APPENDIX A

Visual Resources Study

United States Department of the Interior
Bureau of Land Management

MESA WIND REPOWER

Visual Resources Study

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REV January 2021

Contents

Figures

1. Methodology for Analysis

This report provides the visual contrast analysis and simulations for the Mesa Wind Repower Project (MWRP). The MWRP is a repower of an existing 30 megawatt wind project. It would amend the existing right-of-way grant to remove more than 400 existing 36-year-old turbines and construct, operate, maintain, and decommission up to 11 new turbines located entirely within the existing Mesa Wind right-of-way on Bureau of Land Management (BLM) administered land.

An *adverse visual effect* typically occurs within public view when: (1) an action perceptibly changes existing features of the physical environment so that they no longer appear to be characteristic of the subject locality or region; (2) an action introduces new features to the physical environment that are perceptibly uncharacteristic of the region and/or locale; or (3) visually prominent natural or cultural features of the landscape become less visible (e.g., partially or totally blocked from view) or are removed. Changes that seem uncharacteristic are those that appear out of place, discordant, or distracting. The degree of the visual effect depends upon how noticeable the adverse change is. The noticeability of a visual effect is a function of project features, context, and viewing conditions (angle of view, distance, primary viewing directions, and duration of view).

The factors considered in determining adverse effects on visual resources included: (1) scenic quality of the MWRP site and vicinity; (2) available visual access and visibility and the frequency and duration under which the landscape is viewed; (3) viewing conditions (distance, angle of observation, relative size or scale, spatial relationships, motion, light conditions, seasonable variability and use, atmospheric conditions, and recovery time) and the degree to which the MWRP components would dominate the view of the observer; (4) resulting contrast (form, line, color, and texture) of the project facilities or activities with existing landscape characteristics; (5) the extent to which MWRP features or activities would block views of higher value landscape features; and (6) the level of public interest in the existing landscape characteristics and concern over potential changes.

After review of the MWRP project viewshed analysis, the BLM selected six Key Observation Points (KOPs) that would represent key views of the project. Digital techniques were used to produce simulations of the MWRP as it would appear with implementation as seen from the KOPs. The Proposed Action and alternatives simulations assisted in the on-site assessment of the contrast of the action alternatives with existing landscape elements.

BLM VRM Contrast Analysis Methodology

Under the BLM's Visual Resource Management (VRM) Visual Contrast Rating (VCR) System, the Proposed Action and alternatives are analyzed for their effects on visual resources using an assessment of the visual contrast within the landscape created by components of the MWRP. Impacts to the visual resource values and conformance with VRM Class Objectives are evaluated through a contrast rating process described below. The degree to which the Proposed Action and alternatives adversely affect the visual quality of a landscape is directly related to the amount of visual contrast between the action alternatives and the existing landscape character.

Visual Contrast Ratings were determined at each KOP using the BLM's VRM System manual (BLM 1986). The Visual Contrast Rating forms are provided in Section 3 of this appendix. Under the VRM System, the degree to which a project or activity affects the visual quality of a landscape depends on the visual contrast created between the project components and the major features, or predominant qualities, in the existing landscape. Visual contrast evaluates a project's consistency with the visual elements of form, line, color, and texture already established in the viewshed. In a sense, visual contrast indirectly indicates a particular landscape's ability to absorb a project's components and location without resulting in an uncharacteristic appearance. Other elements that are considered in evaluating visual contrast include the degree of natural screening by vegetation and landforms; placement of structures relative to existing vegetation, landforms, and other structures; observer's angle of view relative to the project; distance from the point of observation; viewing duration/spatial relationships; atmospheric conditions; season of use; lighting conditions; and relative size or scale of a project. Once the degree of anticipated contrast is determined (ranging from none to strong), a conclusion on the overall level of change is made (ranging from very low to high) and compared to the applicable VRM Class Objective for a determination of conformance with the Interim VRM Class Objectives.

For the MWRP, the applicable VRM Classes are **VRM Class II** (for the access road) and **VRM Class IV** (for the wind ROW including all WTGs). The management objectives for these VRM Classes are as follows.

> ***VRM Class II***. *The objective is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.*
>
> ***VRM Class IV***. *The objective is to provide for management activities that require major modification of the landscape character. The level of change to the characteristic landscape can be high. Management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repetition of the basic landscape elements.*

2. Key Observation Points

Six representative KOPs were established to assess the various factors that are considered in the evaluation of a landscape's existing visual resources. These KOPs were selected in consultation with the BLM and are representative of the most critical locations from which the Project and alternatives would be seen. KOPs were located based on their usefulness in evaluating existing landscapes and potential impacts on various viewing populations. KOP locations include: (1) sensitive residential communities in close proximity to the Project (Bonnie Bell, Whitewater, and Snow Creek Village), (2) important recreation facilities (PCT), (3) important travel routes (SR-111 and I-10), and (4) more distant communities (Cabazon) with views of the Project. These locations provide representative examples of the existing landscape context and viewing conditions for the Project and are shown on Figure H 1. At each KOP, the existing landscape was characterized and photographed. The following paragraphs describe each of the six KOPs.

KOP 1 – Bonnie Bell. KOP 1 was established on Whitewater Canyon Road in the residential enclave of Bonnie Bell (see Figure H 2A). This KOP was selected because of the high visual sensitivity of this nearby residential area and its proximity to the Project site. Viewing to the northwest, this view captures a portion of the southern foothills of the San Bernardino Mountains. The rocky ridge in the center of Figure H-2A is approximately 0.5 mile west of Bonnie Bell and marks the eastern-most extent of the Mesa site. This area includes a foreground desert community landscape backdropped by rounded, rugged desert hills and curvilinear to angular ridges that support vegetation patterns that range from sparse to patchy clumps to irregular groupings.

Grasses and shrubs are of subdued color consisting of tans, browns, and muted greens. The rugged foothills and pronounced ridgelines confine views to the foreground distance zone and provide a backdrop of visual interest. The residential structures comprise geometric forms that appear somewhat weathered and rough-hewn and are substantially obscured in shaded depths by surrounding trees and vegetation. The applicable VRM Class Rating is Class IV along the hilltops and ridges underlying the footprint of the Proposed Action and Alternative C WTGs that would be visible from this viewpoint. The KOP 1 Contrast Rating Form is provided in Section 3.

KOP 2 – Whitewater. KOP 2 was established on Haugen-Lehmann Way in the residential community of Whitewater (Figure H 3A). This KOP was selected because of the high visual sensitivity of this nearby residential area and its proximity to the Project site. Viewing to the northeast, this view captures a portion of the southern foothills of the San Bernardino Mountains and the dry, rocky alluvial fan where the community of Whitewater is located. The curvilinear ridge in the center of Figure H-3A is approximately 1.25 miles northeast of KOP 2. This area includes a foreground desert residential community landscape of scattered houses, utility lines, and sparse to irregular groupings of arid vegetation of subdued color, consisting of tans, browns, and muted greens. The residential structures comprise geometric forms and the numerous WTGs of the existing Mesa and Alta Mesa projects are readily visible as skylined vertical features along the ridgeline in the background. The applicable VRM Class Rating is Class IV along the western hilltops and ridges underlying the footprint of the Proposed Action and Alternative C WTGs that would be visible from this viewpoint. The KOP 2 Contrast Rating Form is provided in Section 3.

KOP 3 – Snow Creek Village. KOP 3 was established on northbound Snow Creek Road, just north of the Snow Creek Village residential enclave (see Figure H 4A). This KOP was selected because of the high visual sensitivity of this residential area and its unobstructed sightlines to the Mesa Project. As shown in Figure H-4A, viewing to the north, the open, panoramic view over the alluvial plain of the eastern portion San Gorgonio Pass captures a portion of the southern foothills of the San Bernardino Mountains. These angular to horizontal ridges provide a backdrop of visual interest to the foreground flat desert landscape that appears somewhat non-descript and common to the western Coachella Valley. The vegetation consists of low-growing grasses and shrubs of subdued color consisting of tans, browns, and muted greens. The vegetation appears patchy to more continuous at distance. The angular to horizontal tan ridge that occupies the center of the image is approximately 3.6 miles north of KOP 3 and is the location of the western portion of the Mesa Project. Some of the existing gray, lattice-support WTGs are visible along the western slopes of the ridge and along the ridgetop. The applicable VRM Class Rating is Class IV along the western hilltops and ridgeline underlying the footprint of the Proposed Action and Alternative C WTGs that would be visible from this viewpoint. The KOP 3 Contrast Rating Form is provided in Section 3.

KOP 4 – Pacific Crest National Scenic Trail. KOP 4 was established on the PCT, approximately 0.4 miles northwest of the nearest existing WTGs along the ridge (to the east) in Figure H 5A. This KOP was selected because of the high visual sensitivity of the PCT and its very close proximity to the Mesa Project. As shown in Figure H-5A, the view to the southeast for the southbound hiker on the PCT would be fairly constrained by parallel ridges. Views to the east and southeast down the trail would be dominated by a very dense distribution of vertical, lattice-support legacy towers. The simple linear to complex geometric forms and lines create substantial industrial landscape character in an area that would otherwise be characterized as a rugged, desert backcountry landscape. Landforms are predominantly angular to horizontal rocky ridges with patchy clumps to irregular groupings of shrubs and grasses. Overall natural landscape colors consist of muted earth tones of tan, brown, gray, and green. The applicable VRM Class Ratings for this portion of the Mesa Project area is VRM Class IV for all other areas underlying the footprint of the Proposed

Action and Alternative C WTGs that would be visible from this viewpoint. The KOP 4 Contrast Rating Form is provided in Section 3.

KOP 5 – Cabazon and I-10. KOP 5 was established at the Circle K parking lot, adjacent to the Main Street off-ramp from eastbound I-10, approximately 6.3 miles west-southwest of the Mesa site (see Figure H 6A). This KOP was selected to be representative of the typically obstructed views of the Project from the community of Cabazon and from the I-10. As shown in Figure 3.12-6A, viewing to the east-northeast, the view encompasses primarily an urban freeway landscape of travel lanes, off-ramps, overpasses, and frontage businesses, backdropped by the southeast extent of the San Bernardino Mountains and the distant Mesa legacy towers (along with others) on the eastern-most ridgelines forming the northern boundary of San Gorgonio Pass. The angular to horizontal ridges provide a backdrop of some visual interest to the foreground freeway landscape that typifies the view within San Gorgonio Pass. The vegetation consists of low-growing grasses and shrubs of subdued color consisting of tans, browns, and muted greens. The vegetation appears patchy to more continuous at distance along the hillslopes and ridgelines. The Mesa legacy towers with their lattice support structures can barely be distinguished along the angular to horizontal tan ridges that backdrop the center of the image presented as Figure H-6A. The applicable VRM Class Ratings are Class IV for the Proposed Action and Alternative C WTGs that would be visible from this viewpoint. The KOP 5 Contrast Rating Form is provided in Section 3.

KOP 6 – SR-111. KOP 6 was established on westbound SR-111, approximately 0.8 mile east of Snow Creek Road and approximately 2.7 miles south of the Mesa Project (see Figure H 7A). This KOP was selected as representative of the available views of Project from major roads in the area. As shown in Figure H-7A, viewing to the north, the open, panoramic view over the alluvial plain of the eastern portion San Gorgonio Pass captures a portion of the southern foothills of the San Bernardino Mountains. These angular to horizontal ridges provide a backdrop of visual interest to the foreground flat desert landscape that appears somewhat non-descript and common to the western Coachella Valley. The vegetation consists of low-growing grasses and shrubs of subdued color consisting of tans, browns, and muted greens. The vegetation appears patchy and irregular. Existing legacy turbines of the Project and the Alta Mesa Project are visible along the ridgelines in Figure H-7A. The turbines visible in the center of the image are part of the Alta Mesa Project. The applicable VRM Class Rating is Class IV along the ridgelines underlying the footprint of the Proposed Action and Alternative C WTGs that would be visible from this viewpoint. The KOP 6 Contrast Rating Form is provided in Section 3.

3. Contrast Rating Forms

The following pages provide the MWRP Proposed Action Contrast Rating Forms for each of the KOPs. An additional Contrast Rating Form is also provided for Alternative C (Reduced Turbine Alternative) as viewed from KOP 1.

Visual Contrast Rating Data Sheet

Mesa Wind Repower Project Environmental Assessment

KEY VIEWPOINT DESCRIPTION

Key Observation Point

1 – Alternative C (RTA)

Location

Whitewater Canyon Road in the residential community of Bonnie Bell, viewing northwest.

VRM Class

IV

Analyst

Michael Clayton

Date

February 11, 2020

Latitude: 33.946581° Longitude: -116.642462°

CHARACTERISTIC LANDSCAPE DESCRIPTION – Alternative C (RTA)

	LANDFORM / WATER	VEGETATION	STRUCTURES
Form	Rounded to angular hills and ridges	Patchy clumps to irregular groupings and continuous	Partially obscured geometric forms and linear fence posts in residential area
Line	Curvilinear to diagonal	Irregular and indistinct	Partially obscured diagonal to vertical; irregular for ridgeline WTGs
Color	Light tans to gray	Tans and greens for trees and shrubs, golden tans for grasses	Brown for residential features, white to light gray for ridgeline WTGs
Texture	Smooth to granular and coarse	Matte	Rough-hewn to matte for residential features, smooth for WTGs

PROPOSED ACTIVITY DESCRIPTION – Alternative C (RTA)

	LANDFORM / WATER	VEGETATION	STRUCTURES
Form	Same	Same	Geometric to simple linear
Line	Same	Same	Noticeable vertical for supports and horizontal, vertical and diagonal for blades
Color	Same	Same	White with gray shadowing
Texture	Same	Same	Smooth

DEGREE OF CONTRAST – Alternative C (RTA)

	LANDFORM / WATER				VEGETATION				STRUCTURES			
	NONE	WEAK	MODERATE	STRONG	NONE	WEAK	MODERATE	STRONG	NONE	WEAK	MODERATE	STRONG
Form	✓				✓					✓	✓	
Line	✓				✓					✓	✓	
Color	✓				✓					✓	✓	
Texture	✓				✓					✓	✓	

LEVEL OF CHANGE & VRM CLASS CONSISTENCY

Term: ☐ Short ☒ Long **Level of Change:** ☐ Very Low ☒ Low ☒ Moderate ☐ High

Does the Project Design Meet VRM Objectives? ☒ Yes ☐ No

Visual Contrast Rating Data Sheet

Mesa Wind Repower Project Environmental Assessment

KEY VIEWPOINT DESCRIPTION

Key Observation Point
2

Location
Haugen-Lehmann Way in the rural residential community of White Water, viewing northeast.

VRM Class
IV

Analyst
Michael Clayton

Date
February 11, 2020

CHARACTERISTIC LANDSCAPE DESCRIPTION

	LANDFORM / WATER	VEGETATION	STRUCTURES
Form	Rounded to angular hills and ridges to horizontal alluvial fan	Patchy clumps to irregular groupings and continuous	Partially obscured geometric forms, prominent utility poles and energy facilities
Line	Curvilinear to diagonal	Irregular and indistinct	Vertical to diagonal and horizontal
Color	Light tans to gray	Tans and muted greens for trees and shrubs, golden tans for grasses	Variable for residences, white to light gray and brown for utility and energy facilities
Texture	Smooth to granular and coarse	Matte	Smooth to rough-hewn to matte

PROPOSED ACTIVITY DESCRIPTION

	LANDFORM / WATER	VEGETATION	STRUCTURES
Form	Same	Same	Geometric to simple linear
Line	Same	Same	Prominent vertical for supports and horizontal, vertical and diagonal for blades
Color	Same	Same	White
Texture	Same	Same	Smooth

DEGREE OF CONTRAST

	LANDFORM / WATER				VEGETATION				STRUCTURES			
	NONE	WEAK	MODERATE	STRONG	NONE	WEAK	MODERATE	STRONG	NONE	WEAK	MODERATE	STRONG
Form	✓				✓						✓	
Line	✓				✓						✓	
Color	✓				✓						✓	
Texture	✓				✓					✓		

LEVEL OF CHANGE & VRM CLASS CONSISTENCY

Term: ☐ **Short** ☒ **Long** | **Level of Change:** ☐ **Very Low** ☐ **Low** ☒ **Moderate** ☐ **High**

Does the Project Design Meet VRM Objectives? ☒ **Yes** ☐ **No**

Visual Contrast Rating Data Sheet

Mesa Wind Repower Project Environmental Assessment

KEY VIEWPOINT DESCRIPTION

Key Observation Point
3

Location
Snow Creek Road, just north of the rural residential enclave of Snow Creek Village, viewing north across San Gorgonio Pass.

VRM Class
IV

Analyst
Michael Clayton

Date
February 11, 2020

Latitude: 33.894064° **Longitude: -116.682789°**

CHARACTERISTIC LANDSCAPE DESCRIPTION

	LANDFORM / WATER	VEGETATION	STRUCTURES
Form	Horizontal valley floor, horizontal to angular mountains and ridgelines	Patchy clumps to irregular and continuous at distance	Foreground linear utility poles to ridgetop linear wind turbines
Line	Horizontal to diagonal and irregular	Irregular and indistinct to horizontal as defined by valley floor	Vertical (poles and turbines) to diagonal (conductors and road)
Color	Light tans to gray	Tans and muted to dark greens for shrubs, golden tans for grasses	Gray (road) to brown (poles) to white (turbines)
Texture	Smooth to granular and coarse	Matte	Smooth to Matte

PROPOSED ACTIVITY DESCRIPTION

	LANDFORM / WATER	VEGETATION	STRUCTURES
Form	Same	Same	Simple linear
Line	Same	Same	Prominent vertical for supports and horizontal, vertical and diagonal for blades
Color	Same	Same	White
Texture	Same	Same	Smooth

DEGREE OF CONTRAST

	LANDFORM / WATER				VEGETATION				STRUCTURES			
	NONE	WEAK	MODERATE	STRONG	NONE	WEAK	MODERATE	STRONG	NONE	WEAK	MODERATE	STRONG
Form	✓				✓					✓	✓	
Line	✓				✓					✓	✓	
Color	✓				✓						✓	
Texture	✓				✓					✓		

LEVEL OF CHANGE & VRM CLASS CONSISTENCY

Term: ☐ **Short** ☒ **Long** | **Level of Change:** ☐ **Very Low** ☒ **Low** ☒ **Moderate** ☐ **High**

Does the Project Design Meet VRM Objectives? ☒ **Yes** ☐ **No**

Visual Contrast Rating Data Sheet

Mesa Wind Repower Project Environmental Assessment

KEY VIEWPOINT DESCRIPTION

Key Observation Point
4

Location
Pacific Crest Trail, approximately 0.4 mile northwest of the nearest existing WTGs along the ridge to the left (east) in the image.

