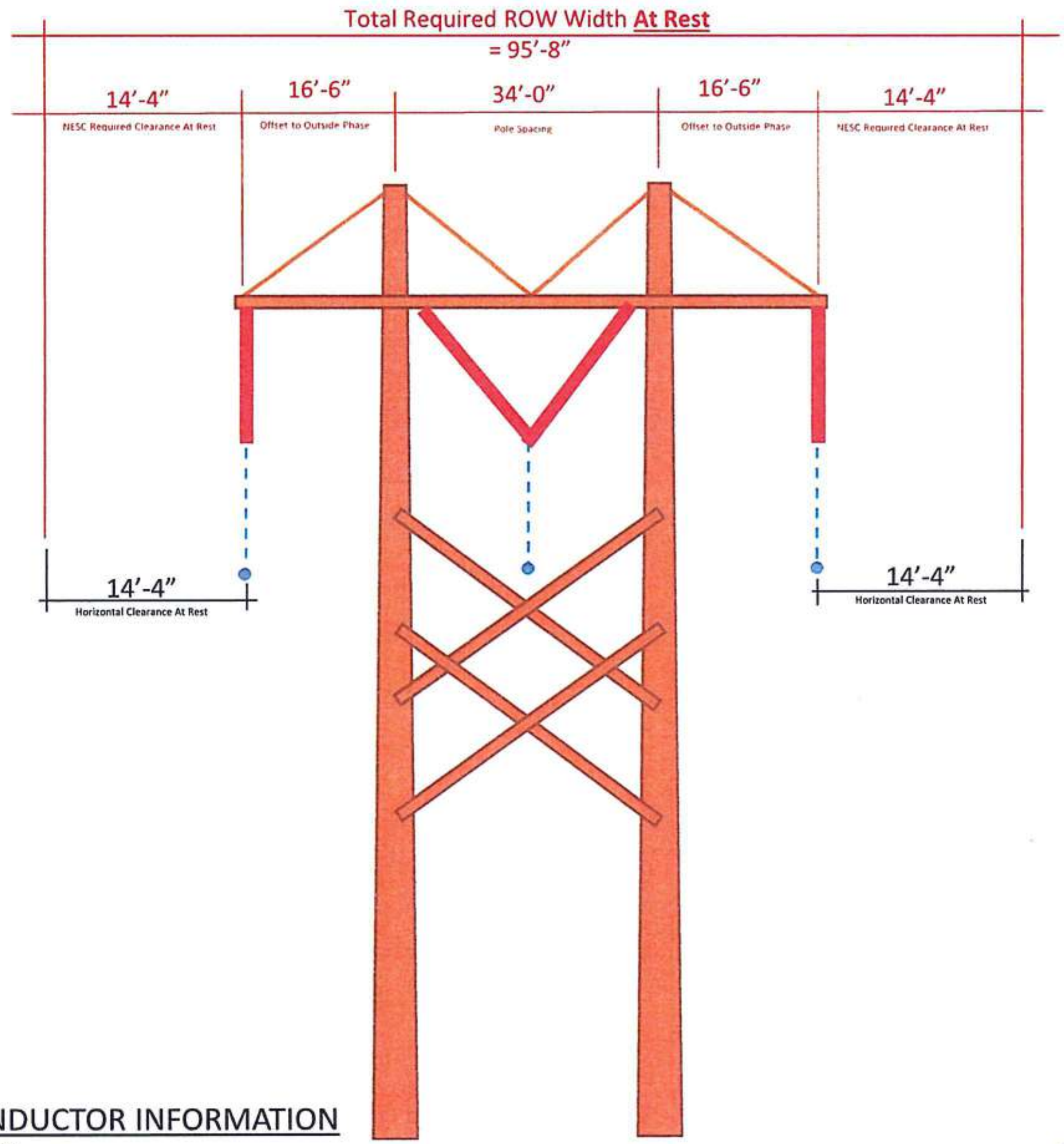

SCALE: NTS

STRUCTURE AND CONDUCTOR INFORMATION

Operational Voltage: 345kV
Structure Type = Single Circuit Wood H-Frame
Insulator Type = Suspension Insulators, I & V Type
Typical Design Span = 1300ft
Conductor Type = Bundled (2) 954kcmil ACSR "CARDINAL"
NESC Rule Analyzed: 234B1a
Weather Condition Displayed = 0 PSF @ 60 deg F

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LINCOLN AND TORRANCE COUNTIES, NEW MEXICO

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ROW WIDTH
EXHIBITS
SC WOOD H-FRAME