VRM Class
II / IV

Analyst
Michael Clayton

Date
February 11, 2020

CHARACTERISTIC LANDSCAPE DESCRIPTION

	LANDFORM / WATER	VEGETATION	STRUCTURES
Form	Rounded to angular hills and ridges	Patchy clumps to irregular groupings and continuous	Simple linear to complex geometric
Line	Curvilinear to diagonal and irregular	Irregular and indistinct	Prominent vertical (supports) to vertical, horizontal, and diagonal (supports & blades)
Color	Light tans to brown and gray	Tans and muted greens for shrubs, golden tans for grasses	Gray and white
Texture	Smooth to granular and coarse	Matte	Smooth

PROPOSED ACTIVITY DESCRIPTION

	LANDFORM / WATER	VEGETATION	STRUCTURES
Form	Same	Same	Simple linear (supports and blades), tubular (supports)
Line	Same	Same	Prominent vertical (supports) to horizontal, vertical, and diagonal (blades)
Color	Same	Same	White and gray
Texture	Same	Same	Smooth

DEGREE OF CONTRAST

	LANDFORM / WATER				VEGETATION				STRUCTURES			
	NONE	WEAK	MODERATE	STRONG	NONE	WEAK	MODERATE	STRONG	NONE	WEAK	MODERATE	STRONG
Form	✓				✓					✓	✓	
Line	✓				✓					✓	✓	
Color	✓				✓					✓	✓	
Texture	✓				✓					✓	✓	

LEVEL OF CHANGE & VRM CLASS CONSISTENCY

Term: ☐ Short ☒ Long | **Level of Change:** ☐ Very Low ☒ Low ☒ Moderate ☐ High

Does the Project Design Meet VRM Objectives? ☒ Yes ☐ No

Visual Contrast Rating Data Sheet

Mesa Wind Repower Project Environmental Assessment

KEY VIEWPOINT DESCRIPTION

Key Observation Point **5**	
Location Circle K parking lot in Cabazon, along the south side of Interstate 10 and approximately 6.25 miles west-southwest of the Project site.	
VRM Class **II / IV**	
Analyst Michael Clayton	
Date February 11, 2020	

CHARACTERISTIC LANDSCAPE DESCRIPTION

	LANDFORM / WATER	VEGETATION	STRUCTURES
Form	Horizontal valley floor to rounded and angular hills and ridges	Patchy clumps to irregular groupings and continuous	Partially obscured geometric forms and linear posts, lights, and roads
Line	Horizontal to curvilinear and diagonal	Irregular and indistinct	Horizontal to partially obscured diagonal to vertical
Color	Light tans to gray	Tans and muted to greens for shrubs, golden tans for grasses	Tans, gray, white and yellow
Texture	Smooth to granular and coarse	Matte	Smooth to matte

PROPOSED ACTIVITY DESCRIPTION

	LANDFORM / WATER	VEGETATION	STRUCTURES
Form	Same	Same	Simple linear
Line	Same	Same	Barely distinct vertical to diagonal
Color	Same	Same	White and gray
Texture	Same	Same	Smooth

DEGREE OF CONTRAST

	LANDFORM / WATER				VEGETATION				STRUCTURES			
	NONE	WEAK	MODERATE	STRONG	NONE	WEAK	MODERATE	STRONG	NONE	WEAK	MODERATE	STRONG
Form	✓				✓					✓		
Line	✓				✓					✓		
Color	✓				✓					✓		
Texture	✓				✓					✓		

LEVEL OF CHANGE & VRM CLASS CONSISTENCY

Term: ☐ **Short** ☒ **Long** | **Level of Change:** ☐ **Very Low** ☒ **Low** ☐ **Moderate** ☐ **High**

Does the Project Design Meet VRM Objectives? ☒ **Yes** ☐ **No**

Visual Contrast Rating Data Sheet

Mesa Wind Repower Project Environmental Assessment

KEY VIEWPOINT DESCRIPTION

Key Observation Point
6

Location
Westbound SR-111, approximately 0.8 mile east of Snow Creek Road and approximately 2.5 miles south of the Project site.

VRM Class
IV

Analyst
Michael Clayton

Date
February 11, 2020

Latitude: 33.909743° Longitude: -116.655530°

CHARACTERISTIC LANDSCAPE DESCRIPTION

	LANDFORM / WATER	VEGETATION	STRUCTURES
Form	Horizontal valley floor, horizontal to angular mountains and ridgelines	Patchy clumps to irregular	Distant ridgetop linear wind turbines
Line	Horizontal to diagonal and irregular	Irregular and indistinct	Vertical (turbines) to diagonal (some rotors)
Color	Light tans to gray to bluish hues at distance	Tans and muted to dark greens for shrubs, golden tans for grasses	White
Texture	Smooth to granular and coarse	Matte	Smooth

PROPOSED ACTIVITY DESCRIPTION

	LANDFORM / WATER	VEGETATION	STRUCTURES
Form	Same	Same	Simple linear
Line	Same	Same	Prominent vertical for supports and horizontal, vertical and diagonal for blades
Color	Same	Same	White
Texture	Same	Same	Smooth

DEGREE OF CONTRAST

	LANDFORM / WATER				VEGETATION				STRUCTURES			
	NONE	WEAK	MODERATE	STRONG	NONE	WEAK	MODERATE	STRONG	NONE	WEAK	MODERATE	STRONG
Form	✓				✓					✓	✓	
Line	✓				✓					✓	✓	
Color	✓				✓						✓	✓
Texture	✓				✓					✓	✓	

LEVEL OF CHANGE & VRM CLASS CONSISTENCY

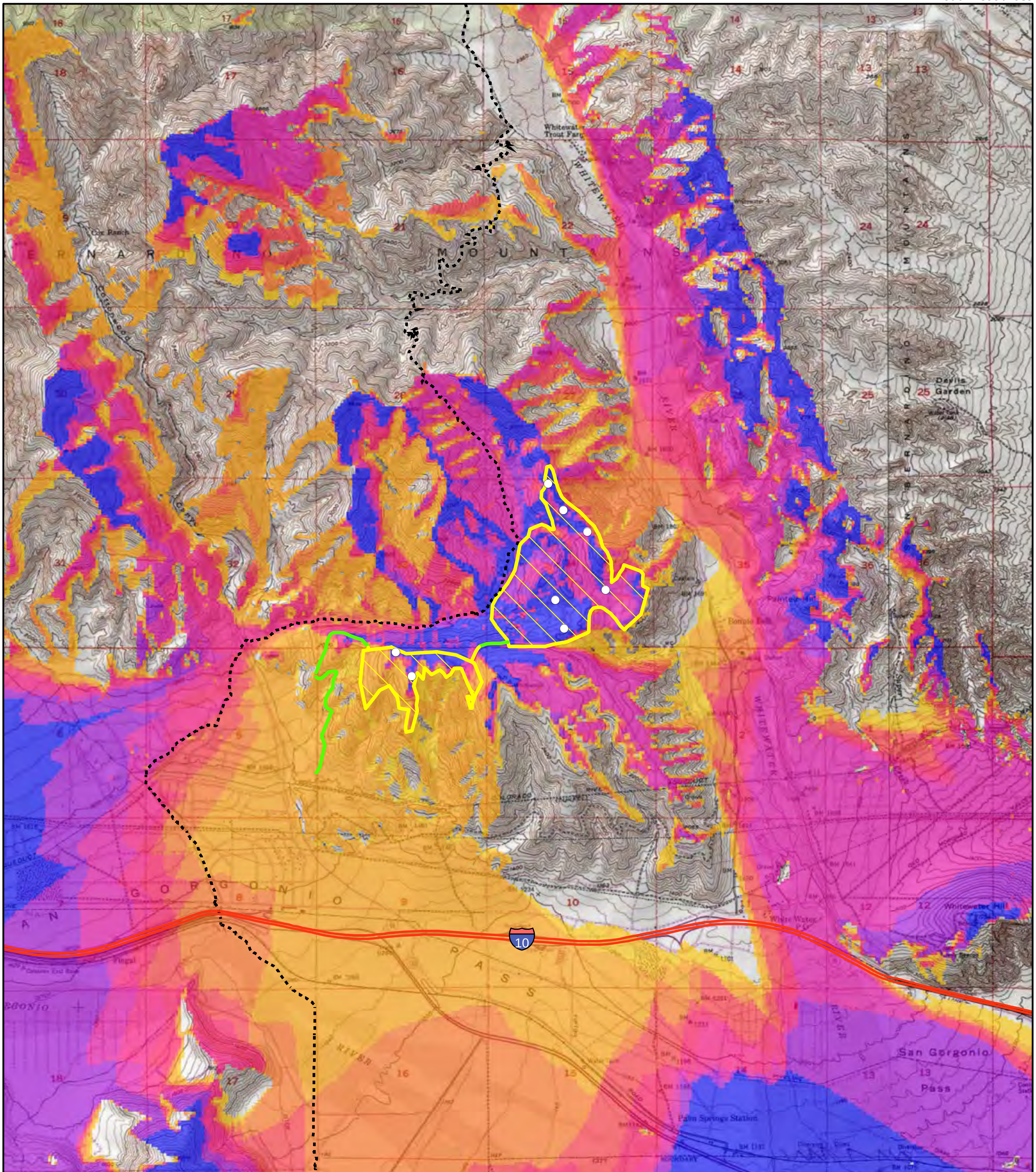
Term: ☐ Short ☒ Long

Level of Change: ☐ Very Low ☒ Low ☒ Moderate ☐ High

Does the Project Design Meet VRM Objectives? ☒ Yes ☐ No

4. Figures

The following pages provide a viewshed analysis, a KOP map, a detailed discussion of each KOP simulations, and the existing view photographs and visual simulations for the MWRP Proposed Action as viewed from each of six KOPs. Cumulative simulations are also provided for KOPs 1 through 3.



N

0 0.5 1 Miles

○ Proposed Turbine
Pacific Crest Trail

Mesa Wind Existing ROW
VRM Class 4
Access Road
VRM Class 2
VRM Class 4

Number of visible turbines*

1 4 7
2 5 8
3 6 9

*Based on USGS 1/3 arc-second DEM

Figure H-0

Viewshed Analysis

LEGEND

2 Key Observation Point (KOP)

Proposed Wind Turbine Generators (WTGs)

KOP Map

Mesa Wind Repower Project EA
Visual Resources
Figure H-1

KOP 1 – Bonnie Bell

As previously noted, Figure H-2A presents the existing view from KOP 1 on northbound Whitewater Canyon Road in the residential enclave of Bonnie Bell. Figure H-2B presents a simulation of the Proposed Action from KOP 1, and Figure H-11 presents a visual simulation that depicts the Reduced Turbine Alternative that includes elimination of the two eastern-most proposed WTGs. These two WTGs would be the most visually prominent turbines and their elimination under this alternative would substantially reduce the overall visibility of this alternative from KOP 1. As shown in the simulation, the southern-most (remaining) WTG (to the left in the image) would be partially screened by terrain when viewed from KOP 1 as would the northern-most WTGs where only the rotor (blade) tips would be visible. At a viewing distance of approximately 1.0 mile, the three visible WTGs would be noticeable but not prominent in the field of view from KOP 1 and would appear subordinate in scale, comparable to the surrounding landforms. A Visual Contrast Rating form for KOP 1 is included in Appendix H. The visual contrast ratings for all four of the visual attributes of form, line, color, and texture would be reduced to weak-to-moderate levels. The resulting weak-to-moderate visual contrast under the Project would cause a low-to-moderate level of change that would be consistent with the applicable VRM Class IV management objective that applies to the footprint of the wind turbines that would be visible from Bonnie Bell.

This image presents the **Existing View** to the northwest from **KOP 1** on Whitewater Canyon Road at the south end of the residential community of Bonnie Bell. This view captures a portion of the ridge that forms the western border of Whitewater Canyon. The ridgeline landscape appears relatively undeveloped, though a few WTGs are slightly visible above the ridgeline in the left side of the image.	**KOP 1** **Bonnie Bell** **Existing View**	**Mesa Wind Repower Project EA** **Visual Resources** **Figure H-2A**

This image presents a **Visual Simulation** of the proposed Project as viewed from **KOP 1** on Whitewater Canyon Road at the south end of the residential community of Bonnie Bell. The existing, lower-capacity (and smaller) WTGs on the site would be removed and the proposed, larger WTGs would be added along the ridgeline. As shown in the simulation, three Mesa Wind WTGs would be partially visible to the residents of Bonnie Bell.	**KOP 1** **Bonnie Bell** Visual Simulation	Mesa Wind Repower Project EA Visual Resources **Figure H-2B**

KOP 2 – Whitewater

Figure H-3A presents the existing view from KOP 2 on Haugen-Lehmann Way in the residential community of Whitewater. The view presented in Figure H-3B presents a visual simulation that depicts the removal of numerous existing (and smaller) WTGs and the addition of two, larger WTGs along the ridgeline closest to the community. As shown in the simulation, the new turbines would be visually prominent, vertical, built structures introduced into a landscape lacking structures of similar scale. However, other numerous, existing WTGs (along ridgelines farther to the east) are also visible from KOP 2 though they appear less prominent due to smaller scale and greater viewing distance (approximately 1.6 to 2.0 miles). Still, the proliferation of these numerous, existing WTGs along the ridgelines establish a more industrial character to the otherwise natural appearing hilltop landscapes.

At a viewing distance ranging from approximately 1.2 miles to approximately 1.5 miles, the proposed Mesa WTGs would be centrally located in the field of view from KOP 2 and would appear moderate in scale, comparable to the surrounding ridges (landforms). Views from within the community would be static, offering extended view durations of the Mesa repower features. Although the linear and vertical structural characteristics of the proposed WTGs would result in a moderate-to-high degree of contrast (in terms of form and line) with the rounded to horizontal natural landforms, the proposed WTGs would be consistent with the numerous, existing WTGs that proliferate along the ridgelines in the background. Therefore, an overall moderate degree of contrast would result from the proposed WTGs with respect to the design elements of form and line. Similarly, a moderate degree of contrast would result for the element of color, with the white color and gray shadowing of the turbines contrasting with the muted earth tones of the natural landscape features. However, the turbine color would appear consistent with the color already established in the landscape by the numerous existing (being replaced) and adjacent WTGs. The smooth turbine surfaces would result in an overall weak degree of contrast with the coarser natural landscape textures of the rocky slopes and ridges, vegetation, and smooth structural surfaces established by the numerous existing WTGs.

The resulting overall visual change caused by the Alternative B (Proposed Action) development scenario would be moderate (due to structural scale) but would minimally degrade the existing visual character and quality of the landscape as established by the numerous existing WTGs as viewed from KOP 2 (and similar locations in the Whitewater community). Although the resulting visual effect would be adverse, the moderate level of change would be allowed under the VRM Class IV management objective that applies to the footprint of the WTGs that would be visible from Whitewater.

This image presents the **Existing View** to the northeast from **KOP 2** on Haugen-Lehmann Way in the rural residential community of White Water. This view captures a portion of the sparsely vegetated hillslopes and ridges that border the eastern perimeter of the residential community. The ridges northeast of the community presently host numerous WTGs associated with two separate projects, as is apparent in the image.	**KOP 2** **White Water** **Existing View**	**Mesa Wind Repower Project EA** **Visual Resources** **Figure H-3A**

This image presents a **Visual Simulation** of the proposed Project as viewed from **KOP 2** on Haugen-Lehmann Way in the rural residential community of White Water. As shown in the simulation, the numerous, existing, lower-capacity (and smaller) WTGs on the site would be removed and the proposed, larger WTGs would be added along the ridgeline. From KOP 2, two Mesa Wind WTGs would be visible at viewing distances ranging from approximately 1.4 miles to 1.5 miles.	**KOP 2** **White Water** **Visual Simulation**	**Mesa Wind Repower Project EA** **Visual Resources** **Figure H-3B**

KOP 3 – Snow Creek Village

Figure H-4A presents the existing view from KOP 3 on Snow Creek Road just north of the Snow Creek Village residential enclave. Figure H-4B presents a visual simulation that depicts the removal of numerous existing (and smaller) WTGs and the addition of several larger WTGs (some partially screened by another wind energy development). As shown in the simulation, the two western-most proposed WTGs would be visually prominent, vertical, built structures introduced into a landscape with similar structural features but lacking the scale of the proposed WTGs. The proliferation of the numerous existing WTGs along the ridgeline in the center of the image establishes an apparent industrial character and structural clutter in an otherwise natural appearing hilltop landscape.

At a viewing distance ranging from approximately 3.3 miles to approximately 4.4 miles, the proposed WTGs that would be visible from KOP 3 would be centrally located in the field of view and would appear subordinate-to-moderate in scale, compared to the surrounding foothills and moderate-to-large in scale compared to the existing, smaller WTGs. Views from the Snow Creek Village community would be static, offering extended view durations of the Project features. Although the linear and vertical structural characteristics of the proposed WTGs would result in a moderate degree of contrast (in terms of form and line) with the rounded to horizontal natural landforms, the proposed WTGs would be consistent with the numerous, existing WTGs situated along the adjacent ridgelines. Therefore, an overall weak-to-moderate degree of contrast would result from the proposed WTGs with respect to the design elements of form and line. A moderate degree of contrast would result for the element of color, with the white color of the WTGs contrasting with the muted earth tones of the natural landscape features, though they would appear more consistent with the color already established in the landscape by the smaller WTGs being replaced and the WTGs associated with the adjacent wind energy development to the east (as shown in Figure H-4B). The smooth turbine surfaces would result in a weak-to-moderate degree of contrast with the coarser natural landscape textures of the rocky slopes, ridges, and vegetation and would result in a weak degree of contrast with the smooth structural surfaces established by the numerous existing WTGs.

The resulting overall visual change associated with Alternative B would be low-to-moderate but would minimally degrade the existing visual character and quality of the landscape, which is substantially influenced by the numerous existing WTGs visible from KOP 3 (and similar locations in Snow Creek Village). Although the resulting visual effect would be adverse, the resulting low-to-moderate level of change would be allowed under the VRM Class IV management objective that applies to the footprint of the WTGs that would be visible from Snow Creek Village and Snow Creek Road.

Latitude: 33.894064° Longitude: -116.682789°

This image presents the **Existing View** to the north from **KOP 3** on Snow Creek Road, just north of the rural residential enclave of Snow Creek Village. This view across San Gorgonio Pass encompasses a portion of the southeastern extent of the San Bernardino Mountains and the ridgeline north of 1-10 where the proposed Project would be located. The scattered grouping of WTGs along the westerly-sloping ridgeline in the left center of the image would be replaced by the proposed Project.	**KOP 3** **Snow Creek Village** **Existing View**	**Mesa Wind Repower Project EA** **Visual Resources** **Figure H-4A**

This image presents a **Visual Simulation** to the north from **KOP 3** on Snow Creek Road, just north of the rural residential enclave of Snow Creek Village. As shown in the simulation, the existing, lower-capacity (and smaller) WTGs on the site (left center portion of the image) would be removed. Two of the larger, proposed WTGs would be partially but still prominently visible along the ridgeline in the left side of the image.

KOP 3
Snow Creek Village
Visual Simulation

Mesa Wind Repower Project EA
Visual Resources
Figure H-4B

KOP 4 – Pacific Crest National Scenic Trail

Figure H-5A presents the existing view to the southeast from KOP 4 on the PCT, approximately 0.4 miles northwest of the nearest existing WTGs shown in the figure. Figure H-5B presents a visual simulation that depicts the removal of the numerous existing, lattice-tower WTGs and installation of the much larger, but substantially fewer, monopole WTGs along the ridge east and southeast of the PCT. As shown in the simulation, the turbines would appear as visually prominent, vertical, built structures replacing the many smaller, more structurally complex lattice support turbines that combine to create a landscape with considerable industrial or technological character. At a viewing distance ranging from approximately 0.4 mile to 1.3 miles, the turbines would be centrally located in the field of view from KOP 4 and would appear large in scale compared to other existing, smaller turbines adjacent to the Mesa development area, and would appear co-dominant in scale compared to the surrounding ridges. Although the proposed WTGs would skyline more and appear substantially larger than the existing WTGs, the overall industrial character, structural complexity, and number of visible turbines would be reduced along the ridgelines.

The turbines would be located in VRM Class IV areas. Views from the PCT would essentially be static given the slow rate of travel along the trail, offering extended view durations of the Project features. The simple linear, vertical, structural characteristics of the WTGs would cause a moderate degree of contrast with both the existing smaller structures and rounded, curvilinear to horizontal landforms, with respect to the design element of form. Line contrast would be weak-to-moderate given the prevalence of both vertical structural lines and curvilinear to horizontal landscape lines. Due to the greater mass of the proposed turbines, the white color (if not in shadow) would appear brighter and more prominent relative to the white color of the adjacent tubular support turbines (beyond the frame of view in Figures H-5A and H-5B). The resulting visual contrast for color would be moderate compared to the existing built structures and the muted earth tones of the natural landscape features. The smooth turbine surfaces would cause a weak-to-moderate degree of contrast with the existing structures (weak contrast) and coarser natural landscape textures of the rocky slopes and ridges, and vegetation (moderate contrast). The skyline effect of the ridge-top turbines would exacerbate structural prominence and would impair views of the background sky, which is also a characteristic of the existing development.

The resulting overall visual change would be low-to-moderate. As a result of the existing developed context of the site, the existing character of the landscape would be retained and the WTGs would not substantially degrade the existing visual character and quality of the landscape as viewed from KOP 4 and similar locations along the PCT. Rather, the resulting visual effect would be somewhat beneficial in its reduction of the existing industrial character and built structural complexity. In this context, the low-to-moderate level of change would be appropriate for VRM Class IV management objectives that apply to the footprint of the Proposed Action.

Latitude: 33.963924° Longitude: -116.666803°

This image presents the **Existing View** to the southeast from **KOP 4** on the Pacific Crest Trail, approximately 0.4 mile northwest of the the nearest existing WTGs shown along the left side of the image. The numerous existing WTGs impart considerable industrial character to an otherwise generally, natural-appearing landscape. All of the existing lattice-structure WTGs shown in this image would be replaced by the proposed Project.	**KOP 4** **Pacific Crest Trail** **Existing View**	**Mesa Wind Repower Project EA** **Visual Resources** **Figure H-5A**

This image presents a **Visual Simulation** of the the proposed Project as viewed from **KOP 4** on the Pacific Crest Trail, approximately 0.4 mile northwest of the the nearest proposed WTGs shown along the left side of the image. As shown in the simulation, the existing, lower-capacity (and smaller) WTGs on the site would be removed, and the larger, proposed WTGs would be added along the ridges. The viewing distances would range from approximately 0.4 mile to approximately 1.1 miles.

KOP 4
Pacific Crest Trail

Visual Simulation

Mesa Wind Repower Project EA
Visual Resources
Figure H-5B

KOP 5 – Cabazon and I-10

Figure H6A presents the existing view from KOP 5 in Cabazon at the Circle K parking lot, adjacent to the Main Street off-ramp from I-10. Figure H6B presents a visual simulation that depicts the removal of the numerous existing (and smaller) WTGs and the installation of several, larger WTGs (some partially to fully screened by terrain). As shown in the simulation, the vertical support towers would be most noticeable when backdropped by terrain and less so when backdropped by sky. Regardless, given the greater viewing distance from KOP 5 (ranging from 6.3 to 7.8 miles), and in the context of the foreground to middle ground freeway corridor landscape features, the proposed WTGs would be minimally noticeable. Also, the removal of the numerous existing WTGs would be less visually consequential (less visual benefit) due to their limited visibility from Cabazon.

As a result, the linear and vertical structural characteristics of the proposed WTGs would result in a weak degree of contrast (in terms of form and line) with the rounded to horizontal natural land-forms and angular to curvilinear ridgeline. A weak degree of contrast would also result with respect to the element of color, with the white color of the WTGs contrasting somewhat with the muted earth tones of the background ridges but much less so with the background sky. At this more extended viewing distance and limited discernibility, the smooth turbine surfaces would result in only a weak degree of contrast with the coarser natural landscape textures of the rocky slopes, ridges, and vegetation, and would result in a weak degree of contrast with the smooth structural surfaces established by the numerous existing WTGs.

The resulting overall visual change would be low and would minimally degrade the existing visual character and quality of the landscape, and the resulting low level of visual change would be allowed under VRM Class IV management objectives that apply to the footprint of the WTGs that would be visible from Cabazon.

This image presents the **Existing View** to the east-northeast from **KOP 5** in Cabazon at the Circle K parking lot, adjacent to the Main Street off-ramp from I-10, approximately 6.3 miles west-southwest of the location of the proposed Project. This view encompasses an urban freeway landscape of travel lanes, off-ramps, overpasses, and frontage businesses, backdropped by the southeast extent of the San Bernardino Mountains and existing WTGs along distant ridgelines at the proposed Project site.	KOP 5 Cabazon Existing View	Mesa Wind Repower Project EA Visual Resources **Figure H-6A**

This image presents the **Visual Simulation** of the proposed Project as viewed from **KOP 5** in Cabazon at the Circle K parking lot, adjacent to the Main Street off-ramp from I-10. As shown in the simulation, the existing, lower-capacity (and smaller) WTGs on on the distant ridgelines (Project site) would be replaced by the larger, and substantially fewer, proposed WTGs. The viewing distances would range from approximately 6.3 miles to approximately 7.8 miles.	**KOP 5** **Cabazon** **Visual Simulation**	**Mesa Wind Repower Project EA** **Visual Resources** **Figure H-6B**

KOP 6 – SR-111

Figure H-7A presents the existing view from KOP 6 on SR-111, approximately 0.8 mile east of Snow Creek Road. Figure H-7B presents a visual simulation that depicts the removal of numerous existing (and smaller) WTGs (left side of image) and the addition of several larger WTGs (some partially screened by another wind energy development). As shown in the simulation, the western-most proposed WTGs would be visually prominent, vertical, built structures introduced into a landscape with similar structural features but lacking the large scale of the proposed WTGs. The proliferation of the numerous existing WTGs along the ridgeline in the center of the image establishes an apparent industrial character and structural clutter in an otherwise natural appearing hilltop landscape.

At a viewing distance ranging from approximately 2.6 to 2.9 miles, the proposed WTGs that would be visible from KOP 6 would be centrally located in the field of view and would appear subordinate-to-moderate in scale, compared to the surrounding foothills and moderate-to-large in scale compared to the existing, smaller WTGs. Views from SR-111 would be transitory, offering brief-to-moderate view durations of the Project features. Although the linear and vertical structural characteristics of the proposed WTGs would result in a moderate degree of contrast (in terms of form and line) with the rounded to horizontal natural landforms, the proposed WTGs would be consistent with the numerous, existing WTGs situated along the adjacent ridgelines. Therefore, the overall form and line contrast would be weak-to-moderate with respect to the design elements of form and line. A moderate-to-strong degree of contrast would result for the element of color, with the white color of the WTGs contrasting with the muted earth tones of the background natural landscape features, though they would appear more consistent with the color already established in the landscape by the smaller WTGs being replaced, and with the WTGs associated with the adjacent wind energy development to the east (as shown in Figure H-7B). The smooth turbine surfaces would result in a weak-to-moderate degree of contrast with the coarser natural landscape textures of the rocky slopes, ridges, and vegetation, and would result in a weak degree of contrast with the smooth structural surfaces established by the numerous existing WTGs.

The resulting overall visual change associated with Alternative B would be low-to-moderate and would minimally degrade the existing visual character and quality of the landscape, which is substantially influenced by the numerous existing WTGs visible from KOP 6 (and similar locations along SR-111). Although the resulting visual effect would be adverse, the resulting low-to-moderate level of change would be allowed under the VRM Class IV management objective that applies to the footprint of the WTGs that would be visible from SR-111.

This image presents the **Existing View** to the north from **KOP 6** on SR-111, approximately 0.8 mile east of Snow Creek Road and approximately 2.7 miles south of the location of the proposed Project. This view encompasses the southeastern extent of the San Bernardino Mountains and the ridges north of I-10 where the proposed Project would be located. The distant grouping of WTGs, backdropped by more distant ridges in the left portion of the image, would be replaced by the proposed Project.	**KOP 6** **SR-111** **Existing View**	**Mesa Wind Repower Project EA** **Visual Resources** **Figure H-7A**

This image presents a **Visual Simulation** of the proposed Project as viewed from **KOP 6** on SR-111, approximately 0.8 mile east of Snow Creek Road. As shown in the simulation, the existing, lower-capacity (and smaller) WTGs on the site (left center portion of the image) would be removed, and two of the eight, larger, proposed WTGs would be prominently visible just beyond the western ridgeline in the left side of the image. The viewing distance from KOP 6 to the two visible WTGs would be approximately 2.7 miles.	**KOP 6** SR-111 **Visual Simulation**	**Mesa Wind Repower Project EA** **Visual Resources** **Figure H-7B**

Cumulative Simulations

For the purposes of the cumulative simulations, one additional project was included – the adjacent Alta Mesa Repower. Alta Mesa is co-located with the Mesa WTGs on adjacent ridges in the east and south of the ROW, and, it would be difficult for viewing populations to discern where the Mesa Project ends and the Alta Mesa Project begins. Three representative cumulative simulations were prepared for KOPs 1 through 3.

Latitude: 33.946581˚ Longitude: -116.642462˚

This image presents a **Cumulative Simulation** of the **revised** Alta Mesa and Mesa Wind Repower projects as viewed from **KOP 1** on Whitewater Canyon Road at the south end of the residential community of Bonnie Bell. As shown in the simulation, portions of seven Alta Mesa WTGs would be visible along the ridgelines west of Bonnie Bell. Portions of three Mesa Wind Project WTGs (right center to far right of image would also be visible along the ridgeline. All of the existing turbines would be removed from the ridges.	**KOP 1** **Bonnie Bell** **Cumulative Simulation**	**Alta Mesa & Mesa Wind Repower Projects** **Figure 1-CU**

Latitude: 33.928230° Longitude: -116.689077°

This image presents a **Cumulative Simulation** of both the proposed Alta Mesa and Mesa Wind Repower Projects as viewed from **KOP 2** on Haugen-Lehmann Way in the rural residential community of White Water. As shown in the simulation, portions of seven Alta Mesa WTGs would be visible along the ridgeline bordering the eastern perimeter of the residential community. Two (left-center) Mesa Wind WTGs would be visible on the ridge to the northeast of the community. All existing turbines would be removed.	KOP 2 White Water Cumulative Simulation	Alta Mesa & Mesa Wind Repower Projects **Figure 2-CU**

This image presents a **Cumulative Simulation** of both the proposed Alta Mesa and Mesa Wind Repower Projects as viewed from **KOP 3** on Snow Creek Road, just north of the rural residential enclave of Snow Creek Village. As shown in the simulation, portions of seven Alta Mesa WTGs would be visible in the central part of the image. Two Mesa Wind WTGs would be prominently visible in the left side of image	**KOP 3** **Snow Creek Village** **Cumulative Simulation**	**Alta Mesa & Mesa Wind Repower Projects** **Figure 3-CU**

5. References

BLM (Bureau of Land Management). 1986. Manual H-8431. Visual Resource Contrast Rating. https://www.blm.gov/sites/blm.gov/files/program_recreation_visual%20resource%20management_quick%20link_BLM%20Handbook%20H-8431-1%2C%20Visual%20Resource%20Contrast%20Rating.pdf

APPENDIX B

Emissions Estimates Results

Mesa Wind Repower, Emissions Estimates Results

Construction - Emissions Details from CalEEMod Results

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	CO2e
Year	tons/yr										MT/yr
2021	0.52	5.50	3.97	0.01	42.16	0.19	42.36	4.34	0.18	4.52	1,300
2022	0.65	5.91	5.63	0.02	62.60	0.23	62.82	6.33	0.21	6.54	1,542
2023	0.03	0.20	0.32	0.00	3.88	0.01	3.89	0.39	0.01	0.40	74
2053	0.18	0.72	2.00	0.00	14.84	0.02	14.86	1.50	0.02	1.51	424
Maximum	**0.65**	**5.91**	**5.63**	**0.02**	**62.60**	**0.23**	**62.82**	**6.33**	**0.21**	**6.54**	**1,542**
Total of Construction	**1.38**	**12.32**	**11.92**	**0.04**	**123.48**	**0.44**	**123.93**	**12.57**	**0.41**	**12.98**	**3,341**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	CO2e
Year	tons/yr										MT/yr
2021	0.28	4.43	4.71	0.01	7.18	0.15	7.34	0.82	0.15	0.97	1,300
2022	0.39	5.41	6.71	0.02	10.47	0.22	10.69	1.13	0.22	1.35	1,542
2023	0.02	0.23	0.35	0.00	0.67	0.01	0.68	0.07	0.01	0.08	74
2053	0.10	2.03	2.62	0.00	2.47	0.11	2.58	0.26	0.11	0.37	424
Maximum	**0.39**	**5.41**	**6.71**	**0.02**	**10.47**	**0.22**	**10.69**	**1.13**	**0.22**	**1.35**	**1,542**
Total of Construction	**0.79**	**12.10**	**14.40**	**0.04**	**20.79**	**0.50**	**21.29**	**2.29**	**0.49**	**2.78**	**3,341**

Unmitigated Construction (Maximum Daily Emission) Summer

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total
Year	lb/day									
2021	10.69	122.08	80.14	0.34	800.10	3.93	804.03	84.19	3.64	87.83
2022	7.13	61.48	63.27	0.18	707.72	2.38	710.10	71.55	2.22	73.77
2023	0.91	5.83	10.18	0.03	121.30	0.24	121.55	12.28	0.23	12.51
2053	1.39	5.55	15.41	0.04	120.77	0.12	120.88	12.18	0.12	12.30
Maximum	**10.69**	**122.08**	**80.14**	**0.34**	**800.10**	**3.93**	**804.03**	**84.19**	**3.64**	**87.83**

Mitigated Construction (Maximum Daily Emission) Summer

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total
Year	lb/day									
2021	5.88	97.28	94.06	0.34	138.61	2.94	141.55	16.68	2.93	19.61
2022	4.37	56.64	74.55	0.18	118.07	2.37	120.44	12.71	2.36	15.07
2023	0.60	6.85	11.02	0.03	20.44	0.35	20.79	2.21	0.35	2.56
2053	0.76	15.64	20.16	0.04	20.09	0.82	20.91	2.14	0.82	2.96
Maximum	**5.88**	**97.28**	**94.06**	**0.34**	**138.61**	**2.94**	**141.55**	**16.68**	**2.93**	**19.61**

Unmitigated Construction (Maximum Daily Emission) Winter

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total
Year	lb/day									
2021	10.43	124.06	75.69	0.33	800.10	3.93	804.03	84.19	3.64	87.83
2022	6.88	62.05	58.83	0.18	707.72	2.38	710.10	71.55	2.22	73.77
2023	0.87	5.85	9.48	0.02	121.30	0.24	121.55	12.28	0.23	12.51
2053	1.39	5.55	15.41	0.04	120.77	0.12	120.88	12.18	0.12	12.30
Maximum	**10.43**	**124.06**	**75.69**	**0.33**	**800.10**	**3.93**	**804.03**	**84.19**	**3.64**	**87.83**

Mitigated Construction (Maximum Daily Emission) Winter

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total
Year	lb/day									
2021	5.61	99.26	89.61	0.33	138.61	2.94	141.55	16.68	2.93	19.61
2022	4.11	57.21	70.10	0.18	118.07	2.37	120.44	12.71	2.36	15.07
2023	0.56	6.88	10.32	0.02	20.44	0.35	20.79	2.21	0.35	2.56
2053	0.76	15.64	20.16	0.04	20.09	0.82	20.91	2.14	0.82	2.96
Maximum	**5.61**	**99.26**	**89.61**	**0.33**	**138.61**	**2.94**	**141.55**	**16.68**	**2.93**	**19.61**

Mesa Wind Repower, Emissions Estimates

Construction - Schedule for Emissions Estimates

Phase	Start (estd.)	End (estd.)	Schedule (months)	Duration (work days)	Avg No. of Employees	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23
					Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Pre construction / Permitting																											
Removing Legacy Towers - Not Included with Project	12/14/2020																										
Roadway Improvements	7/1/2021	8/31/2021	2	44	20																						
Installing New WTGs	7/1/2021	10/6/2022	15	330	100																						
Restoration, Revegetation	7/1/2022	4/4/2023	9	198	20																						
Decommissioning of New WTGs	1/1/2053	12/31/2053	12	260	20																					Future	>>>

Average working schedule of 22 days/month.

Mesa Wind Repower, Emissions Estimates

Construction - Equipment Assumptions, input to CalEEMod

Assumptions:

Project Description: POD dated October 2019 : up to 25 New WTGs for Mesa + Alta Mesa
- Work occurs 5 days a week, typical 10 hr/day (average 22 days/month).
- On-road motor vehicle trips are counted as one-way here.
- HDT haul trucks include 250 WTG component trucks, 1400 concrete trucks, 2000 aggregate material (access roads): up to 5290 deliveries (10,580 trips 1-way)

Construction Schedule, and On-Road Vehicle Use

	Phase	Duration (work days)	Start	End	Avg No. of Employees	Worker Trip Count (1-way, daily)	Avg Heavy Truck Trip Count (1-way, daily)	Add'l HDT Components and Materials Deliveries	Total HHDT Truck Trips (1-way, phase)
0	Pre construction / Permitting								
0	Removing Legacy Towers - Not Included with Project								
1	Roadway Improvements	44	7/1/2021	8/31/2021	20	50	2	1,400	2,888
2	Installing New WTGs	330	7/1/2021	10/6/2022	100	250	12	2,250	8,460
3	Restoration, Revegetation	198	7/1/2022	4/4/2023	20	50	4	0	792
4	Decommissioning of New WTGs	260	1/1/2053	12/31/2053	20	50	12		3,120

Construction HHDT (excluding future decommissioning of new WTGs): 12,140

Offroad Equipment Use

		CalEEMod Type Offroad Equipment	Type	Rating (hp)	Load Factor	Quantity	Typical (hr/day)	Count per Phase
1	Roadway Improvements	Excavator	Offroad	158	0.38	1	8	
		Grader	Offroad	187	0.41	1	8	
		Roller	Offroad	80	0.38	1	8	
		Tractor/Loader/Backhoe	Offroad	97	0.37	1	8	
		Rubber Tired Dozer	Offroad	247	0.40	1	8	5

2	Installing New WTGs	Crane	Offroad	231	0.29	2	10	
		Forklift	Offroad	89	0.20	2	10	
		Tractor/Loader/Backhoe	Offroad	97	0.37	2	10	
		Excavator	Offroad	158	0.38	1	8	
		Bore/Drill Rig	Offroad	221	0.50	1	8	
		Roller	Offroad	80	0.38	2	8	
		Other Material Handling Equip	Offroad	168	0.40	1	8	
		Welders	Offroad	46	0.45	1	8	
		Other Const Equip	Offroad	172	0.42	2	8	
		Generator	Offroad	84	0.74	1	8	
		Air Compressor	Offroad	78	0.48	1	8	16
3	Restoration, Revegetation	Other Material Handling Equip	Offroad	168	0.40	1	8	
		Skid Steer Loaders	Offroad	65	0.37	1	8	
		Air Compressor	Offroad	78	0.48	1	6	3
4	Decommissioning of New WTGs	Excavator	Offroad	158	0.38	1	8	
		Crane	Offroad	231	0.29	1	8	
		Concrete/Industrial Saws	Offroad	81	0.73	1	8	
		Tractor/Loader/Backhoe	Offroad	97	0.37	1	8	
		Air Compressor	Offroad	78	0.48	1	6	
		Rubber Tired Dozer	Offroad	247	0.40	1	8	6

* Default offroad hp and load factors listed in Appendix D (Table 3.3) of CalEEMod 2016 user's guide.