REVISION:
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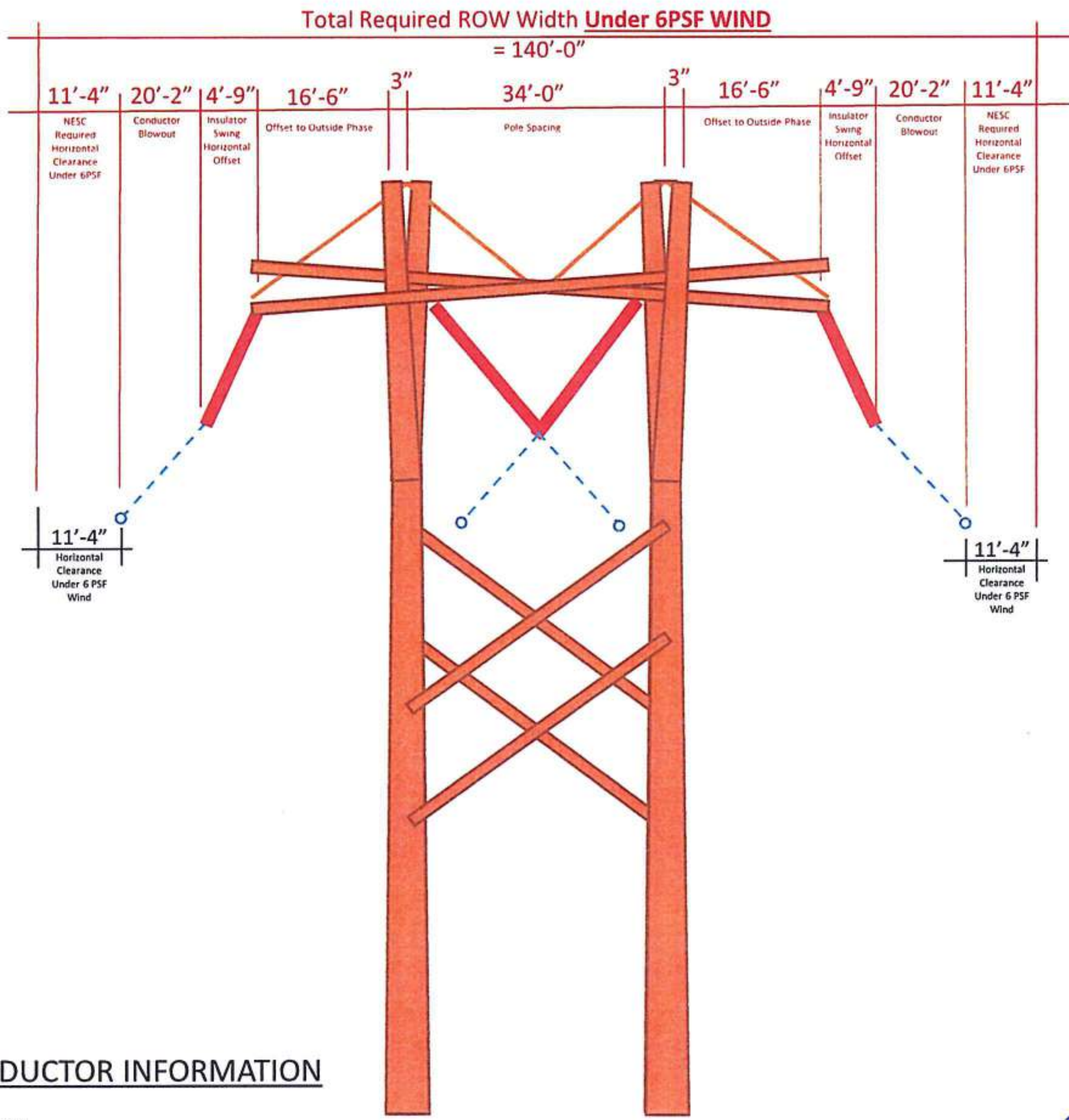

SCALE: NTS

STRUCTURE AND CONDUCTOR INFORMATION

Operational Voltage: 345kV
Structure Type = Single Circuit Wood H-Frame
Insulator Type = Suspension Insulators, I & V Type
Typical Design Span = 1300ft
Conductor Type = Bundled (2) 954kcmil ACSR "CARDINAL"
NESC Rule Analyzed: 234B1b
Weather Condition Displayed = 6 psf (48.4mph) @ 60 deg F
Pole Deflections, Insulator Swings and Conductor Blowouts calculated from analysis of pole models in PLS-CADD.

GREG C. PARENT
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CORONA WIND PROJECT

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ROW WIDTH EXHIBITS
SC WOOD H-FRAME