Mesa Wind Repower - CEQA Tech Support

Salton Sea Air Basin, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Manufacturing	1,300.00	1000sqft	29.84	1,300,000.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	3.4	**Precipitation Freq (Days)**	20
Climate Zone	10			**Operational Year**	2022

Utility Company

CO2 Intensity (lb/MWhr)	0	**CH4 Intensity (lb/MWhr)**	0	**N2O Intensity (lb/MWhr)**	0

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Existing wind project repower. Decommissioning and removing the legacy towers is not included in this CEQA emissions estimate.

Land Use - Total site estimated disturbance of up to 107 acres. Equiv of 1.3 million sq ft.

Construction Phase - Phasing approximate per POD dated October 2019, excluding removing legacy towers

Off-road Equipment - Roadway Improvements - Estd Offroad Equipment ct 5

Off-road Equipment - Install New WTGs - Estd Offroad Equipment ct 16

Off-road Equipment - Ph 2a for on-road only

Off-road Equipment - Restoration Revegetation - Estd Offroad Equipment ct 3

Off-road Equipment - Future year decommissioning new WTGs - Estd Offroad Equipment ct 6

Trips and VMT - approx up to 400 Light Duty vehicles daily and overall 10,580 Heavy Duty haul trips

On-road Fugitive Dust - final fraction of average trip is unpaved

Grading - Total disturbance up to 107 ac. Temp site disturbance approx 82 acres

Vehicle Trips - Operational mobile sources under 100 trips daily

Road Dust - final fraction of worker trip is unpaved

Consumer Products - no consumer products in operational phase

Area Coating - no architectural coatings needed in operation phase

Energy Use - no energy use applicable in operational phase

Water And Wastewater - no water use applicable in operational phase

Solid Waste - no solid waste applicable in operational phase

Construction Off-road Equipment Mitigation - Mitigation includes offroad Tier 3 fleet or higher, stabilizer is 84% effective per Table XI-D, watering 2x daily is 55% effective PM10 control per Rule 403, unpaved travel speed limit 15 mph

Table Name	Column Name	Default Value	New Value
tblAreaCoating	ReapplicationRatePercent	10	0
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	0.5
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	40
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3

tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstructionPhase	NumDays	440.00	330.00
tblConstructionPhase	NumDays	440.00	330.00
tblConstructionPhase	NumDays	45.00	44.00
tblConstructionPhase	NumDays	20.00	198.00
tblConsumerProducts	ROG_EF	2.14E-05	0
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	NT24E	5.02	0.00
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	T24E	2.20	0.00
tblEnergyUse	T24NG	15.36	0.00
tblGrading	AcresOfGrading	66.00	107.00
tblGrading	AcresOfGrading	0.00	107.00
tblGrading	MaterialExported	0.00	2,000.00
tblGrading	MaterialExported	0.00	2,000.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	7.00	10.00
tblOffRoadEquipment	UsageHours	8.00	10.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblRoadDust	RoadPercentPave	50	90
tblSolidWaste	SolidWasteGenerationRate	1,612.00	0.00
tblTripsAndVMT	HaulingTripLength	20.00	60.00
tblTripsAndVMT	HaulingTripLength	20.00	60.00
tblTripsAndVMT	HaulingTripLength	20.00	140.00
tblTripsAndVMT	HaulingTripLength	20.00	60.00

tblTripsAndVMT	HaulingTripLength	20.00	60.00
tblTripsAndVMT	HaulingTripNumber	198.00	2,888.00
tblTripsAndVMT	HaulingTripNumber	0.00	7,960.00
tblTripsAndVMT	HaulingTripNumber	0.00	500.00
tblTripsAndVMT	HaulingTripNumber	198.00	792.00
tblTripsAndVMT	HaulingTripNumber	0.00	3,120.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	213.00	10.00
tblTripsAndVMT	VendorTripNumber	213.00	0.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	WorkerTripNumber	13.00	50.00
tblTripsAndVMT	WorkerTripNumber	546.00	250.00
tblTripsAndVMT	WorkerTripNumber	546.00	0.00
tblTripsAndVMT	WorkerTripNumber	8.00	50.00
tblTripsAndVMT	WorkerTripNumber	15.00	50.00
tblVehicleTrips	ST_TR	1.49	0.05
tblVehicleTrips	SU_TR	0.62	0.05
tblVehicleTrips	WD_TR	3.82	0.05
tblWater	IndoorWaterUseRate	300,625,000.00	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.5171	5.4952	3.9711	0.0142	42.1621	0.1942	42.3562	4.3427	0.1801	4.5229	0.0000	1,295.856 6	1,295.856 6	0.1733	0.0000	1,300.189 2
2022	0.6489	5.9072	5.6252	0.0170	62.5967	0.2265	62.8232	6.3332	0.2108	6.5439	0.0000	1,536.414 0	1,536.414 0	0.2294	0.0000	1,542.149 2
2023	0.0290	0.1961	0.3247	8.2000e-004	3.8812	8.1500e-003	3.8893	0.3933	7.7600e-003	0.4011	0.0000	74.1452	74.1452	9.1800e-003	0.0000	74.3746
2053	0.1811	0.7218	2.0029	4.9300e-003	14.8443	0.0152	14.8594	1.4983	0.0152	1.5135	0.0000	423.5210	423.5210	0.0143	0.0000	423.8786
Maximum	**0.6489**	**5.9072**	**5.6252**	**0.0170**	**62.5967**	**0.2265**	**62.8232**	**6.3332**	**0.2108**	**6.5439**	**0.0000**	**1,536.414 0**	**1,536.414 0**	**0.2294**	**0.0000**	**1,542.149 2**

2.1 Overall Construction

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.2827	4.4334	4.7119	0.0142	7.1837	0.1538	7.3375	0.8193	0.1534	0.9727	0.0000	1,295.8560	1,295.8560	0.1733	0.0000	1,300.1886
2022	0.3864	5.4056	6.7133	0.0170	10.4666	0.2225	10.6891	1.1310	0.2222	1.3532	0.0000	1,536.4132	1,536.4132	0.2294	0.0000	1,542.1484
2023	0.0188	0.2304	0.3528	8.2000e-004	0.6662	0.0116	0.6778	0.0723	0.0116	0.0839	0.0000	74.1451	74.1451	9.1800e-003	0.0000	74.3745
2053	0.0986	2.0334	2.6214	4.9300e-003	2.4734	0.1072	2.5806	0.2639	0.1072	0.3710	0.0000	423.5205	423.5205	0.0143	0.0000	423.8781
Maximum	**0.3864**	**5.4056**	**6.7133**	**0.0170**	**10.4666**	**0.2225**	**10.6891**	**1.1310**	**0.2222**	**1.3532**	**0.0000**	**1,536.4132**	**1,536.4132**	**0.2294**	**0.0000**	**1,542.1484**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**42.84**	**1.77**	**-20.76**	**0.00**	**83.16**	**-11.52**	**82.82**	**81.81**	**-19.46**	**78.58**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**7-1-2021**	**9-30-2021**	3.6809	2.8681
2	**10-1-2021**	**12-31-2021**	2.2843	1.8029
3	**1-1-2022**	**3-31-2022**	1.9627	1.7076
4	**4-1-2022**	**6-30-2022**	1.9751	1.7172
5	**7-1-2022**	**9-30-2022**	2.2543	2.0044
6	**10-1-2022**	**12-31-2022**	0.3675	0.3642
7	**1-1-2023**	**3-31-2023**	0.2161	0.2391
8	**4-1-2023**	**6-30-2023**	0.0096	0.0106

127	**1-1-2053**	**3-31-2053**	0.2232	0.5271
128	**4-1-2053**	**6-30-2053**	0.2257	0.5330
129	**7-1-2053**	**9-30-2053**	0.2282	0.5389
		Highest	3.6809	2.8681

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.1100e-003	1.1000e-004	0.0120	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005	0.0000	0.0232	0.0232	6.0000e-005	0.0000	0.0248
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0286	0.2597	0.3505	1.4000e-003	8.8581	9.3000e-004	8.8591	0.8964	8.7000e-004	0.8973	0.0000	130.5661	130.5661	7.7800e-003	0.0000	130.7607
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0297**	**0.2598**	**0.3624**	**1.4000e-003**	**8.8581**	**9.7000e-004**	**8.8591**	**0.8964**	**9.1000e-004**	**0.8973**	**0.0000**	**130.5893**	**130.5893**	**7.8400e-003**	**0.0000**	**130.7855**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.1100e-003	1.1000e-004	0.0120	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005	0.0000	0.0232	0.0232	6.0000e-005	0.0000	0.0248
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0286	0.2597	0.3505	1.4000e-003	8.8581	9.3000e-004	8.8591	0.8964	8.7000e-004	0.8973	0.0000	130.5661	130.5661	7.7800e-003	0.0000	130.7607
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0297**	**0.2598**	**0.3624**	**1.4000e-003**	**8.8581**	**9.7000e-004**	**8.8591**	**0.8964**	**9.1000e-004**	**0.8973**	**0.0000**	**130.5893**	**130.5893**	**7.8400e-003**	**0.0000**	**130.7855**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	1 Roadway Improvements	Grading	7/1/2021	8/31/2021	5	44	1 Roadway Improvements
2	2 Installing New WTGs	Building Construction	7/1/2021	10/5/2022	5	330	2 Installing New WTGs
3	2a Delivering New WTGs Components	Building Construction	7/1/2021	10/5/2022	5	330	2a Delivering New WTGs Components
4	3 Restoration	Site Preparation	7/1/2022	4/4/2023	5	198	3 Restoration
5	4 Decommissioning New WTGs	Trenching	1/1/2053	12/30/2053	5	260	4 Decommissioning New WTGs

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
1 Roadway Improvements	Excavators	1	8.00	158	0.38
1 Roadway Improvements	Graders	1	8.00	187	0.41
1 Roadway Improvements	Rubber Tired Dozers	1	8.00	247	0.40
1 Roadway Improvements	Scrapers	1	8.00	367	0.48
1 Roadway Improvements	Tractors/Loaders/Backhoes	1	8.00	97	0.37
2 Installing New WTGs	Bore/Drill Rigs	1	8.00	221	0.50
2 Installing New WTGs	Cranes	2	10.00	231	0.29
2 Installing New WTGs	Forklifts	3	10.00	89	0.20
2 Installing New WTGs	Generator Sets	1	8.00	84	0.74
2 Installing New WTGs	Graders	1	8.00	187	0.41
2 Installing New WTGs	Other Construction Equipment	2	8.00	172	0.42

2 Installing New WTGs	Other Material Handling Equipment	1	8.00	168	0.40
2 Installing New WTGs	Rollers	2	8.00	80	0.38
2 Installing New WTGs	Tractors/Loaders/Backhoes	2	8.00	97	0.37
2 Installing New WTGs	Welders	1	8.00	46	0.45
2a Delivering New WTGs Components	Cranes	0	7.00	231	0.29
2a Delivering New WTGs Components	Forklifts	0	8.00	89	0.20
2a Delivering New WTGs Components	Generator Sets	0	8.00	84	0.74
2a Delivering New WTGs Components	Tractors/Loaders/Backhoes	0	7.00	97	0.37
2a Delivering New WTGs Components	Welders	0	8.00	46	0.45
3 Restoration	Air Compressors	1	8.00	78	0.48
3 Restoration	Other Material Handling Equipment	1	8.00	168	0.40
3 Restoration	Rubber Tired Dozers	0	8.00	247	0.40
3 Restoration	Skid Steer Loaders	1	8.00	65	0.37
3 Restoration	Tractors/Loaders/Backhoes	0	8.00	97	0.37
4 Decommissioning New WTGs	Air Compressors	1	8.00	78	0.48
4 Decommissioning New WTGs	Concrete/Industrial Saws	1	8.00	81	0.73
4 Decommissioning New WTGs	Cranes	1	8.00	231	0.29
4 Decommissioning New WTGs	Excavators	1	8.00	158	0.38
4 Decommissioning New WTGs	Rubber Tired Dozers	1	8.00	247	0.40
4 Decommissioning New WTGs	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
1 Roadway Improvements	5	50.00	10.00	2,888.00	14.60	6.20	60.00	LD_Mix	HDT_Mix	HHDT
2 Installing New WTGs	16	250.00	10.00	7,960.00	14.60	6.20	60.00	LD_Mix	HDT_Mix	HHDT
2a Delivering New WTGs Components	0	0.00	0.00	500.00	14.60	6.20	140.00	LD_Mix	HDT_Mix	HHDT
3 Restoration	3	50.00	2.00	792.00	14.60	6.20	60.00	LD_Mix	HDT_Mix	HHDT
4 Decommissioning New WTGs	6	50.00	2.00	3,120.00	14.60	6.20	60.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 1 Roadway Improvements - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1894	0.0000	0.1894	0.0790	0.0000	0.0790	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0626	0.6963	0.4035	8.5000e-004		0.0298	0.0298		0.0274	0.0274	0.0000	74.6040	74.6040	0.0241	0.0000	75.2073
Total	**0.0626**	**0.6963**	**0.4035**	**8.5000e-004**	**0.1894**	**0.0298**	**0.2191**	**0.0790**	**0.0274**	**0.1064**	**0.0000**	**74.6040**	**74.6040**	**0.0241**	**0.0000**	**75.2073**

3.2 1 Roadway Improvements - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0154	0.6209	0.0959	2.8400e-003	1.2797	2.6800e-003	1.2824	0.1407	2.5600e-003	0.1433	0.0000	270.7431	270.7431	6.5200e-003	0.0000	270.9061
Vendor	6.4000e-004	0.0204	4.8900e-003	5.0000e-005	0.1909	4.0000e-005	0.1909	0.0193	4.0000e-005	0.0193	0.0000	5.2134	5.2134	4.0000e-004	0.0000	5.2233
Worker	6.3800e-003	4.8500e-003	0.0484	1.1000e-004	2.2450	7.0000e-005	2.2451	0.2259	7.0000e-005	0.2259	0.0000	9.8918	9.8918	4.0000e-004	0.0000	9.9017
Total	**0.0224**	**0.6461**	**0.1492**	**3.0000e-003**	**3.7157**	**2.7900e-003**	**3.7184**	**0.3859**	**2.6700e-003**	**0.3886**	**0.0000**	**285.8484**	**285.8484**	**7.3200e-003**	**0.0000**	**286.0312**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0852	0.0000	0.0852	0.0355	0.0000	0.0355	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0208	0.4087	0.4925	8.5000e-004		0.0173	0.0173		0.0173	0.0173	0.0000	74.6040	74.6040	0.0241	0.0000	75.2072
Total	**0.0208**	**0.4087**	**0.4925**	**8.5000e-004**	**0.0852**	**0.0173**	**0.1025**	**0.0355**	**0.0173**	**0.0528**	**0.0000**	**74.6040**	**74.6040**	**0.0241**	**0.0000**	**75.2072**

3.2 1 Roadway Improvements - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0154	0.6209	0.0959	2.8400e-003	0.2674	2.6800e-003	0.2700	0.0397	2.5600e-003	0.0423	0.0000	270.7431	270.7431	6.5200e-003	0.0000	270.9061
Vendor	6.4000e-004	0.0204	4.8900e-003	5.0000e-005	0.0315	4.0000e-005	0.0316	3.3700e-003	4.0000e-005	3.4100e-003	0.0000	5.2134	5.2134	4.0000e-004	0.0000	5.2233
Worker	6.3800e-003	4.8500e-003	0.0484	1.1000e-004	0.3685	7.0000e-005	0.3685	0.0386	7.0000e-005	0.0387	0.0000	9.8918	9.8918	4.0000e-004	0.0000	9.9017
Total	**0.0224**	**0.6461**	**0.1492**	**3.0000e-003**	**0.6673**	**2.7900e-003**	**0.6701**	**0.0817**	**2.6700e-003**	**0.0844**	**0.0000**	**285.8484**	**285.8484**	**7.3200e-003**	**0.0000**	**286.0312**

3.3 2 Installing New WTGs - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.3153	3.2493	2.5582	4.9500e-003		0.1570	0.1570		0.1457	0.1457	0.0000	431.2693	431.2693	0.1269	0.0000	434.4423
Total	**0.3153**	**3.2493**	**2.5582**	**4.9500e-003**		**0.1570**	**0.1570**		**0.1457**	**0.1457**	**0.0000**	**431.2693**	**431.2693**	**0.1269**	**0.0000**	**434.4423**

3.3 2 Installing New WTGs - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0170	0.6845	0.1057	3.1300e-003	3.4964	2.9500e-003	3.4994	0.3768	2.8200e-003	0.3796	0.0000	298.4924	298.4924	7.1900e-003	0.0000	298.6722
Vendor	1.9200e-003	0.0610	0.0147	1.6000e-004	0.5727	1.2000e-004	0.5728	0.0578	1.1000e-004	0.0579	0.0000	15.6403	15.6403	1.1900e-003	0.0000	15.6700
Worker	0.0958	0.0727	0.7260	1.6400e-003	33.6754	1.0900e-003	33.6765	3.3881	1.0100e-003	3.3891	0.0000	148.3774	148.3774	5.9400e-003	0.0000	148.5258
Total	**0.1147**	**0.8183**	**0.8464**	**4.9300e-003**	**37.7446**	**4.1600e-003**	**37.7487**	**3.8226**	**3.9400e-003**	**3.8266**	**0.0000**	**462.5101**	**462.5101**	**0.0143**	**0.0000**	**462.8679**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1226	2.4750	3.2100	4.9500e-003		0.1291	0.1291		0.1291	0.1291	0.0000	431.2688	431.2688	0.1269	0.0000	434.4418
Total	**0.1226**	**2.4750**	**3.2100**	**4.9500e-003**		**0.1291**	**0.1291**		**0.1291**	**0.1291**	**0.0000**	**431.2688**	**431.2688**	**0.1269**	**0.0000**	**434.4418**

3.3 2 Installing New WTGs - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0170	0.6845	0.1057	3.1300e-003	0.7061	2.9500e-003	0.7091	0.0983	2.8200e-003	0.1011	0.0000	298.4924	298.4924	7.1900e-003	0.0000	298.6722
Vendor	1.9200e-003	0.0610	0.0147	1.6000e-004	0.0946	1.2000e-004	0.0947	0.0101	1.1000e-004	0.0102	0.0000	15.6403	15.6403	1.1900e-003	0.0000	15.6700
Worker	0.0958	0.0727	0.7260	1.6400e-003	5.5269	1.0900e-003	5.5280	0.5792	1.0100e-003	0.5802	0.0000	148.3774	148.3774	5.9400e-003	0.0000	148.5258
Total	**0.1147**	**0.8183**	**0.8464**	**4.9300e-003**	**6.3276**	**4.1600e-003**	**6.3318**	**0.6876**	**3.9400e-003**	**0.6916**	**0.0000**	**462.5101**	**462.5101**	**0.0143**	**0.0000**	**462.8679**

3.3 2 Installing New WTGs - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.4243	4.2580	3.7812	7.4200e-003		0.2026	0.2026		0.1880	0.1880	0.0000	647.0516	647.0516	0.1900	0.0000	651.8024
Total	**0.4243**	**4.2580**	**3.7812**	**7.4200e-003**		**0.2026**	**0.2026**		**0.1880**	**0.1880**	**0.0000**	**647.0516**	**647.0516**	**0.1900**	**0.0000**	**651.8024**

3.3 2 Installing New WTGs - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0238	0.8993	0.1533	4.6400e-003	3.5067	3.6400e-003	3.5103	0.3805	3.4800e-003	0.3839	0.0000	442.5199	442.5199	0.0102	0.0000	442.7756
Vendor	2.6700e-003	0.0864	0.0203	2.4000e-004	0.8591	1.5000e-004	0.8592	0.0867	1.4000e-004	0.0869	0.0000	23.2635	23.2635	1.6500e-003	0.0000	23.3049
Worker	0.1344	0.0994	1.0024	2.3800e-003	50.5131	1.5900e-003	50.5147	5.0821	1.4600e-003	5.0836	0.0000	214.4141	214.4141	8.1200e-003	0.0000	214.6169
Total	**0.1609**	**1.0851**	**1.1759**	**7.2600e-003**	**54.8789**	**5.3800e-003**	**54.8842**	**5.5493**	**5.0800e-003**	**5.5544**	**0.0000**	**680.1975**	**680.1975**	**0.0200**	**0.0000**	**680.6974**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1839	3.7125	4.8151	7.4200e-003		0.1937	0.1937		0.1937	0.1937	0.0000	647.0508	647.0508	0.1900	0.0000	651.8016
Total	**0.1839**	**3.7125**	**4.8151**	**7.4200e-003**		**0.1937**	**0.1937**		**0.1937**	**0.1937**	**0.0000**	**647.0508**	**647.0508**	**0.1900**	**0.0000**	**651.8016**

3.3 2 Installing New WTGs - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0238	0.8993	0.1533	4.6400e-003	0.7164	3.6400e-003	0.7200	0.1020	3.4800e-003	0.1055	0.0000	442.5199	442.5199	0.0102	0.0000	442.7756
Vendor	2.6700e-003	0.0864	0.0203	2.4000e-004	0.1419	1.5000e-004	0.1420	0.0152	1.4000e-004	0.0153	0.0000	23.2635	23.2635	1.6500e-003	0.0000	23.3049
Worker	0.1344	0.0994	1.0024	2.3800e-003	8.2904	1.5900e-003	8.2920	0.8688	1.4600e-003	0.8703	0.0000	214.4141	214.4141	8.1200e-003	0.0000	214.6169
Total	**0.1609**	**1.0851**	**1.1759**	**7.2600e-003**	**9.1486**	**5.3800e-003**	**9.1540**	**0.9860**	**5.0800e-003**	**0.9911**	**0.0000**	**680.1975**	**680.1975**	**0.0200**	**0.0000**	**680.6974**

3.4 2a Delivering New WTGs Components - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 2a Delivering New WTGs Components - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.1700e-003	0.0853	0.0139	4.4000e-004	0.5125	4.3000e-004	0.5129	0.0552	4.1000e-004	0.0556	0.0000	41.6248	41.6248	6.3000e-004	0.0000	41.6405
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**2.1700e-003**	**0.0853**	**0.0139**	**4.4000e-004**	**0.5125**	**4.3000e-004**	**0.5129**	**0.0552**	**4.1000e-004**	**0.0556**	**0.0000**	**41.6248**	**41.6248**	**6.3000e-004**	**0.0000**	**41.6405**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 2a Delivering New WTGs Components - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.1700e-003	0.0853	0.0139	4.4000e-004	0.1035	4.3000e-004	0.1039	0.0144	4.1000e-004	0.0148	0.0000	41.6248	41.6248	6.3000e-004	0.0000	41.6405
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**2.1700e-003**	**0.0853**	**0.0139**	**4.4000e-004**	**0.1035**	**4.3000e-004**	**0.1039**	**0.0144**	**4.1000e-004**	**0.0148**	**0.0000**	**41.6248**	**41.6248**	**6.3000e-004**	**0.0000**	**41.6405**

3.4 2a Delivering New WTGs Components - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 2a Delivering New WTGs Components - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0300e-003	0.1100	0.0201	6.5000e-004	0.5140	5.3000e-004	0.5145	0.0558	5.0000e-004	0.0563	0.0000	61.7014	61.7014	9.1000e-004	0.0000	61.7240
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**3.0300e-003**	**0.1100**	**0.0201**	**6.5000e-004**	**0.5140**	**5.3000e-004**	**0.5145**	**0.0558**	**5.0000e-004**	**0.0563**	**0.0000**	**61.7014**	**61.7014**	**9.1000e-004**	**0.0000**	**61.7240**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

3.4 2a Delivering New WTGs Components - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.0300e-003	0.1100	0.0201	6.5000e-004	0.1050	5.3000e-004	0.1055	0.0150	5.0000e-004	0.0155	0.0000	61.7014	61.7014	9.1000e-004	0.0000	61.7240
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**3.0300e-003**	**0.1100**	**0.0201**	**6.5000e-004**	**0.1050**	**5.3000e-004**	**0.1055**	**0.0150**	**5.0000e-004**	**0.0155**	**0.0000**	**61.7014**	**61.7014**	**9.1000e-004**	**0.0000**	**61.7240**

3.5 3 Restoration - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0569	0.0000	0.0569	6.1500e-003	0.0000	6.1500e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0399	0.3309	0.4958	7.7000e-004		0.0174	0.0174		0.0166	0.0166	0.0000	67.4621	67.4621	0.0161	0.0000	67.8636
Total	**0.0399**	**0.3309**	**0.4958**	**7.7000e-004**	**0.0569**	**0.0174**	**0.0743**	**6.1500e-003**	**0.0166**	**0.0227**	**0.0000**	**67.4621**	**67.4621**	**0.0161**	**0.0000**	**67.8636**

3.5 3 Restoration - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.6100e-003	0.0987	0.0168	5.1000e-004	0.3492	4.0000e-004	0.3496	0.0380	3.8000e-004	0.0384	0.0000	48.5512	48.5512	1.1200e-003	0.0000	48.5792
Vendor	3.5000e-004	0.0114	2.6800e-003	3.0000e-005	0.1137	2.0000e-005	0.1137	0.0115	2.0000e-005	0.0115	0.0000	3.0783	3.0783	2.2000e-004	0.0000	3.0838
Worker	0.0178	0.0132	0.1326	3.1000e-004	6.6841	2.1000e-004	6.6843	0.6725	1.9000e-004	0.6727	0.0000	28.3720	28.3720	1.0700e-003	0.0000	28.3988
Total	**0.0208**	**0.1233**	**0.1521**	**8.5000e-004**	**7.1470**	**6.3000e-004**	**7.1476**	**0.7219**	**5.9000e-004**	**0.7225**	**0.0000**	**80.0015**	**80.0015**	**2.4100e-003**	**0.0000**	**80.0618**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0256	0.0000	0.0256	2.7700e-003	0.0000	2.7700e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0178	0.3747	0.5501	7.7000e-004		0.0223	0.0223		0.0223	0.0223	0.0000	67.4620	67.4620	0.0161	0.0000	67.8635
Total	**0.0178**	**0.3747**	**0.5501**	**7.7000e-004**	**0.0256**	**0.0223**	**0.0479**	**2.7700e-003**	**0.0223**	**0.0251**	**0.0000**	**67.4620**	**67.4620**	**0.0161**	**0.0000**	**67.8635**

3.5 3 Restoration - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.6100e-003	0.0987	0.0168	5.1000e-004	0.0716	4.0000e-004	0.0720	0.0103	3.8000e-004	0.0107	0.0000	48.5512	48.5512	1.1200e-003	0.0000	48.5792
Vendor	3.5000e-004	0.0114	2.6800e-003	3.0000e-005	0.0188	2.0000e-005	0.0188	2.0100e-003	2.0000e-005	2.0300e-003	0.0000	3.0783	3.0783	2.2000e-004	0.0000	3.0838
Worker	0.0178	0.0132	0.1326	3.1000e-004	1.0970	2.1000e-004	1.0972	0.1150	1.9000e-004	0.1152	0.0000	28.3720	28.3720	1.0700e-003	0.0000	28.3988
Total	**0.0208**	**0.1233**	**0.1521**	**8.5000e-004**	**1.1874**	**6.3000e-004**	**1.1880**	**0.1272**	**5.9000e-004**	**0.1278**	**0.0000**	**80.0015**	**80.0015**	**2.4100e-003**	**0.0000**	**80.0618**

3.5 3 Restoration - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0569	0.0000	0.0569	6.1500e-003	0.0000	6.1500e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0194	0.1574	0.2532	4.0000e-004		7.9500e-003	7.9500e-003		7.5700e-003	7.5700e-003	0.0000	34.5064	34.5064	8.1500e-003	0.0000	34.7103
Total	**0.0194**	**0.1574**	**0.2532**	**4.0000e-004**	**0.0569**	**7.9500e-003**	**0.0648**	**6.1500e-003**	**7.5700e-003**	**0.0137**	**0.0000**	**34.5064**	**34.5064**	**8.1500e-003**	**0.0000**	**34.7103**

3.5 3 Restoration - 2023

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	9.6000e-004	0.0281	7.6400e-003	2.5000e-004	0.3476	9.0000e-005	0.3477	0.0374	9.0000e-005	0.0375	0.0000	24.1398	24.1398	4.4000e-004	0.0000	24.1508
Vendor	1.4000e-004	4.5000e-003	1.1900e-003	2.0000e-005	0.0581	0.0000	0.0581	5.8700e-003	0.0000	5.8700e-003	0.0000	1.5395	1.5395	8.0000e-005	0.0000	1.5415
Worker	8.5400e-003	6.1600e-003	0.0626	1.5000e-004	3.4186	1.0000e-004	3.4187	0.3439	1.0000e-004	0.3440	0.0000	13.9595	13.9595	5.0000e-004	0.0000	13.9720
Total	**9.6400e-003**	**0.0387**	**0.0715**	**4.2000e-004**	**3.8243**	**1.9000e-004**	**3.8245**	**0.3872**	**1.9000e-004**	**0.3874**	**0.0000**	**39.6388**	**39.6388**	**1.0200e-003**	**0.0000**	**39.6643**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0256	0.0000	0.0256	2.7700e-003	0.0000	2.7700e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	9.1200e-003	0.1917	0.2813	4.0000e-004		0.0114	0.0114		0.0114	0.0114	0.0000	34.5064	34.5064	8.1500e-003	0.0000	34.7102
Total	**9.1200e-003**	**0.1917**	**0.2813**	**4.0000e-004**	**0.0256**	**0.0114**	**0.0370**	**2.7700e-003**	**0.0114**	**0.0142**	**0.0000**	**34.5064**	**34.5064**	**8.1500e-003**	**0.0000**	**34.7102**

3.5 3 Restoration - 2023

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	9.6000e-004	0.0281	7.6400e-003	2.5000e-004	0.0699	9.0000e-005	0.0700	9.6700e-003	9.0000e-005	9.7600e-003	0.0000	24.1398	24.1398	4.4000e-004	0.0000	24.1508
Vendor	1.4000e-004	4.5000e-003	1.1900e-003	2.0000e-005	9.6000e-003	0.0000	9.6000e-003	1.0300e-003	0.0000	1.0300e-003	0.0000	1.5395	1.5395	8.0000e-005	0.0000	1.5415
Worker	8.5400e-003	6.1600e-003	0.0626	1.5000e-004	0.5611	1.0000e-004	0.5612	0.0588	1.0000e-004	0.0589	0.0000	13.9595	13.9595	5.0000e-004	0.0000	13.9720
Total	**9.6400e-003**	**0.0387**	**0.0715**	**4.2000e-004**	**0.6406**	**1.9000e-004**	**0.6408**	**0.0695**	**1.9000e-004**	**0.0697**	**0.0000**	**39.6388**	**39.6388**	**1.0200e-003**	**0.0000**	**39.6643**

3.6 4 Decommissioning New WTGs - 2053

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1811	0.7218	2.0029	4.9300e-003		0.0152	0.0152		0.0152	0.0152	0.0000	423.5210	423.5210	0.0143	0.0000	423.8786
Total	**0.1811**	**0.7218**	**2.0029**	**4.9300e-003**		**0.0152**	**0.0152**		**0.0152**	**0.0152**	**0.0000**	**423.5210**	**423.5210**	**0.0143**	**0.0000**	**423.8786**

3.6 4 Decommissioning New WTGs - 2053

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling					1.3624	0.0000	1.3624	0.1448	0.0000	0.1448	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor					0.2252	0.0000	0.2252	0.0226	0.0000	0.0226	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker					13.2566	0.0000	13.2566	1.3310	0.0000	1.3310	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total					**14.8443**	**0.0000**	**14.8443**	**1.4983**	**0.0000**	**1.4983**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0986	2.0334	2.6214	4.9300e-003		0.1072	0.1072		0.1072	0.1072	0.0000	423.5205	423.5205	0.0143	0.0000	423.8781
Total	**0.0986**	**2.0334**	**2.6214**	**4.9300e-003**		**0.1072**	**0.1072**		**0.1072**	**0.1072**	**0.0000**	**423.5205**	**423.5205**	**0.0143**	**0.0000**	**423.8781**

3.6 4 Decommissioning New WTGs - 2053

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling					0.2687	0.0000	0.2687	0.0356	0.0000	0.0356	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor					0.0368	0.0000	0.0368	3.8100e-003	0.0000	3.8100e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker					2.1678	0.0000	2.1678	0.2244	0.0000	0.2244	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total					**2.4734**	**0.0000**	**2.4734**	**0.2639**	**0.0000**	**0.2639**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0286	0.2597	0.3505	1.4000e-003	8.8581	9.3000e-004	8.8591	0.8964	8.7000e-004	0.8973	0.0000	130.5661	130.5661	7.7800e-003	0.0000	130.7607
Unmitigated	0.0286	0.2597	0.3505	1.4000e-003	8.8581	9.3000e-004	8.8591	0.8964	8.7000e-004	0.8973	0.0000	130.5661	130.5661	7.7800e-003	0.0000	130.7607

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Manufacturing	65.00	65.00	65.00	235,792	235,792
Total	65.00	65.00	65.00	235,792	235,792

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Manufacturing	13.80	6.20	6.20	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Manufacturing	0.490441	0.036099	0.183975	0.121725	0.015214	0.005252	0.022424	0.112230	0.002972	0.001873	0.006187	0.000783	0.000825

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Manufacturing	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Manufacturing	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Manufacturing	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Manufacturing	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.1100e-003	1.1000e-004	0.0120	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005	0.0000	0.0232	0.0232	6.0000e-005	0.0000	0.0248
Unmitigated	1.1100e-003	1.1000e-004	0.0120	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005	0.0000	0.0232	0.0232	6.0000e-005	0.0000	0.0248

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.1100e-003	1.1000e-004	0.0120	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005	0.0000	0.0232	0.0232	6.0000e-005	0.0000	0.0248
Total	**1.1100e-003**	**1.1000e-004**	**0.0120**	**0.0000**		**4.0000e-005**	**4.0000e-005**		**4.0000e-005**	**4.0000e-005**	**0.0000**	**0.0232**	**0.0232**	**6.0000e-005**	**0.0000**	**0.0248**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	1.1100e-003	1.1000e-004	0.0120	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005	0.0000	0.0232	0.0232	6.0000e-005	0.0000	0.0248
Total	**1.1100e-003**	**1.1000e-004**	**0.0120**	**0.0000**		**4.0000e-005**	**4.0000e-005**		**4.0000e-005**	**4.0000e-005**	**0.0000**	**0.0232**	**0.0232**	**6.0000e-005**	**0.0000**	**0.0248**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Manufacturing	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Manufacturing	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Manufacturing	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Manufacturing	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Mesa Wind Repower - CEQA Tech Support

Salton Sea Air Basin, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Manufacturing	1,300.00	1000sqft	29.84	1,300,000.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	3.4	**Precipitation Freq (Days)**	20
Climate Zone	10			**Operational Year**	2022
Utility Company					
CO2 Intensity (lb/MWhr)	0	**CH4 Intensity (lb/MWhr)**	0	**N2O Intensity (lb/MWhr)**	0

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Existing wind project repower. Decommissioning and removing the legacy towers is not included in this CEQA emissions estimate.

Land Use - Total site estimated disturbance of up to 107 acres. Equiv of 1.3 million sq ft.