REVISION
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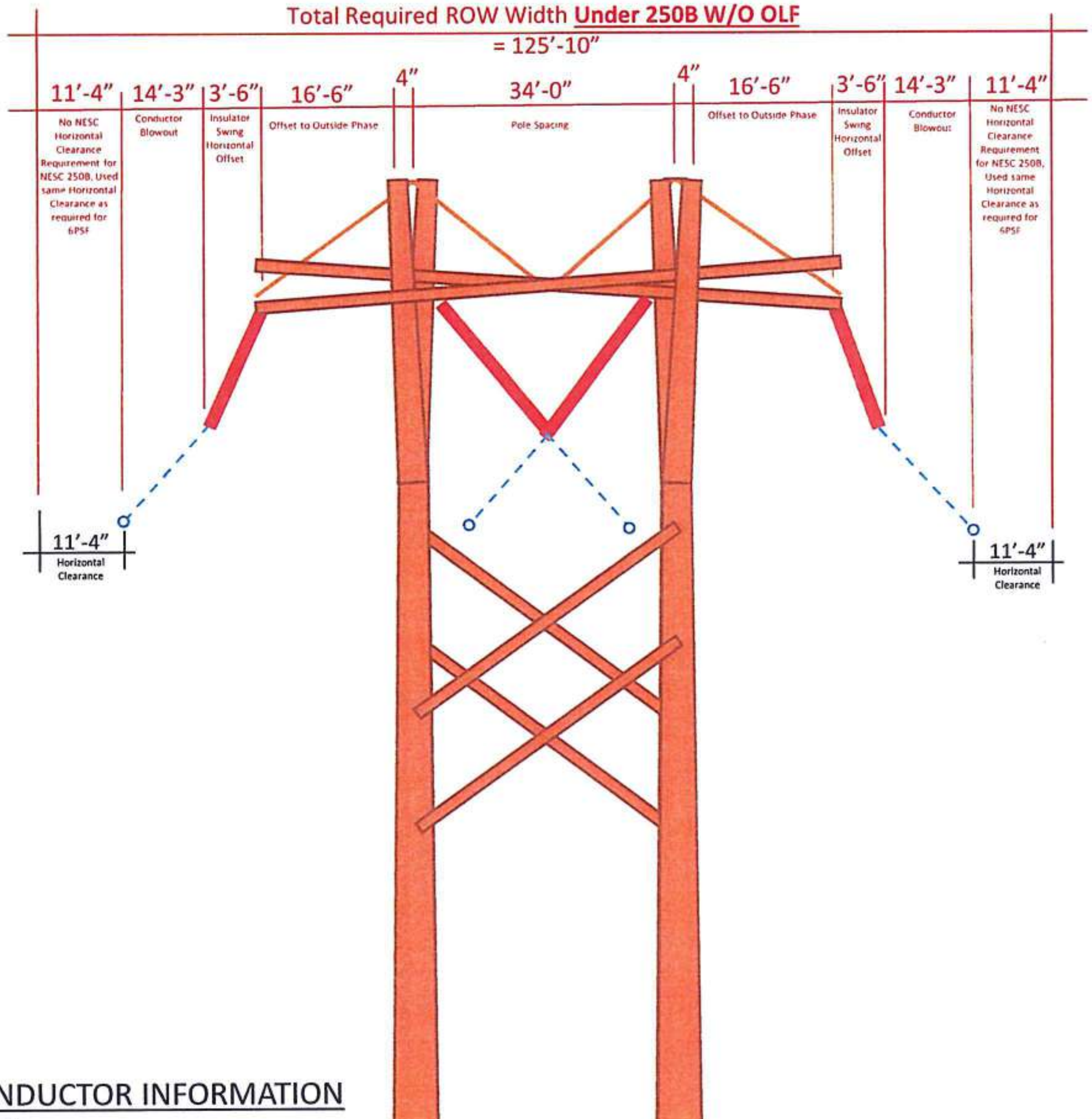

SCALE: NTS

STRUCTURE AND CONDUCTOR INFORMATION

Operational Voltage: 345kV
Structure Type = Single Circuit Wood H-Frame
Insulator Type = Suspension Insulators, I & V Type
Typical Design Span = 1000ft
Conductor Type = Bundled (2) 954kcmil ACSR "CARDINAL"
NESC Rule Analyzed: 250B W/O OLF
Weather Condition Displayed = 4 PSF (40mph) with ½" Radial Ice, 0 deg F
Pole Deflections, Insulator Swings and Conductor Blowouts calculated from analysis of pole models in PLS-CADD.

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NEW MEXICO
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12-18-18

CORONA WIND PROJECT

LINCOLN AND TORRANCE COUNTIES, NEW MEXICO

Rev.	Date	Description	By
A	04-19-2018	ROW EXHIBITS	UFI
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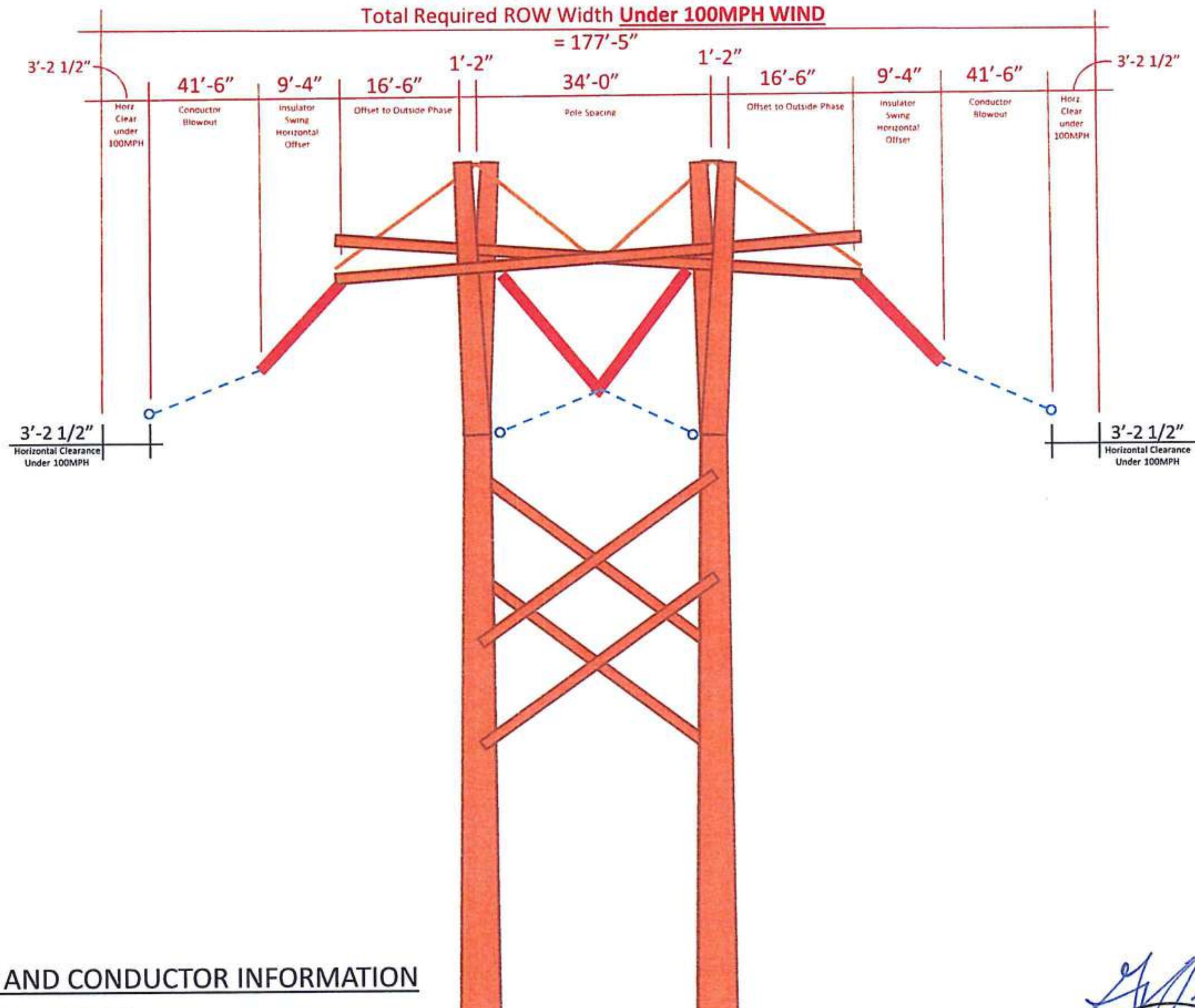
ROW WIDTH EXHIBITS
SC WOOD H-FRAME