Construction Phase - Phasing approximate per POD dated October 2019, excluding removing legacy towers

Off-road Equipment - Roadway Improvements - Estd Offroad Equipment ct 5

Off-road Equipment - Install New WTGs - Estd Offroad Equipment ct 16

Off-road Equipment - Ph 2a for on-road only

Off-road Equipment - Restoration Revegetation - Estd Offroad Equipment ct 3

Off-road Equipment - Future year decommissioning new WTGs - Estd Offroad Equipment ct 6

Trips and VMT - approx up to 400 Light Duty vehicles daily and overall 10,580 Heavy Duty haul trips

On-road Fugitive Dust - final fraction of average trip is unpaved

Grading - Total disturbance up to 107 ac. Temp site disturbance approx 82 acres

Vehicle Trips - Operational mobile sources under 100 trips daily

Road Dust - final fraction of worker trip is unpaved

Consumer Products - no consumer products in operational phase

Area Coating - no architectural coatings needed in operation phase

Energy Use - no energy use applicable in operational phase

Water And Wastewater - no water use applicable in operational phase

Solid Waste - no solid waste applicable in operational phase

Construction Off-road Equipment Mitigation - Mitigation includes offroad Tier 3 fleet or higher, stabilizer is 84% effective per Table XI-D, watering 2x daily is 55% effective PM10 control per Rule 403, unpaved travel speed limit 15 mph

Table Name	Column Name	Default Value	New Value
tblAreaCoating	ReapplicationRatePercent	10	0
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	0.5
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	40
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3

tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstructionPhase	NumDays	440.00	330.00
tblConstructionPhase	NumDays	440.00	330.00
tblConstructionPhase	NumDays	45.00	44.00
tblConstructionPhase	NumDays	20.00	198.00
tblConsumerProducts	ROG_EF	2.14E-05	0
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	NT24E	5.02	0.00
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	T24E	2.20	0.00
tblEnergyUse	T24NG	15.36	0.00
tblGrading	AcresOfGrading	66.00	107.00
tblGrading	AcresOfGrading	0.00	107.00
tblGrading	MaterialExported	0.00	2,000.00
tblGrading	MaterialExported	0.00	2,000.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	7.00	10.00
tblOffRoadEquipment	UsageHours	8.00	10.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblRoadDust	RoadPercentPave	50	90
tblSolidWaste	SolidWasteGenerationRate	1,612.00	0.00
tblTripsAndVMT	HaulingTripLength	20.00	60.00
tblTripsAndVMT	HaulingTripLength	20.00	60.00
tblTripsAndVMT	HaulingTripLength	20.00	140.00
tblTripsAndVMT	HaulingTripLength	20.00	60.00

tblTripsAndVMT	HaulingTripLength	20.00	60.00
tblTripsAndVMT	HaulingTripNumber	198.00	2,888.00
tblTripsAndVMT	HaulingTripNumber	0.00	7,960.00
tblTripsAndVMT	HaulingTripNumber	0.00	500.00
tblTripsAndVMT	HaulingTripNumber	198.00	792.00
tblTripsAndVMT	HaulingTripNumber	0.00	3,120.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	213.00	10.00
tblTripsAndVMT	VendorTripNumber	213.00	0.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	WorkerTripNumber	13.00	50.00
tblTripsAndVMT	WorkerTripNumber	546.00	250.00
tblTripsAndVMT	WorkerTripNumber	546.00	0.00
tblTripsAndVMT	WorkerTripNumber	8.00	50.00
tblTripsAndVMT	WorkerTripNumber	15.00	50.00
tblVehicleTrips	ST_TR	1.49	0.05
tblVehicleTrips	SU_TR	0.62	0.05
tblVehicleTrips	WD_TR	3.82	0.05
tblWater	IndoorWaterUseRate	300,625,000.00	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	10.6925	122.0836	80.1376	0.3357	800.1036	3.9277	804.0313	84.1872	3.6393	87.8265	0.0000	34,102.8117	34,102.8117	3.9453	0.0000	34,201.4443
2022	7.1322	61.4767	63.2738	0.1831	707.7193	2.3805	710.0998	71.5527	2.2175	73.7702	0.0000	18,287.8052	18,287.8052	2.6708	0.0000	18,354.5741
2023	0.9065	5.8262	10.1751	0.0250	121.3032	0.2433	121.5466	12.2773	0.2315	12.5088	0.0000	2,493.4880	2,493.4880	0.3039	0.0000	2,501.0865
2053	1.3930	5.5521	15.4072	0.0379	120.7664	0.1167	120.8831	12.1839	0.1167	12.3007	0.0000	3,591.1689	3,591.1689	0.1213	0.0000	3,594.2010
Maximum	**10.6925**	**122.0836**	**80.1376**	**0.3357**	**800.1036**	**3.9277**	**804.0313**	**84.1872**	**3.6393**	**87.8265**	**0.0000**	**34,102.8117**	**34,102.8117**	**3.9453**	**0.0000**	**34,201.4443**

2.1 Overall Construction (Maximum Daily Emission)

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	5.8758	97.2827	94.0563	0.3357	138.6120	2.9380	141.5500	16.6768	2.9288	19.6057	0.0000	34,102.8117	34,102.8117	3.9453	0.0000	34,201.4443
2022	4.3672	56.6369	74.5457	0.1831	118.0722	2.3663	120.4385	12.7107	2.3626	15.0734	0.0000	18,287.8052	18,287.8052	2.6708	0.0000	18,354.5741
2023	0.6011	6.8487	11.0150	0.0250	20.4431	0.3470	20.7900	2.2101	0.3466	2.5567	0.0000	2,493.4880	2,493.4880	0.3039	0.0000	2,501.0865
2053	0.7583	15.6416	20.1644	0.0379	20.0895	0.8245	20.9139	2.1377	0.8245	2.9621	0.0000	3,591.1689	3,591.1689	0.1213	0.0000	3,594.2010
Maximum	**5.8758**	**97.2827**	**94.0563**	**0.3357**	**138.6120**	**2.9380**	**141.5500**	**16.6768**	**2.9288**	**19.6057**	**0.0000**	**34,102.8117**	**34,102.8117**	**3.9453**	**0.0000**	**34,201.4443**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**42.35**	**9.50**	**-18.22**	**0.00**	**83.02**	**2.89**	**82.71**	**81.28**	**-4.15**	**78.44**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0124	1.2100e-003	0.1329	1.0000e-005		4.7000e-004	4.7000e-004		4.7000e-004	4.7000e-004		0.2845	0.2845	7.5000e-004		0.3033
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.1908	1.4114	2.3093	8.2000e-003	48.6764	5.0800e-003	48.6815	4.9266	4.7700e-003	4.9313		838.7264	838.7264	0.0480		839.9272
Total	**0.2032**	**1.4127**	**2.4422**	**8.2100e-003**	**48.6764**	**5.5500e-003**	**48.6819**	**4.9266**	**5.2400e-003**	**4.9318**		**839.0109**	**839.0109**	**0.0488**	**0.0000**	**840.2305**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0124	1.2100e-003	0.1329	1.0000e-005		4.7000e-004	4.7000e-004		4.7000e-004	4.7000e-004		0.2845	0.2845	7.5000e-004		0.3033
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.1908	1.4114	2.3093	8.2000e-003	48.6764	5.0800e-003	48.6815	4.9266	4.7700e-003	4.9313		838.7264	838.7264	0.0480		839.9272
Total	**0.2032**	**1.4127**	**2.4422**	**8.2100e-003**	**48.6764**	**5.5500e-003**	**48.6819**	**4.9266**	**5.2400e-003**	**4.9318**		**839.0109**	**839.0109**	**0.0488**	**0.0000**	**840.2305**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	1 Roadway Improvements	Grading	7/1/2021	8/31/2021	5	44	1 Roadway Improvements
2	2 Installing New WTGs	Building Construction	7/1/2021	10/5/2022	5	330	2 Installing New WTGs
3	2a Delivering New WTGs Components	Building Construction	7/1/2021	10/5/2022	5	330	2a Delivering New WTGs Components
4	3 Restoration	Site Preparation	7/1/2022	4/4/2023	5	198	3 Restoration
5	4 Decommissioning New WTGs	Trenching	1/1/2053	12/30/2053	5	260	4 Decommissioning New WTGs

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
1 Roadway Improvements	Excavators	1	8.00	158	0.38
1 Roadway Improvements	Graders	1	8.00	187	0.41
1 Roadway Improvements	Rubber Tired Dozers	1	8.00	247	0.40
1 Roadway Improvements	Scrapers	1	8.00	367	0.48
1 Roadway Improvements	Tractors/Loaders/Backhoes	1	8.00	97	0.37

2 Installing New WTGs	Bore/Drill Rigs	1	8.00	221	0.50
2 Installing New WTGs	Cranes	2	10.00	231	0.29
2 Installing New WTGs	Forklifts	3	10.00	89	0.20
2 Installing New WTGs	Generator Sets	1	8.00	84	0.74
2 Installing New WTGs	Graders	1	8.00	187	0.41
2 Installing New WTGs	Other Construction Equipment	2	8.00	172	0.42
2 Installing New WTGs	Other Material Handling Equipment	1	8.00	168	0.40
2 Installing New WTGs	Rollers	2	8.00	80	0.38
2 Installing New WTGs	Tractors/Loaders/Backhoes	2	8.00	97	0.37
2 Installing New WTGs	Welders	1	8.00	46	0.45
2a Delivering New WTGs Components	Cranes	0	7.00	231	0.29
2a Delivering New WTGs Components	Forklifts	0	8.00	89	0.20
2a Delivering New WTGs Components	Generator Sets	0	8.00	84	0.74
2a Delivering New WTGs Components	Tractors/Loaders/Backhoes	0	7.00	97	0.37
2a Delivering New WTGs Components	Welders	0	8.00	46	0.45
3 Restoration	Air Compressors	1	8.00	78	0.48
3 Restoration	Other Material Handling Equipment	1	8.00	168	0.40
3 Restoration	Rubber Tired Dozers	0	8.00	247	0.40
3 Restoration	Skid Steer Loaders	1	8.00	65	0.37
3 Restoration	Tractors/Loaders/Backhoes	0	8.00	97	0.37
4 Decommissioning New WTGs	Air Compressors	1	8.00	78	0.48
4 Decommissioning New WTGs	Concrete/Industrial Saws	1	8.00	81	0.73
4 Decommissioning New WTGs	Cranes	1	8.00	231	0.29
4 Decommissioning New WTGs	Excavators	1	8.00	158	0.38
4 Decommissioning New WTGs	Rubber Tired Dozers	1	8.00	247	0.40
4 Decommissioning New WTGs	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
1 Roadway Improvements	5	50.00	10.00	2,888.00	14.60	6.20	60.00	LD_Mix	HDT_Mix	HHDT
2 Installing New WTGs	16	250.00	10.00	7,960.00	14.60	6.20	60.00	LD_Mix	HDT_Mix	HHDT
2a Delivering New WTGs Components	0	0.00	0.00	500.00	14.60	6.20	140.00	LD_Mix	HDT_Mix	HHDT
3 Restoration	3	50.00	2.00	792.00	14.60	6.20	60.00	LD_Mix	HDT_Mix	HHDT
4 Decommissioning New WTGs	6	50.00	2.00	3,120.00	14.60	6.20	60.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 1 Roadway Improvements - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					8.6082	0.0000	8.6082	3.5898	0.0000	3.5898			0.0000			0.0000
Off-Road	2.8453	31.6479	18.3417	0.0386		1.3527	1.3527		1.2445	1.2445		3,738.0399	3,738.0399	1.2090		3,768.2638
Total	**2.8453**	**31.6479**	**18.3417**	**0.0386**	**8.6082**	**1.3527**	**9.9609**	**3.5898**	**1.2445**	**4.8343**		**3,738.0399**	**3,738.0399**	**1.2090**		**3,768.2638**

3.2 1 Roadway Improvements - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.6924	26.9404	4.2125	0.1297	61.3800	0.1214	61.5014	6.7228	0.1161	6.8389		13,632.2967	13,632.2967	0.3144		13,640.1571
Vendor	0.0287	0.9187	0.2070	2.5400e-003	9.1779	1.7800e-003	9.1797	0.9261	1.7000e-003	0.9278		266.3903	266.3903	0.0189		266.8617
Worker	0.3390	0.2179	2.7755	5.5200e-003	107.9394	3.3200e-003	107.9427	10.8558	3.0500e-003	10.8588		548.3647	548.3647	0.0231		548.9425
Total	**1.0600**	**28.0769**	**7.1950**	**0.1377**	**178.4973**	**0.1265**	**178.6237**	**18.5046**	**0.1209**	**18.6255**		**14,447.0517**	**14,447.0517**	**0.3564**		**14,455.9613**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					3.8737	0.0000	3.8737	1.6154	0.0000	1.6154			0.0000			0.0000
Off-Road	0.9472	18.5790	22.3845	0.0386		0.7859	0.7859		0.7859	0.7859	0.0000	3,738.0399	3,738.0399	1.2090		3,768.2638
Total	**0.9472**	**18.5790**	**22.3845**	**0.0386**	**3.8737**	**0.7859**	**4.6596**	**1.6154**	**0.7859**	**2.4013**	**0.0000**	**3,738.0399**	**3,738.0399**	**1.2090**		**3,768.2638**

3.2 1 Roadway Improvements - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.6924	26.9404	4.2125	0.1297	12.6958	0.1214	12.8172	1.8647	0.1161	1.9808		13,632.2967	13,632.2967	0.3144		13,640.1571
Vendor	0.0287	0.9187	0.2070	2.5400e-003	1.5134	1.7800e-003	1.5152	0.1613	1.7000e-003	0.1630		266.3903	266.3903	0.0189		266.8617
Worker	0.3390	0.2179	2.7755	5.5200e-003	17.6960	3.3200e-003	17.6994	1.8506	3.0500e-003	1.8537		548.3647	548.3647	0.0231		548.9425
Total	**1.0600**	**28.0769**	**7.1950**	**0.1377**	**31.9053**	**0.1265**	**32.0317**	**3.8766**	**0.1209**	**3.9975**		**14,447.0517**	**14,447.0517**	**0.3564**		**14,455.9613**

3.3 2 Installing New WTGs - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	4.7766	49.2318	38.7612	0.0749		2.3791	2.3791		2.2081	2.2081		7,202.9249	7,202.9249	2.1198		7,255.9193
Total	**4.7766**	**49.2318**	**38.7612**	**0.0749**		**2.3791**	**2.3791**		**2.2081**	**2.2081**		**7,202.9249**	**7,202.9249**	**2.1198**		**7,255.9193**

3.3 2 Installing New WTGs - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2544	9.9005	1.5481	0.0477	55.9265	0.0446	55.9711	6.0074	0.0427	6.0501		5,009.837 6	5,009.837 6	0.1156		5,012.726 2
Vendor	0.0287	0.9187	0.2070	2.5400e-003	9.1779	1.7800e-003	9.1797	0.9261	1.7000e-003	0.9278		266.3903	266.3903	0.0189		266.8617
Worker	1.6948	1.0893	13.8776	0.0276	539.6968	0.0166	539.7134	54.2789	0.0153	54.2941		2,741.823 3	2,741.823 3	0.1156		2,744.712 6
Total	**1.9780**	**11.9085**	**15.6326**	**0.0778**	**604.8012**	**0.0630**	**604.8642**	**61.2124**	**0.0596**	**61.2720**		**8,018.051 2**	**8,018.051 2**	**0.2500**		**8,024.300 5**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.8579	37.4997	48.6371	0.0749		1.9563	1.9563		1.9563	1.9563	0.0000	7,202.924 9	7,202.924 9	2.1198		7,255.919 3
Total	**1.8579**	**37.4997**	**48.6371**	**0.0749**		**1.9563**	**1.9563**		**1.9563**	**1.9563**	**0.0000**	**7,202.924 9**	**7,202.924 9**	**2.1198**		**7,255.919 3**

3.3 2 Installing New WTGs - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2544	9.9005	1.5481	0.0477	11.1982	0.0446	11.2428	1.5441	0.0427	1.5868		5,009.8376	5,009.8376	0.1156		5,012.7262
Vendor	0.0287	0.9187	0.2070	2.5400e-003	1.5134	1.7800e-003	1.5152	0.1613	1.7000e-003	0.1630		266.3903	266.3903	0.0189		266.8617
Worker	1.6948	1.0893	13.8776	0.0276	88.4802	0.0166	88.4967	9.2532	0.0153	9.2684		2,741.8233	2,741.8233	0.1156		2,744.7126
Total	**1.9780**	**11.9085**	**15.6326**	**0.0778**	**101.1918**	**0.0630**	**101.2548**	**10.9585**	**0.0596**	**11.0182**		**8,018.0512**	**8,018.0512**	**0.2500**		**8,024.3005**

3.3 2 Installing New WTGs - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	4.2856	43.0096	38.1935	0.0750		2.0462	2.0462		1.8994	1.8994		7,204.5683	7,204.5683	2.1159		7,257.4665
Total	**4.2856**	**43.0096**	**38.1935**	**0.0750**		**2.0462**	**2.0462**		**1.8994**	**1.8994**		**7,204.5683**	**7,204.5683**	**2.1159**		**7,257.4665**

3.3 2 Installing New WTGs - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2374	8.6914	1.4976	0.0471	37.3878	0.0366	37.4245	4.0425	0.0350	4.0775		4,951.681 8	4,951.681 8	0.1096		4,954.421 8
Vendor	0.0267	0.8682	0.1903	2.5200e-003	9.1779	1.4900e-003	9.1794	0.9261	1.4300e-003	0.9275		264.1890	264.1890	0.0175		264.6265
Worker	1.5815	0.9931	12.7799	0.0266	539.6968	0.0160	539.7128	54.2789	0.0148	54.2936		2,641.262 7	2,641.262 7	0.1050		2,643.887 3
Total	**1.8455**	**10.5528**	**14.4678**	**0.0762**	**586.2625**	**0.0541**	**586.3167**	**59.2474**	**0.0512**	**59.2987**		**7,857.133 6**	**7,857.133 6**	**0.2321**		**7,862.935 6**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.8579	37.4997	48.6371	0.0750		1.9563	1.9563		1.9563	1.9563	0.0000	7,204.568 3	7,204.568 3	2.1159		7,257.466 5
Total	**1.8579**	**37.4997**	**48.6371**	**0.0750**		**1.9563**	**1.9563**		**1.9563**	**1.9563**	**0.0000**	**7,204.568 3**	**7,204.568 3**	**2.1159**		**7,257.466 5**

3.3 2 Installing New WTGs - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2374	8.6914	1.4976	0.0471	7.5690	0.0366	7.6056	1.0669	0.0350	1.1020		4,951.6818	4,951.6818	0.1096		4,954.4218
Vendor	0.0267	0.8682	0.1903	2.5200e-003	1.5134	1.4900e-003	1.5149	0.1613	1.4300e-003	0.1627		264.1890	264.1890	0.0175		264.6265
Worker	1.5815	0.9931	12.7799	0.0266	88.4802	0.0160	88.4962	9.2532	0.0148	9.2679		2,641.2627	2,641.2627	0.1050		2,643.8873
Total	**1.8455**	**10.5528**	**14.4678**	**0.0762**	**97.5625**	**0.0541**	**97.6167**	**10.4814**	**0.0512**	**10.5326**		**7,857.1336**	**7,857.1336**	**0.2321**		**7,862.9356**

3.4 2a Delivering New WTGs Components - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

3.4 2a Delivering New WTGs Components - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0327	1.2186	0.2071	6.6300e-003	8.1969	6.4500e-003	8.2034	0.8805	6.1700e-003	0.8866		696.7441	696.7441	0.0102		696.9994
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0327**	**1.2186**	**0.2071**	**6.6300e-003**	**8.1969**	**6.4500e-003**	**8.2034**	**0.8805**	**6.1700e-003**	**0.8866**		**696.7441**	**696.7441**	**0.0102**		**696.9994**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

3.4 2a Delivering New WTGs Components - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0327	1.2186	0.2071	6.6300e-003	1.6412	6.4500e-003	1.6477	0.2263	6.1700e-003	0.2325		696.7441	696.7441	0.0102		696.9994
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0327**	**1.2186**	**0.2071**	**6.6300e-003**	**1.6412**	**6.4500e-003**	**1.6477**	**0.2263**	**6.1700e-003**	**0.2325**		**696.7441**	**696.7441**	**0.0102**		**696.9994**

3.4 2a Delivering New WTGs Components - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

3.4 2a Delivering New WTGs Components - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0305	1.0496	0.2006	6.5500e-003	5.4798	5.3000e-003	5.4851	0.5925	5.0700e-003	0.5976		688.5477	688.5477	9.8300e-003		688.7935
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0305**	**1.0496**	**0.2006**	**6.5500e-003**	**5.4798**	**5.3000e-003**	**5.4851**	**0.5925**	**5.0700e-003**	**0.5976**		**688.5477**	**688.5477**	**9.8300e-003**		**688.7935**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

3.4 2a Delivering New WTGs Components - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0305	1.0496	0.2006	6.5500e-003	1.1093	5.3000e-003	1.1146	0.1564	5.0700e-003	0.1614		688.5477	688.5477	9.8300e-003		688.7935
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0305**	**1.0496**	**0.2006**	**6.5500e-003**	**1.1093**	**5.3000e-003**	**1.1146**	**0.1564**	**5.0700e-003**	**0.1614**		**688.5477**	**688.5477**	**9.8300e-003**		**688.7935**

3.5 3 Restoration - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.5747	0.0000	0.5747	0.0621	0.0000	0.0621			0.0000			0.0000
Off-Road	0.6097	5.0512	7.5696	0.0118		0.2653	0.2653		0.2528	0.2528		1,135.3321	1,135.3321	0.2703		1,142.0884
Total	**0.6097**	**5.0512**	**7.5696**	**0.0118**	**0.5747**	**0.2653**	**0.8400**	**0.0621**	**0.2528**	**0.3149**		**1,135.3321**	**1,135.3321**	**0.2703**		**1,142.0884**

3.5 3 Restoration - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0394	1.4413	0.2483	7.8100e-003	5.6274	6.0700e-003	5.6335	0.6097	5.8100e-003	0.6155		821.1332	821.1332	0.0182		821.5875
Vendor	5.3300e-003	0.1737	0.0381	5.0000e-004	1.8356	3.0000e-004	1.8359	0.1852	2.9000e-004	0.1855		52.8378	52.8378	3.5000e-003		52.9253
Worker	0.3163	0.1986	2.5560	5.3100e-003	107.9394	3.2100e-003	107.9426	10.8558	2.9500e-003	10.8587		528.2525	528.2525	0.0210		528.7775
Total	**0.3610**	**1.8136**	**2.8424**	**0.0136**	**115.4023**	**9.5800e-003**	**115.4119**	**11.6507**	**9.0500e-003**	**11.6597**		**1,402.2235**	**1,402.2235**	**0.0427**		**1,403.2903**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.2586	0.0000	0.2586	0.0280	0.0000	0.0280			0.0000			0.0000
Off-Road	0.2724	5.7212	8.3979	0.0118		0.3410	0.3410		0.3410	0.3410	0.0000	1,135.3321	1,135.3321	0.2703		1,142.0884
Total	**0.2724**	**5.7212**	**8.3979**	**0.0118**	**0.2586**	**0.3410**	**0.5996**	**0.0280**	**0.3410**	**0.3689**	**0.0000**	**1,135.3321**	**1,135.3321**	**0.2703**		**1,142.0884**

3.5 3 Restoration - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0394	1.4413	0.2483	7.8100e-003	1.1431	6.0700e-003	1.1491	0.1622	5.8100e-003	0.1680		821.1332	821.1332	0.0182		821.5875
Vendor	5.3300e-003	0.1737	0.0381	5.0000e-004	0.3027	3.0000e-004	0.3030	0.0323	2.9000e-004	0.0325		52.8378	52.8378	3.5000e-003		52.9253
Worker	0.3163	0.1986	2.5560	5.3100e-003	17.6960	3.2100e-003	17.6992	1.8506	2.9500e-003	1.8536		528.2525	528.2525	0.0210		528.7775
Total	**0.3610**	**1.8136**	**2.8424**	**0.0136**	**19.1418**	**9.5800e-003**	**19.1514**	**2.0451**	**9.0500e-003**	**2.0541**		**1,402.2235**	**1,402.2235**	**0.0427**		**1,403.2903**

3.5 3 Restoration - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.5747	0.0000	0.5747	0.0621	0.0000	0.0621			0.0000			0.0000
Off-Road	0.5777	4.6986	7.5581	0.0118		0.2373	0.2373		0.2259	0.2259		1,135.4270	1,135.4270	0.2683		1,142.1346
Total	**0.5777**	**4.6986**	**7.5581**	**0.0118**	**0.5747**	**0.2373**	**0.8120**	**0.0621**	**0.2259**	**0.2880**		**1,135.4270**	**1,135.4270**	**0.2683**		**1,142.1346**

3.5 3 Restoration - 2023

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0283	0.8112	0.2226	7.5900e-003	10.9536	2.7600e-003	10.9564	1.1742	2.6400e-003	1.1768		798.2511	798.2511	0.0140		798.6014
Vendor	4.2200e-003	0.1345	0.0335	4.9000e-004	1.8356	1.2000e-004	1.8357	0.1852	1.1000e-004	0.1853		51.6584	51.6584	2.5000e-003		51.7209
Worker	0.2962	0.1819	2.3610	5.1100e-003	107.9394	3.1200e-003	107.9425	10.8558	2.8700e-003	10.8586		508.1514	508.1514	0.0191		508.6296
Total	**0.3288**	**1.1275**	**2.6171**	**0.0132**	**120.7285**	**6.0000e-003**	**120.7345**	**12.2152**	**5.6200e-003**	**12.2208**		**1,358.0609**	**1,358.0609**	**0.0356**		**1,358.9518**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.2586	0.0000	0.2586	0.0280	0.0000	0.0280			0.0000			0.0000
Off-Road	0.2724	5.7212	8.3979	0.0118		0.3410	0.3410		0.3410	0.3410	0.0000	1,135.4270	1,135.4270	0.2683		1,142.1346
Total	**0.2724**	**5.7212**	**8.3979**	**0.0118**	**0.2586**	**0.3410**	**0.5996**	**0.0280**	**0.3410**	**0.3689**	**0.0000**	**1,135.4270**	**1,135.4270**	**0.2683**		**1,142.1346**

3.5 3 Restoration - 2023

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0283	0.8112	0.2226	7.5900e-003	2.1857	2.7600e-003	2.1885	0.2993	2.6400e-003	0.3019		798.2511	798.2511	0.0140		798.6014
Vendor	4.2200e-003	0.1345	0.0335	4.9000e-004	0.3027	1.2000e-004	0.3028	0.0323	1.1000e-004	0.0324		51.6584	51.6584	2.5000e-003		51.7209
Worker	0.2962	0.1819	2.3610	5.1100e-003	17.6960	3.1200e-003	17.6992	1.8506	2.8700e-003	1.8535		508.1514	508.1514	0.0191		508.6296
Total	**0.3288**	**1.1275**	**2.6171**	**0.0132**	**20.1844**	**6.0000e-003**	**20.1904**	**2.1822**	**5.6200e-003**	**2.1878**		**1,358.0609**	**1,358.0609**	**0.0356**		**1,358.9518**

3.6 4 Decommissioning New WTGs - 2053

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3930	5.5521	15.4072	0.0379		0.1167	0.1167		0.1167	0.1167		3,591.1689	3,591.1689	0.1213		3,594.2010
Total	**1.3930**	**5.5521**	**15.4072**	**0.0379**		**0.1167**	**0.1167**		**0.1167**	**0.1167**		**3,591.1689**	**3,591.1689**	**0.1213**		**3,594.2010**

3.6 4 Decommissioning New WTGs - 2053

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling					11.0673	0.0000	11.0673	1.1730	0.0000	1.1730			0.0000			0.0000
Vendor					1.8323	0.0000	1.8323	0.1839	0.0000	0.1839			0.0000			0.0000
Worker					107.8668	0.0000	107.8668	10.8270	0.0000	10.8270			0.0000			0.0000
Total					**120.7664**	**0.0000**	**120.7664**	**12.1839**	**0.0000**	**12.1839**			**0.0000**			**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.7583	15.6416	20.1644	0.0379		0.8245	0.8245		0.8245	0.8245	0.0000	3,591.1689	3,591.1689	0.1213		3,594.2010
Total	**0.7583**	**15.6416**	**20.1644**	**0.0379**		**0.8245**	**0.8245**		**0.8245**	**0.8245**	**0.0000**	**3,591.1689**	**3,591.1689**	**0.1213**		**3,594.2010**

3.6 4 Decommissioning New WTGs - 2053

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling					2.1666	0.0000	2.1666	0.2848	0.0000	0.2848			0.0000			0.0000
Vendor					0.2994	0.0000	0.2994	0.0310	0.0000	0.0310			0.0000			0.0000
Worker					17.6235	0.0000	17.6235	1.8219	0.0000	1.8219			0.0000			0.0000
Total					**20.0895**	**0.0000**	**20.0895**	**2.1377**	**0.0000**	**2.1377**			**0.0000**			**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.1908	1.4114	2.3093	8.2000e-003	48.6764	5.0800e-003	48.6815	4.9266	4.7700e-003	4.9313		838.7264	838.7264	0.0480		839.9272
Unmitigated	0.1908	1.4114	2.3093	8.2000e-003	48.6764	5.0800e-003	48.6815	4.9266	4.7700e-003	4.9313		838.7264	838.7264	0.0480		839.9272

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Manufacturing	65.00	65.00	65.00	235,792	235,792
Total	65.00	65.00	65.00	235,792	235,792

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Manufacturing	13.80	6.20	6.20	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Manufacturing	0.490441	0.036099	0.183975	0.121725	0.015214	0.005252	0.022424	0.112230	0.002972	0.001873	0.006187	0.000783	0.000825

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Manufacturing	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Manufacturing	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0124	1.2100e-003	0.1329	1.0000e-005		4.7000e-004	4.7000e-004		4.7000e-004	4.7000e-004		0.2845	0.2845	7.5000e-004		0.3033
Unmitigated	0.0124	1.2100e-003	0.1329	1.0000e-005		4.7000e-004	4.7000e-004		4.7000e-004	4.7000e-004		0.2845	0.2845	7.5000e-004		0.3033

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0124	1.2100e-003	0.1329	1.0000e-005		4.7000e-004	4.7000e-004		4.7000e-004	4.7000e-004		0.2845	0.2845	7.5000e-004		0.3033
Total	**0.0124**	**1.2100e-003**	**0.1329**	**1.0000e-005**		**4.7000e-004**	**4.7000e-004**		**4.7000e-004**	**4.7000e-004**		**0.2845**	**0.2845**	**7.5000e-004**		**0.3033**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0124	1.2100e-003	0.1329	1.0000e-005		4.7000e-004	4.7000e-004		4.7000e-004	4.7000e-004		0.2845	0.2845	7.5000e-004		0.3033
Total	**0.0124**	**1.2100e-003**	**0.1329**	**1.0000e-005**		**4.7000e-004**	**4.7000e-004**		**4.7000e-004**	**4.7000e-004**		**0.2845**	**0.2845**	**7.5000e-004**		**0.3033**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Mesa Wind Repower - CEQA Tech Support

Salton Sea Air Basin, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Manufacturing	1,300.00	1000sqft	29.84	1,300,000.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	3.4	**Precipitation Freq (Days)**	20
Climate Zone	10			**Operational Year**	2022

Utility Company

CO2 Intensity (lb/MWhr)	0	**CH4 Intensity (lb/MWhr)**	0	**N2O Intensity (lb/MWhr)**	0

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Existing wind project repower. Decommissioning and removing the legacy towers is not included in this CEQA emissions estimate.

Land Use - Total site estimated disturbance of up to 107 acres. Equiv of 1.3 million sq ft.

Construction Phase - Phasing approximate per POD dated October 2019, excluding removing legacy towers

Off-road Equipment - Roadway Improvements - Estd Offroad Equipment ct 5

Off-road Equipment - Install New WTGs - Estd Offroad Equipment ct 16

Off-road Equipment - Ph 2a for on-road only

Off-road Equipment - Restoration Revegetation - Estd Offroad Equipment ct 3

Off-road Equipment - Future year decommissioning new WTGs - Estd Offroad Equipment ct 6

Trips and VMT - approx up to 400 Light Duty vehicles daily and overall 10,580 Heavy Duty haul trips

On-road Fugitive Dust - final fraction of average trip is unpaved

Grading - Total disturbance up to 107 ac. Temp site disturbance approx 82 acres

Vehicle Trips - Operational mobile sources under 100 trips daily

Road Dust - final fraction of worker trip is unpaved

Consumer Products - no consumer products in operational phase

Area Coating - no architectural coatings needed in operation phase

Energy Use - no energy use applicable in operational phase

Water And Wastewater - no water use applicable in operational phase

Solid Waste - no solid waste applicable in operational phase

Construction Off-road Equipment Mitigation - Mitigation includes offroad Tier 3 fleet or higher, stabilizer is 84% effective per Table XI-D, watering 2x daily is 55% effective PM10 control per Rule 403, unpaved travel speed limit 15 mph

Table Name	Column Name	Default Value	New Value
tblAreaCoating	ReapplicationRatePercent	10	0
tblConstDustMitigation	WaterUnpavedRoadMoistureContent	0	0.5
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	40
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	4.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3

tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstructionPhase	NumDays	440.00	330.00
tblConstructionPhase	NumDays	440.00	330.00
tblConstructionPhase	NumDays	45.00	44.00
tblConstructionPhase	NumDays	20.00	198.00
tblConsumerProducts	ROG_EF	2.14E-05	0
tblEnergyUse	LightingElect	2.93	0.00
tblEnergyUse	NT24E	5.02	0.00
tblEnergyUse	NT24NG	17.13	0.00
tblEnergyUse	T24E	2.20	0.00
tblEnergyUse	T24NG	15.36	0.00
tblGrading	AcresOfGrading	66.00	107.00
tblGrading	AcresOfGrading	0.00	107.00
tblGrading	MaterialExported	0.00	2,000.00
tblGrading	MaterialExported	0.00	2,000.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	1.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	4.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	7.00	10.00
tblOffRoadEquipment	UsageHours	8.00	10.00
tblOffRoadEquipment	UsageHours	7.00	8.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	HaulingPercentPave	50.00	99.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	VendorPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblOnRoadDust	WorkerPercentPave	50.00	90.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblRoadDust	RoadPercentPave	50	90
tblSolidWaste	SolidWasteGenerationRate	1,612.00	0.00
tblTripsAndVMT	HaulingTripLength	20.00	60.00
tblTripsAndVMT	HaulingTripLength	20.00	60.00
tblTripsAndVMT	HaulingTripLength	20.00	140.00
tblTripsAndVMT	HaulingTripLength	20.00	60.00

tblTripsAndVMT	HaulingTripLength	20.00	60.00
tblTripsAndVMT	HaulingTripNumber	198.00	2,888.00
tblTripsAndVMT	HaulingTripNumber	0.00	7,960.00
tblTripsAndVMT	HaulingTripNumber	0.00	500.00
tblTripsAndVMT	HaulingTripNumber	198.00	792.00
tblTripsAndVMT	HaulingTripNumber	0.00	3,120.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	VendorTripNumber	213.00	10.00
tblTripsAndVMT	VendorTripNumber	213.00	0.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	WorkerTripNumber	13.00	50.00
tblTripsAndVMT	WorkerTripNumber	546.00	250.00
tblTripsAndVMT	WorkerTripNumber	546.00	0.00
tblTripsAndVMT	WorkerTripNumber	8.00	50.00
tblTripsAndVMT	WorkerTripNumber	15.00	50.00
tblVehicleTrips	ST_TR	1.49	0.05
tblVehicleTrips	SU_TR	0.62	0.05
tblVehicleTrips	WD_TR	3.82	0.05
tblWater	IndoorWaterUseRate	300,625,000.00	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	10.4295	124.0572	75.6893	0.3280	800.1036	3.9290	804.0326	84.1872	3.6406	87.8278	0.0000	33,329.4437	33,329.4437	3.9609	0.0000	33,428.4669
2022	6.8769	62.0505	58.8299	0.1772	707.7193	2.3809	710.1003	71.5527	2.2179	73.7706	0.0000	17,693.1999	17,693.1999	2.6589	0.0000	17,759.6723
2023	0.8673	5.8547	9.4769	0.0241	121.3032	0.2434	121.5466	12.2773	0.2316	12.5089	0.0000	2,400.2871	2,400.2871	0.3013	0.0000	2,407.8205
2053	1.3930	5.5521	15.4072	0.0379	120.7664	0.1167	120.8831	12.1839	0.1167	12.3007	0.0000	3,591.1689	3,591.1689	0.1213	0.0000	3,594.2010
Maximum	**10.4295**	**124.0572**	**75.6893**	**0.3280**	**800.1036**	**3.9290**	**804.0326**	**84.1872**	**3.6406**	**87.8278**	**0.0000**	**33,329.4437**	**33,329.4437**	**3.9609**	**0.0000**	**33,428.4669**

2.1 Overall Construction (Maximum Daily Emission)

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	5.6128	99.2563	89.6080	0.3280	138.6120	2.9394	141.5514	16.6768	2.9301	19.6069	0.0000	33,329.4437	33,329.4437	3.9609	0.0000	33,428.4669
2022	4.1118	57.2107	70.1018	0.1772	118.0722	2.3667	120.4390	12.7107	2.3630	15.0738	0.0000	17,693.1998	17,693.1998	2.6589	0.0000	17,759.6723
2023	0.5619	6.8773	10.3167	0.0241	20.4431	0.3470	20.7901	2.2101	0.3466	2.5567	0.0000	2,400.2871	2,400.2871	0.3013	0.0000	2,407.8205
2053	0.7583	15.6416	20.1644	0.0379	20.0895	0.8245	20.9139	2.1377	0.8245	2.9621	0.0000	3,591.1689	3,591.1689	0.1213	0.0000	3,594.2010
Maximum	**5.6128**	**99.2563**	**89.6080**	**0.3280**	**138.6120**	**2.9394**	**141.5514**	**16.6768**	**2.9301**	**19.6069**	**0.0000**	**33,329.4437**	**33,329.4437**	**3.9609**	**0.0000**	**33,428.4669**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**43.55**	**9.38**	**-19.31**	**0.00**	**83.02**	**2.89**	**82.71**	**81.28**	**-4.15**	**78.43**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0124	1.2100e-003	0.1329	1.0000e-005		4.7000e-004	4.7000e-004		4.7000e-004	4.7000e-004		0.2845	0.2845	7.5000e-004		0.3033
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.1433	1.4176	1.7947	7.3600e-003	48.6764	5.1700e-003	48.6816	4.9266	4.8600e-003	4.9314		755.0056	755.0056	0.0480		756.2058
Total	**0.1557**	**1.4188**	**1.9277**	**7.3700e-003**	**48.6764**	**5.6400e-003**	**48.6820**	**4.9266**	**5.3300e-003**	**4.9319**		**755.2901**	**755.2901**	**0.0488**	**0.0000**	**756.5091**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0124	1.2100e-003	0.1329	1.0000e-005		4.7000e-004	4.7000e-004		4.7000e-004	4.7000e-004		0.2845	0.2845	7.5000e-004		0.3033
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.1433	1.4176	1.7947	7.3600e-003	48.6764	5.1700e-003	48.6816	4.9266	4.8600e-003	4.9314		755.0056	755.0056	0.0480		756.2058
Total	**0.1557**	**1.4188**	**1.9277**	**7.3700e-003**	**48.6764**	**5.6400e-003**	**48.6820**	**4.9266**	**5.3300e-003**	**4.9319**		**755.2901**	**755.2901**	**0.0488**	**0.0000**	**756.5091**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	1 Roadway Improvements	Grading	7/1/2021	8/31/2021	5	44	1 Roadway Improvements
2	2 Installing New WTGs	Building Construction	7/1/2021	10/5/2022	5	330	2 Installing New WTGs
3	2a Delivering New WTGs Components	Building Construction	7/1/2021	10/5/2022	5	330	2a Delivering New WTGs Components
4	3 Restoration	Site Preparation	7/1/2022	4/4/2023	5	198	3 Restoration
5	4 Decommissioning New WTGs	Trenching	1/1/2053	12/30/2053	5	260	4 Decommissioning New WTGs

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
1 Roadway Improvements	Excavators	1	8.00	158	0.38
1 Roadway Improvements	Graders	1	8.00	187	0.41
1 Roadway Improvements	Rubber Tired Dozers	1	8.00	247	0.40
1 Roadway Improvements	Scrapers	1	8.00	367	0.48
1 Roadway Improvements	Tractors/Loaders/Backhoes	1	8.00	97	0.37