REVISION:
B
COR-TLO-E-ROW-011



SCALE: NTS

STRUCTURE AND CONDUCTOR INFORMATION

Operational Voltage: 345kV
Structure Type = Single Circuit Wood H-Frame
Insulator Type = Suspension Insulators, I & V Type
Typical Design Span = 1300ft
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NESC Rule Analyzed: 250C
Weather Condition Displayed = 100 MPH @ 60 deg F
Pole Deflections, Insulator Swings and Conductor Blowouts calculated from analysis of pole models in PLS-CADD.

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LINCOLN AND TORRANCE COUNTIES, NEW MEXICO

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ROW WIDTH
EXHIBITS
SC WOOD H-FRAME

REVISION:
B
COR-TLO-E-ROW-012

Audiable Noise Calculation
Project Name: Corona Wind Project
Engineer: Greg Parent

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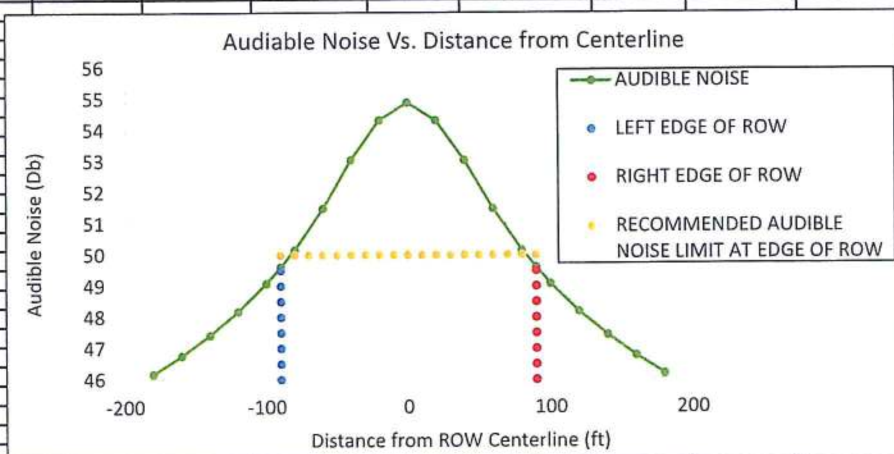
Bundle	x-feet	y-feet	n cond	cond dia	spacing	l-n voltage	phase	Kv/cm
1	27	32	2	1.196	18	205	0	15.1994
2	0	32	2	1.196	18	205	120	16.3518
3	-27	32	2	1.196	18	205	240	15.2031
4	13.5	50.5	1	0.6		0	0	4.1242
5	-13.7	50.5	1	0.6		0	0	4.1462
6								0.0000
7								0.0000
8								0.0000
NPH=	5.00	Calculated	Altitude ft=	7100				
(Inverse	8343.59	Dummy Output)	Note: Use "Paste Special" and "values" to copy data					
Dist		L50 rain						

Goal: output in C column < 50 DB

Away from Center Line (ft)	Vert	Decibles at distance away from centerline [db]	
-300	5	43.66	O.K.
-280	5	44.00	O.K.
-260	5	44.37	O.K.
-240	5	44.76	O.K.
-220	5	45.19	O.K.
-200	5	45.66	O.K.
-180	5	46.18	O.K.
-160	5	46.77	O.K.
-140	5	47.43	O.K.
-120	5	48.18	O.K.
-100	5	49.08	O.K.
-90	6	49.61	O.K.
-80	5	50.16	N.G.
-60	5	51.49	N.G.
-40	5	53.04	N.G.
-20	5	54.31	N.G.
0	5	54.88	N.G.
20	5	54.31	N.G.
40	5	53.04	N.G.
60	5	51.48	N.G.
80	5	50.15	N.G.
90	6	49.61	O.K.
100	5	49.08	O.K.
120	5	48.18	O.K.
140	5	47.42	O.K.
160	5	46.77	O.K.
180	5	46.18	O.K.
200	5	45.66	O.K.
220	5	45.19	O.K.
240	5	44.76	O.K.
260	5	44.37	O.K.
280	5	44.00	O.K.
300	5	43.66	O.K.
Max Decibles =		54.88	



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24890
PROFESSIONAL ENGINEER
12-18-19

The table below is a screen shot of a report from PLS CADD which shows the structure deflections for each load case. The controlling case is highlighted below:

Summary of Tip Deflections For All Load Cases:

Note: positive tip load results in positive deflection

Load Case	Joint Label	Long. Defl. (in)	Tran. Defl. (in)	Vert. Defl. (in)	Resultant Defl. (in)	Long. Rot. (deg)	Tran. Rot. (deg)	Twist (deg)
NESC 250C EXTREME WIND, NA+,I NA+	L:t	0.25	14.07	-0.12	14.07	0.01	0.21	0.00
NESC 250C EXTREME WIND, NA+,I NA+	R:t	0.24	14.05	-0.24	14.05	0.01	0.33	0.00
NESC 250C EXTREME WIND, NA-,I NA-	L:t	0.24	-14.05	-0.24	14.05	0.01	-0.33	-0.00
NESC 250C EXTREME WIND, NA-,I NA-	R:t	0.25	-14.07	-0.12	14.07	0.01	-0.21	-0.00
NESC 250D ICE W/ WIND, NA+,I NA+	L:t	0.25	3.58	-0.03	3.59	0.01	-0.01	0.00
NESC 250D ICE W/ WIND, NA+,I NA+	R:t	0.24	3.56	-0.06	3.57	0.01	0.14	0.00
NESC 250D ICE W/ WIND, NA-,I NA-	L:t	0.24	-3.56	-0.06	3.57	0.01	-0.14	-0.00
NESC 250D ICE W/ WIND, NA-,I NA-	R:t	0.25	-3.58	-0.03	3.59	0.01	0.01	-0.00
HEAVY ICE,I NA+	L:t	0.48	0.03	-0.06	0.49	0.03	-0.18	0.00
HEAVY ICE,I NA+	R:t	0.48	-0.01	-0.06	0.49	0.03	0.18	-0.00
UPLIFT,I NA+	L:t	0.34	0.02	-0.03	0.34	0.02	-0.05	0.00
UPLIFT,I NA+	R:t	0.34	0.01	-0.03	0.34	0.02	0.05	-0.00
NESC RULE 261A (wind towards 181),I Max	L:t	-56.00	0.08	-1.39	56.02	-2.33	-0.02	-0.01
NESC RULE 261A (wind towards 181),I Max	R:t	-56.00	0.06	-1.39	56.02	-2.33	0.03	0.01
DEFLECTION, NA+,I NA+	L:t	0.23	3.51	-0.02	3.52	0.01	0.02	0.00
DEFLECTION, NA+,I NA+	R:t	0.23	3.50	-0.05	3.51	0.01	0.12	0.00
DEFLECTION, NA-,I NA-	L:t	0.23	-3.50	-0.05	3.51	0.01	-0.12	-0.00
DEFLECTION, NA-,I NA-	R:t	0.23	-3.51	-0.02	3.52	0.01	-0.02	-0.00
NO WIND, DEFLECTION,I NA+	L:t	0.34	0.02	-0.03	0.34	0.02	-0.05	0.00
NO WIND, DEFLECTION,I NA+	R:t	0.34	0.01	-0.03	0.34	0.02	0.05	-0.00
HEAVY ICE (NO OLF),I NA+	L:t	0.45	0.03	-0.06	0.46	0.03	-0.16	0.00
HEAVY ICE (NO OLF),I NA+	R:t	0.45	-0.01	-0.06	0.46	0.03	0.16	-0.00
NESC 250B HEAVY W/K, NA+,I NA+	L:t	0.31	10.55	-0.10	10.56	0.02	0.06	0.00
NESC 250B HEAVY W/K, NA+,I NA+	R:t	0.30	10.51	-0.19	10.52	0.02	0.34	0.00
NESC 250B HEAVY W/K, NA-,I NA-	L:t	0.30	-10.51	-0.19	10.52	0.02	-0.34	-0.00
NESC 250B HEAVY W/K, NA-,I NA-	R:t	0.31	-10.55	-0.10	10.56	0.02	-0.06	-0.00
NESC RULE 277 INSULATORS, NA+,I NA+	L:t	0.24	3.25	-0.02	3.26	0.01	-0.01	0.00
NESC RULE 277 INSULATORS, NA+,I NA+	R:t	0.24	3.23	-0.05	3.24	0.01	0.13	0.00
NESC RULE 277 INSULATORS, NA-,I NA-	L:t	0.24	-3.23	-0.05	3.24	0.01	-0.13	-0.00
NESC RULE 277 INSULATORS, NA-,I NA-	R:t	0.24	-3.25	-0.02	3.26	0.01	0.01	-0.00
NESC RULE 277 INSULATORS, NA+,I NA+ 1	L:t	0.24	12.69	-0.10	12.69	0.01	0.19	0.00
NESC RULE 277 INSULATORS, NA+,I NA+ 1	R:t	0.23	12.67	-0.20	12.68	0.01	0.30	0.00
NESC RULE 277 INSULATORS, NA-,I NA- 1	L:t	0.23	-12.67	-0.20	12.68	0.01	-0.30	-0.00
NESC RULE 277 INSULATORS, NA-,I NA- 1	R:t	0.24	-12.69	-0.10	12.69	0.01	-0.19	-0.00
NESC RULE 277 INSULATORS, NA+,I NA+ 2	L:t	0.24	3.25	-0.02	3.26	0.01	-0.01	0.00
NESC RULE 277 INSULATORS, NA+,I NA+ 2	R:t	0.24	3.23	-0.05	3.24	0.01	0.13	0.00
NESC RULE 277 INSULATORS, NA-,I NA- 2	L:t	0.24	-3.23	-0.05	3.24	0.01	-0.13	-0.00
NESC RULE 277 INSULATORS, NA-,I NA- 2	R:t	0.24	-3.25	-0.02	3.26	0.01	0.01	-0.00
NESC 250B HEAVY NO OLF W/K, NA+,I NA+	L:t	0.26	4.16	-0.03	4.17	0.01	-0.01	0.00
NESC 250B HEAVY NO OLF W/K, NA+,I NA+	R:t	0.25	4.14	-0.07	4.15	0.01	0.17	0.00
NESC 250B HEAVY NO OLF W/K, NA-,I NA-	L:t	0.25	-4.14	-0.07	4.15	0.01	-0.17	-0.00
NESC 250B HEAVY NO OLF W/K, NA-,I NA-	R:t	0.26	-4.16	-0.03	4.17	0.01	0.01	-0.00

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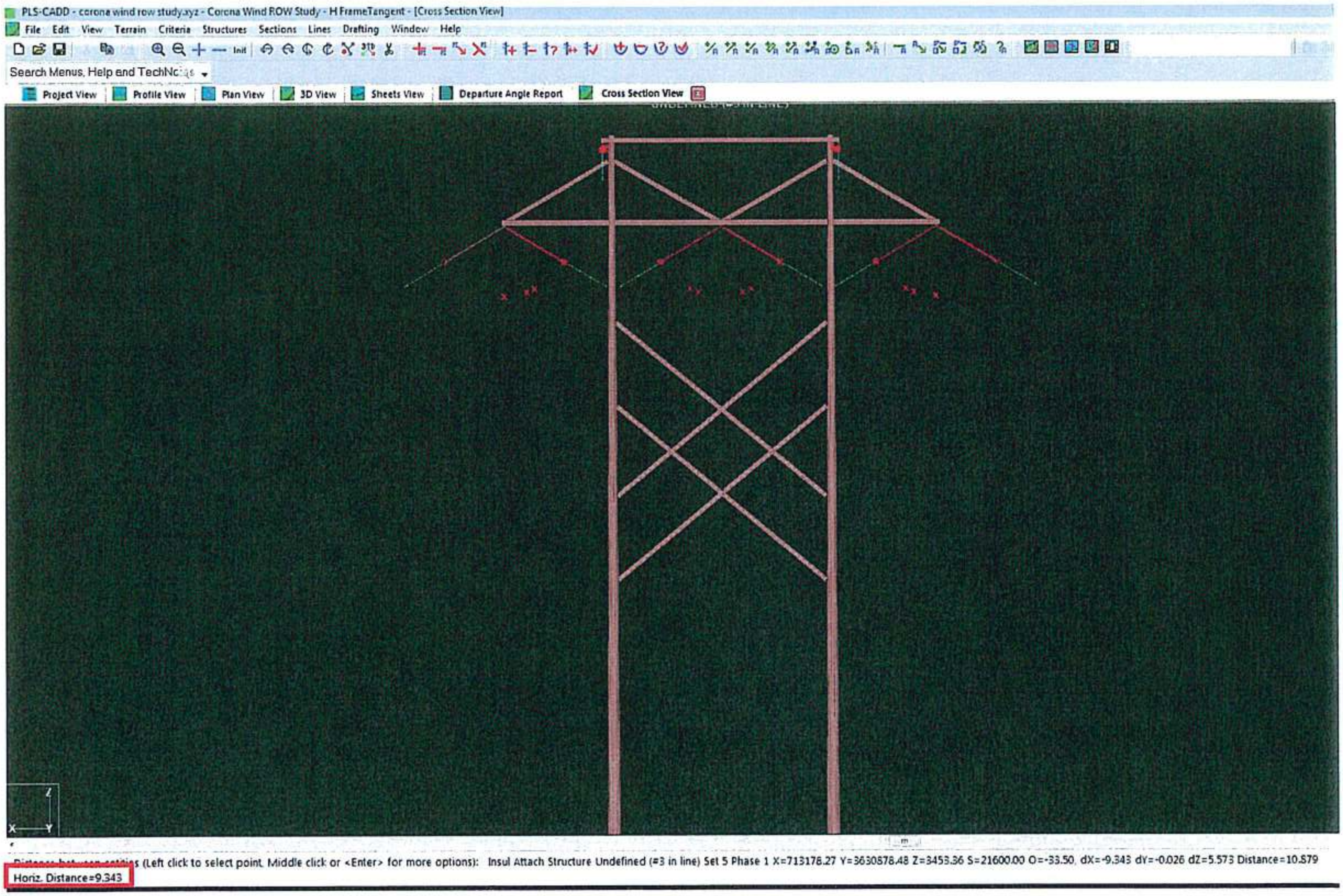
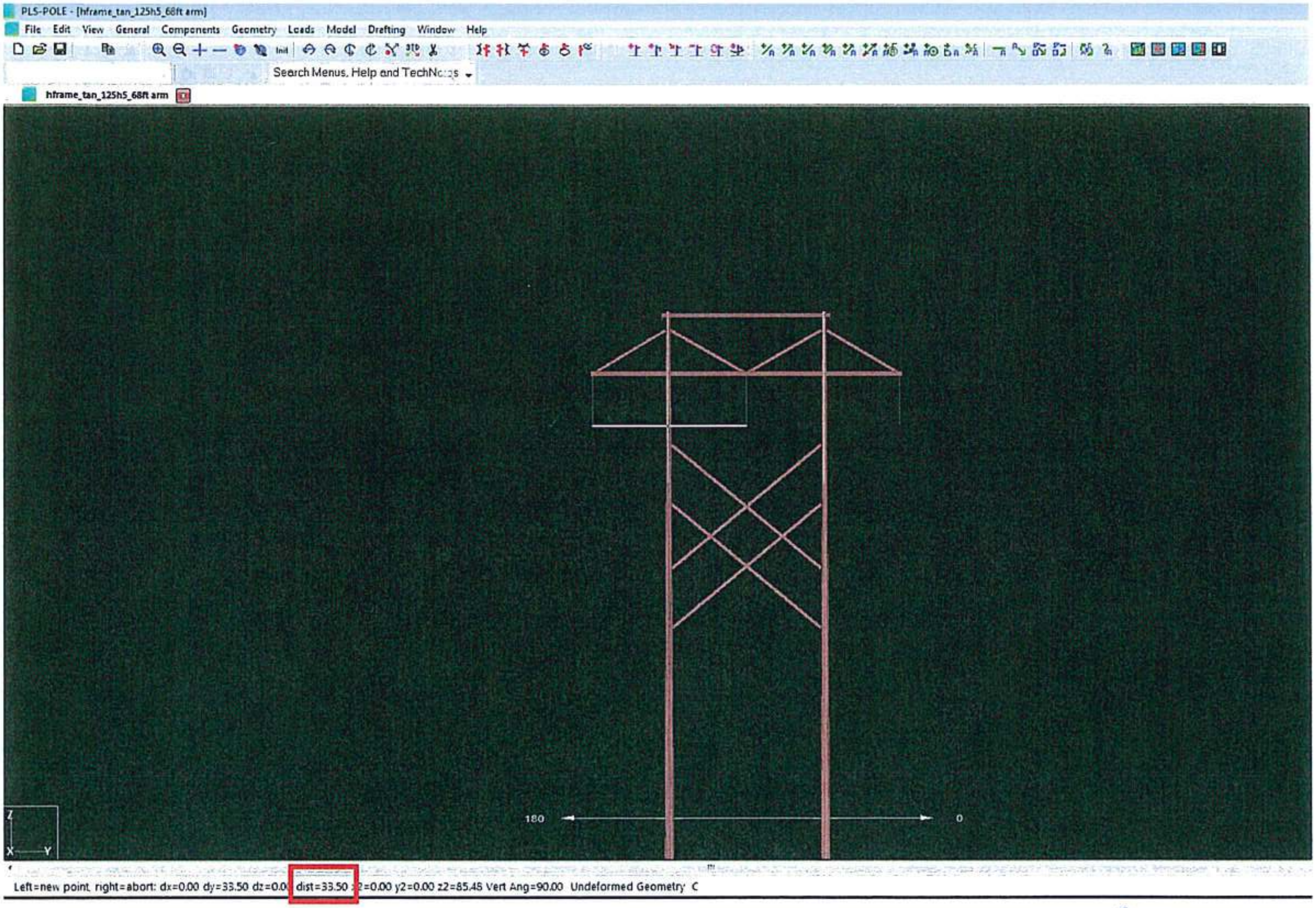
The image below is a screen shot of the cross sectional view of the structure. The insulator swing shown is at the 100 MPH Wind load case. The horizontal distance of the insulator swing (9.43 ft) is shown in the red box in the image:



The image below shows the measurement of the outer phase attachment point to the center of the structure (33.5 ft):



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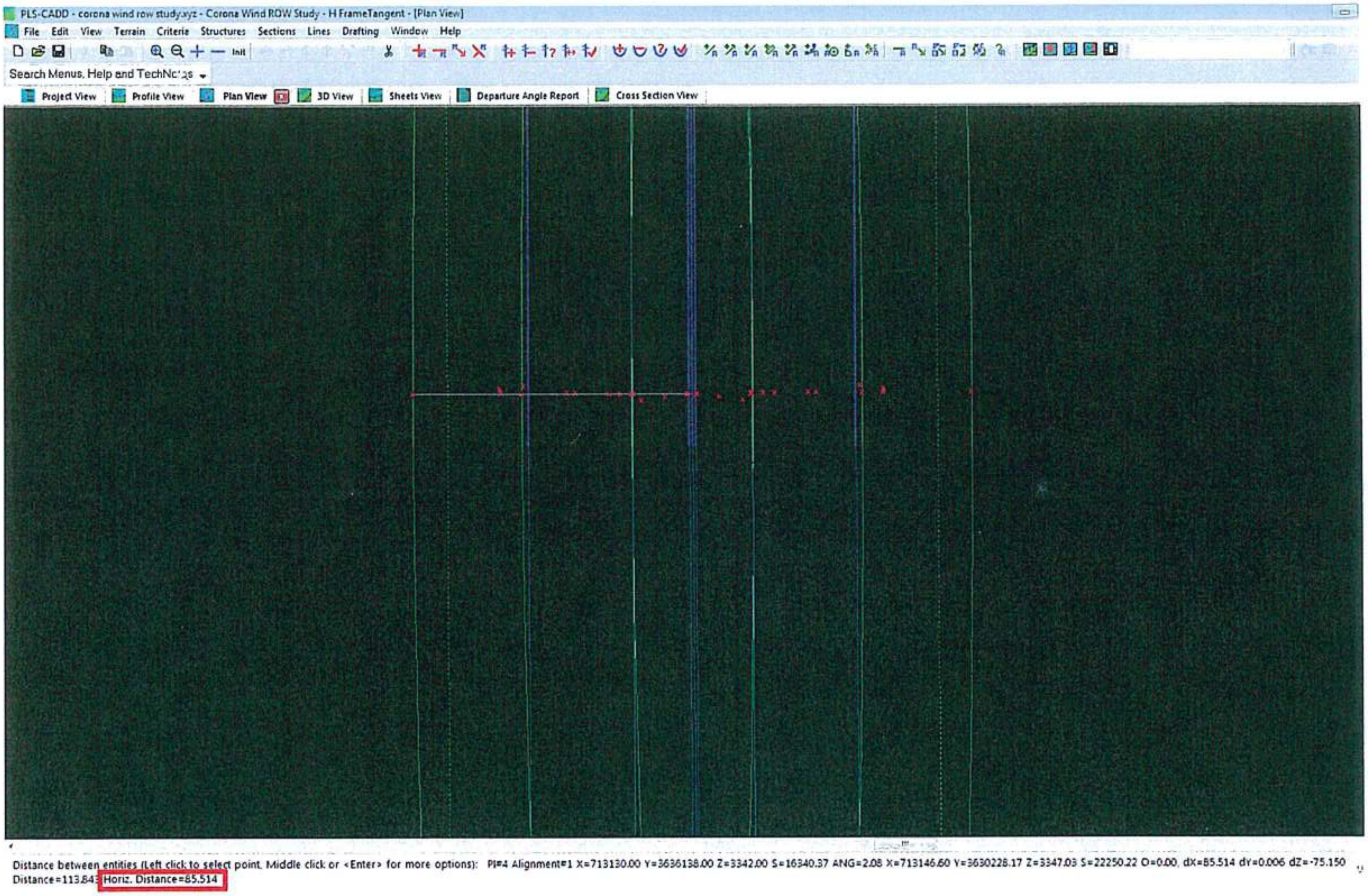
The image below shows the measurement of the total conductor blowout from the center line of the alignment. The distance shown below includes insulator swing, structure deflection and the offset of the outer phase from the center.



The conductor blowout can be calculated by subtracting the structure deflection, horizontal insulator swing length, and attachment point offset from the total blowout value shown above.

(B_C) = Conductor Blowout (ft)
(D_S) = Structure Deflection (ft)
(D_I) = Insulator Swing Horizontal Distance (ft)
(D_O) = Outer Phase Attachment Offset From Structure Center (ft)
(B_T) = Total Blowout

$$B_C = B_T - D_S - D_I - D_O$$
$$= 85.5 \text{ ft} - 1.17 \text{ ft} - 9.34 \text{ ft} - 33.5 \text{ ft}$$
$$= 41.49 \text{ ft}$$

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BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE AMENDED JOINT APPLICATION OF THE CORONA WIND COMPANIES FOR LOCATION APPROVAL OF THE EXPANSION OF THE CORONA WIND PROJECTS RECONFIGURATION OF THE PROPOSED CORONA GEN-TIE SYSTEM, EXTENSION OF THE CORONA GEN-TIE SYSTEM AND REQUEST FOR RIGHT OF WAY DETERMINATION IN LINCOLN, TORRANCE, AND GUADALUPE COUNTIES PURSUANT TO THE PUBLIC UTILITY ACT, NMSA 1978, § 62-9-3	)	**Case No. 20-00008-UT**
ANCHO WIND LLC, COWBOY MESA LLC, DURAN MESA LLC, RED CLOUD WIND LLC, TECOLOTE WIND LLC, AND VIENTO LOCO, LLC,	)	
Joint Applicants.	)	

AFFIDAVIT OF GREG PARENT

BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE CORONA WIND COMPANIES' JOINT APPLICATION FOR THE LOCATION OF THE CORONA WIND PROJECTS AND THE CORONA GEN-TIE SYSTEM IN LINCOLN, TORRANCE AND GUADALUPE COUNTIES PURSUANT TO THE PUBLIC UTILITY ACT, NMSA 1978, §62-9-3 **ANCHO WIND LLC, COWBOY MESA LLC, DURAN MESA LLC, RED CLOUD WIND LLC, TECOLOTE WIND LLC, VIENTO LOCO LLC,** **JOINT APPLICANTS.**	)	**Case No. 18-00065-UT**

AFFIDAVIT OF GREG PARENT

STATE OF COLORADO)
) ss.
COUNTY OF Arapahoe)

I have read the foregoing Direct Testimony, and it is true and accurate based on my own knowledge and belief.

[signature]

SUBSCRIBED and sworn to before me this 19 day of December 2019.

[signature: Jennifer Sievert]
NOTARY PUBLIC

December 14, 2022
My Commission Expires

JENNIFER SIEVERT
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20144047228
MY COMMISSION EXPIRES 12/14/22

BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF THE AMENDED JOINT APPLICATION OF THE CORONA WIND COMPANIES FOR LOCATION APPROVAL OF THE EXPANSION OF THE CORONA WIND PROJECTS RECONFIGURATION OF THE PROPOSED CORONA GEN-TIE SYSTEM, EXTENSION OF THE CORONA GEN-TIE SYSTEM AND REQUEST FOR RIGHT OF WAY DETERMINATION IN LINCOLN, TORRANCE, AND GUADALUPE COUNTIES PURSUANT TO THE PUBLIC UTILITY ACT, NMSA 1978, § 62-9-3	)	**Case No. 20-00008-UT**
ANCHO WIND LLC, COWBOY MESA LLC, DURAN MESA LLC, RED CLOUD WIND LLC, TECOLOTE WIND LLC, AND VIENTO LOCO, LLC,	)	
Joint Applicants.	)	

CERTIFICATE OF SERVICE