2 Installing New WTGs	Bore/Drill Rigs	1	8.00	221	0.50
2 Installing New WTGs	Cranes	2	10.00	231	0.29
2 Installing New WTGs	Forklifts	3	10.00	89	0.20
2 Installing New WTGs	Generator Sets	1	8.00	84	0.74
2 Installing New WTGs	Graders	1	8.00	187	0.41
2 Installing New WTGs	Other Construction Equipment	2	8.00	172	0.42
2 Installing New WTGs	Other Material Handling Equipment	1	8.00	168	0.40
2 Installing New WTGs	Rollers	2	8.00	80	0.38
2 Installing New WTGs	Tractors/Loaders/Backhoes	2	8.00	97	0.37
2 Installing New WTGs	Welders	1	8.00	46	0.45
2a Delivering New WTGs Components	Cranes	0	7.00	231	0.29
2a Delivering New WTGs Components	Forklifts	0	8.00	89	0.20
2a Delivering New WTGs Components	Generator Sets	0	8.00	84	0.74
2a Delivering New WTGs Components	Tractors/Loaders/Backhoes	0	7.00	97	0.37
2a Delivering New WTGs Components	Welders	0	8.00	46	0.45
3 Restoration	Air Compressors	1	8.00	78	0.48
3 Restoration	Other Material Handling Equipment	1	8.00	168	0.40
3 Restoration	Rubber Tired Dozers	0	8.00	247	0.40
3 Restoration	Skid Steer Loaders	1	8.00	65	0.37
3 Restoration	Tractors/Loaders/Backhoes	0	8.00	97	0.37
4 Decommissioning New WTGs	Air Compressors	1	8.00	78	0.48
4 Decommissioning New WTGs	Concrete/Industrial Saws	1	8.00	81	0.73
4 Decommissioning New WTGs	Cranes	1	8.00	231	0.29
4 Decommissioning New WTGs	Excavators	1	8.00	158	0.38
4 Decommissioning New WTGs	Rubber Tired Dozers	1	8.00	247	0.40
4 Decommissioning New WTGs	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
1 Roadway Improvements	5	50.00	10.00	2,888.00	14.60	6.20	60.00	LD_Mix	HDT_Mix	HHDT
2 Installing New WTGs	16	250.00	10.00	7,960.00	14.60	6.20	60.00	LD_Mix	HDT_Mix	HHDT
2a Delivering New WTGs Components	0	0.00	0.00	500.00	14.60	6.20	140.00	LD_Mix	HDT_Mix	HHDT
3 Restoration	3	50.00	2.00	792.00	14.60	6.20	60.00	LD_Mix	HDT_Mix	HHDT
4 Decommissioning New WTGs	6	50.00	2.00	3,120.00	14.60	6.20	60.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use Soil Stabilizer

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 1 Roadway Improvements - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					8.6082	0.0000	8.6082	3.5898	0.0000	3.5898			0.0000			0.0000
Off-Road	2.8453	31.6479	18.3417	0.0386		1.3527	1.3527		1.2445	1.2445		3,738.0399	3,738.0399	1.2090		3,768.2638
Total	**2.8453**	**31.6479**	**18.3417**	**0.0386**	**8.6082**	**1.3527**	**9.9609**	**3.5898**	**1.2445**	**4.8343**		**3,738.0399**	**3,738.0399**	**1.2090**		**3,768.2638**

3.2 1 Roadway Improvements - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.7120	28.3004	4.5583	0.1281	61.3800	0.1222	61.5022	6.7228	0.1169	6.8397		13,473.4977	13,473.4977	0.3440		13,482.0975
Vendor	0.0303	0.9139	0.2463	2.4300e-003	9.1779	1.8500e-003	9.1798	0.9261	1.7700e-003	0.9279		254.0776	254.0776	0.0212		254.6074
Worker	0.2901	0.2245	1.9411	4.6300e-003	107.9394	3.3200e-003	107.9427	10.8558	3.0500e-003	10.8588		460.3781	460.3781	0.0181		460.8302
Total	**1.0323**	**29.4388**	**6.7457**	**0.1352**	**178.4973**	**0.1274**	**178.6247**	**18.5046**	**0.1218**	**18.6264**		**14,187.9533**	**14,187.9533**	**0.3833**		**14,197.5351**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					3.8737	0.0000	3.8737	1.6154	0.0000	1.6154			0.0000			0.0000
Off-Road	0.9472	18.5790	22.3845	0.0386		0.7859	0.7859		0.7859	0.7859	0.0000	3,738.0399	3,738.0399	1.2090		3,768.2638
Total	**0.9472**	**18.5790**	**22.3845**	**0.0386**	**3.8737**	**0.7859**	**4.6596**	**1.6154**	**0.7859**	**2.4013**	**0.0000**	**3,738.0399**	**3,738.0399**	**1.2090**		**3,768.2638**

3.2 1 Roadway Improvements - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.7120	28.3004	4.5583	0.1281	12.6958	0.1222	12.8180	1.8647	0.1169	1.9816		13,473.4977	13,473.4977	0.3440		13,482.0975
Vendor	0.0303	0.9139	0.2463	2.4300e-003	1.5134	1.8500e-003	1.5153	0.1613	1.7700e-003	0.1630		254.0776	254.0776	0.0212		254.6074
Worker	0.2901	0.2245	1.9411	4.6300e-003	17.6960	3.3200e-003	17.6994	1.8506	3.0500e-003	1.8537		460.3781	460.3781	0.0181		460.8302
Total	**1.0323**	**29.4388**	**6.7457**	**0.1352**	**31.9053**	**0.1274**	**32.0326**	**3.8766**	**0.1218**	**3.9984**		**14,187.9533**	**14,187.9533**	**0.3833**		**14,197.5351**

3.3 2 Installing New WTGs - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	4.7766	49.2318	38.7612	0.0749		2.3791	2.3791		2.2081	2.2081		7,202.9249	7,202.9249	2.1198		7,255.9193
Total	**4.7766**	**49.2318**	**38.7612**	**0.0749**		**2.3791**	**2.3791**		**2.2081**	**2.2081**		**7,202.9249**	**7,202.9249**	**2.1198**		**7,255.9193**

3.3 2 Installing New WTGs - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2617	10.4003	1.6752	0.0471	55.9265	0.0449	55.9715	6.0074	0.0430	6.0504		4,951.4793	4,951.4793	0.1264		4,954.6397
Vendor	0.0303	0.9139	0.2463	2.4300e-003	9.1779	1.8500e-003	9.1798	0.9261	1.7700e-003	0.9279		254.0776	254.0776	0.0212		254.6074
Worker	1.4503	1.1225	9.7054	0.0231	539.6968	0.0166	539.7134	54.2789	0.0153	54.2941		2,301.8904	2,301.8904	0.0904		2,304.1509
Total	**1.7422**	**12.4367**	**11.6268**	**0.0727**	**604.8012**	**0.0633**	**604.8646**	**61.2124**	**0.0600**	**61.2724**		**7,507.4472**	**7,507.4472**	**0.2380**		**7,513.3981**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.8579	37.4997	48.6371	0.0749		1.9563	1.9563		1.9563	1.9563	0.0000	7,202.9249	7,202.9249	2.1198		7,255.9193
Total	**1.8579**	**37.4997**	**48.6371**	**0.0749**		**1.9563**	**1.9563**		**1.9563**	**1.9563**	**0.0000**	**7,202.9249**	**7,202.9249**	**2.1198**		**7,255.9193**

3.3 2 Installing New WTGs - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2617	10.4003	1.6752	0.0471	11.1982	0.0449	11.2431	1.5441	0.0430	1.5871		4,951.4793	4,951.4793	0.1264		4,954.6397
Vendor	0.0303	0.9139	0.2463	2.4300e-003	1.5134	1.8500e-003	1.5153	0.1613	1.7700e-003	0.1630		254.0776	254.0776	0.0212		254.6074
Worker	1.4503	1.1225	9.7054	0.0231	88.4802	0.0166	88.4967	9.2532	0.0153	9.2684		2,301.8904	2,301.8904	0.0904		2,304.1509
Total	**1.7422**	**12.4367**	**11.6268**	**0.0727**	**101.1918**	**0.0633**	**101.2552**	**10.9585**	**0.0600**	**11.0185**		**7,507.4472**	**7,507.4472**	**0.2380**		**7,513.3981**

3.3 2 Installing New WTGs - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	4.2856	43.0096	38.1935	0.0750		2.0462	2.0462		1.8994	1.8994		7,204.5683	7,204.5683	2.1159		7,257.4665
Total	**4.2856**	**43.0096**	**38.1935**	**0.0750**		**2.0462**	**2.0462**		**1.8994**	**1.8994**		**7,204.5683**	**7,204.5683**	**2.1159**		**7,257.4665**

3.3 2 Installing New WTGs - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2443	9.1005	1.6186	0.0465	37.3878	0.0369	37.4248	4.0425	0.0353	4.0778		4,893.438 1	4,893.438 1	0.1199		4,896.434 4
Vendor	0.0282	0.8618	0.2276	2.4100e-003	9.1779	1.5600e-003	9.1795	0.9261	1.4900e-003	0.9276		251.8979	251.8979	0.0197		252.3905
Worker	1.3601	1.0223	8.9164	0.0223	539.6968	0.0160	539.7128	54.2789	0.0148	54.2936		2,217.683 4	2,217.683 4	0.0824		2,219.743 5
Total	**1.6325**	**10.9845**	**10.7626**	**0.0712**	**586.2625**	**0.0545**	**586.3170**	**59.2474**	**0.0516**	**59.2990**		**7,363.019 3**	**7,363.019 3**	**0.2220**		**7,368.568 3**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.8579	37.4997	48.6371	0.0750		1.9563	1.9563		1.9563	1.9563	0.0000	7,204.568 3	7,204.568 3	2.1159		7,257.466 5
Total	**1.8579**	**37.4997**	**48.6371**	**0.0750**		**1.9563**	**1.9563**		**1.9563**	**1.9563**	**0.0000**	**7,204.568 3**	**7,204.568 3**	**2.1159**		**7,257.466 5**

3.3 2 Installing New WTGs - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2443	9.1005	1.6186	0.0465	7.5690	0.0369	7.6059	1.0669	0.0353	1.1023		4,893.4381	4,893.4381	0.1199		4,896.4344
Vendor	0.0282	0.8618	0.2276	2.4100e-003	1.5134	1.5600e-003	1.5150	0.1613	1.4900e-003	0.1628		251.8979	251.8979	0.0197		252.3905
Worker	1.3601	1.0223	8.9164	0.0223	88.4802	0.0160	88.4962	9.2532	0.0148	9.2679		2,217.6834	2,217.6834	0.0824		2,219.7435
Total	**1.6325**	**10.9845**	**10.7626**	**0.0712**	**97.5625**	**0.0545**	**97.6171**	**10.4814**	**0.0516**	**10.5329**		**7,363.0193**	**7,363.0193**	**0.2220**		**7,368.5683**

3.4 2a Delivering New WTGs Components - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

3.4 2a Delivering New WTGs Components - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0331	1.3020	0.2140	6.5900e-003	8.1969	6.4700e-003	8.2034	0.8805	6.1900e-003	0.8867		693.0784	693.0784	0.0109		693.3505
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0331**	**1.3020**	**0.2140**	**6.5900e-003**	**8.1969**	**6.4700e-003**	**8.2034**	**0.8805**	**6.1900e-003**	**0.8867**		**693.0784**	**693.0784**	**0.0109**		**693.3505**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

3.4 2a Delivering New WTGs Components - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0331	1.3020	0.2140	6.5900e-003	1.6412	6.4700e-003	1.6477	0.2263	6.1900e-003	0.2325		693.0784	693.0784	0.0109		693.3505
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0331**	**1.3020**	**0.2140**	**6.5900e-003**	**1.6412**	**6.4700e-003**	**1.6477**	**0.2263**	**6.1900e-003**	**0.2325**		**693.0784**	**693.0784**	**0.0109**		**693.3505**

3.4 2a Delivering New WTGs Components - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**		**0.0000**

3.4 2a Delivering New WTGs Components - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0309	1.1193	0.2071	6.5100e-003	5.4798	5.3200e-003	5.4851	0.5925	5.0900e-003	0.5976		684.8892	684.8892	0.0105		685.1508
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0309**	**1.1193**	**0.2071**	**6.5100e-003**	**5.4798**	**5.3200e-003**	**5.4851**	**0.5925**	**5.0900e-003**	**0.5976**		**684.8892**	**684.8892**	**0.0105**		**685.1508**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**

3.4 2a Delivering New WTGs Components - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0309	1.1193	0.2071	6.5100e-003	1.1093	5.3200e-003	1.1146	0.1564	5.0900e-003	0.1615		684.8892	684.8892	0.0105		685.1508
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0309**	**1.1193**	**0.2071**	**6.5100e-003**	**1.1093**	**5.3200e-003**	**1.1146**	**0.1564**	**5.0900e-003**	**0.1615**		**684.8892**	**684.8892**	**0.0105**		**685.1508**

3.5 3 Restoration - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.5747	0.0000	0.5747	0.0621	0.0000	0.0621			0.0000			0.0000
Off-Road	0.6097	5.0512	7.5696	0.0118		0.2653	0.2653		0.2528	0.2528		1,135.3321	1,135.3321	0.2703		1,142.0884
Total	**0.6097**	**5.0512**	**7.5696**	**0.0118**	**0.5747**	**0.2653**	**0.8400**	**0.0621**	**0.2528**	**0.3149**		**1,135.3321**	**1,135.3321**	**0.2703**		**1,142.0884**

3.5 3 Restoration - 2022

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0405	1.5091	0.2684	7.7200e-003	5.6274	6.1200e-003	5.6335	0.6097	5.8500e-003	0.6155		811.4747	811.4747	0.0199		811.9715
Vendor	5.6400e-003	0.1724	0.0455	4.8000e-004	1.8356	3.1000e-004	1.8359	0.1852	3.0000e-004	0.1855		50.3796	50.3796	3.9400e-003		50.4781
Worker	0.2720	0.2045	1.7833	4.4600e-003	107.9394	3.2100e-003	107.9426	10.8558	2.9500e-003	10.8587		443.5367	443.5367	0.0165		443.9487
Total	**0.3182**	**1.8859**	**2.0972**	**0.0127**	**115.4023**	**9.6400e-003**	**115.4120**	**11.6507**	**9.1000e-003**	**11.6598**		**1,305.3909**	**1,305.3909**	**0.0403**		**1,306.3983**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.2586	0.0000	0.2586	0.0280	0.0000	0.0280			0.0000			0.0000
Off-Road	0.2724	5.7212	8.3979	0.0118		0.3410	0.3410		0.3410	0.3410	0.0000	1,135.3321	1,135.3321	0.2703		1,142.0884
Total	**0.2724**	**5.7212**	**8.3979**	**0.0118**	**0.2586**	**0.3410**	**0.5996**	**0.0280**	**0.3410**	**0.3689**	**0.0000**	**1,135.3321**	**1,135.3321**	**0.2703**		**1,142.0884**

3.5 3 Restoration - 2022

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0405	1.5091	0.2684	7.7200e-003	1.1431	6.1200e-003	1.1492	0.1622	5.8500e-003	0.1681		811.4747	811.4747	0.0199		811.9715
Vendor	5.6400e-003	0.1724	0.0455	4.8000e-004	0.3027	3.1000e-004	0.3030	0.0323	3.0000e-004	0.0326		50.3796	50.3796	3.9400e-003		50.4781
Worker	0.2720	0.2045	1.7833	4.4600e-003	17.6960	3.2100e-003	17.6992	1.8506	2.9500e-003	1.8536		443.5367	443.5367	0.0165		443.9487
Total	**0.3182**	**1.8859**	**2.0972**	**0.0127**	**19.1418**	**9.6400e-003**	**19.1514**	**2.0451**	**9.1000e-003**	**2.0542**		**1,305.3909**	**1,305.3909**	**0.0403**		**1,306.3983**

3.5 3 Restoration - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.5747	0.0000	0.5747	0.0621	0.0000	0.0621			0.0000			0.0000
Off-Road	0.5777	4.6986	7.5581	0.0118		0.2373	0.2373		0.2259	0.2259		1,135.4270	1,135.4270	0.2683		1,142.1346
Total	**0.5777**	**4.6986**	**7.5581**	**0.0118**	**0.5747**	**0.2373**	**0.8120**	**0.0621**	**0.2259**	**0.2880**		**1,135.4270**	**1,135.4270**	**0.2683**		**1,142.1346**

3.5 3 Restoration - 2023

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0291	0.8363	0.2359	7.5000e-003	10.9536	2.7800e-003	10.9564	1.1742	2.6600e-003	1.1769		788.8812	788.8812	0.0152		789.2604
Vendor	4.4300e-003	0.1328	0.0391	4.7000e-004	1.8356	1.2000e-004	1.8357	0.1852	1.2000e-004	0.1853		49.2733	49.2733	2.8000e-003		49.3433
Worker	0.2560	0.1870	1.6438	4.2900e-003	107.9394	3.1200e-003	107.9425	10.8558	2.8700e-003	10.8586		426.7056	426.7056	0.0151		427.0822
Total	**0.2895**	**1.1561**	**1.9188**	**0.0123**	**120.7285**	**6.0200e-003**	**120.7346**	**12.2152**	**5.6500e-003**	**12.2208**		**1,264.8601**	**1,264.8601**	**0.0330**		**1,265.6859**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.2586	0.0000	0.2586	0.0280	0.0000	0.0280			0.0000			0.0000
Off-Road	0.2724	5.7212	8.3979	0.0118		0.3410	0.3410		0.3410	0.3410	0.0000	1,135.4270	1,135.4270	0.2683		1,142.1346
Total	**0.2724**	**5.7212**	**8.3979**	**0.0118**	**0.2586**	**0.3410**	**0.5996**	**0.0280**	**0.3410**	**0.3689**	**0.0000**	**1,135.4270**	**1,135.4270**	**0.2683**		**1,142.1346**

3.5 3 Restoration - 2023

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0291	0.8363	0.2359	7.5000e-003	2.1857	2.7800e-003	2.1885	0.2993	2.6600e-003	0.3019		788.8812	788.8812	0.0152		789.2604
Vendor	4.4300e-003	0.1328	0.0391	4.7000e-004	0.3027	1.2000e-004	0.3028	0.0323	1.2000e-004	0.0324		49.2733	49.2733	2.8000e-003		49.3433
Worker	0.2560	0.1870	1.6438	4.2900e-003	17.6960	3.1200e-003	17.6992	1.8506	2.8700e-003	1.8535		426.7056	426.7056	0.0151		427.0822
Total	**0.2895**	**1.1561**	**1.9188**	**0.0123**	**20.1844**	**6.0200e-003**	**20.1905**	**2.1822**	**5.6500e-003**	**2.1878**		**1,264.8601**	**1,264.8601**	**0.0330**		**1,265.6859**

3.6 4 Decommissioning New WTGs - 2053

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3930	5.5521	15.4072	0.0379		0.1167	0.1167		0.1167	0.1167		3,591.1689	3,591.1689	0.1213		3,594.2010
Total	**1.3930**	**5.5521**	**15.4072**	**0.0379**		**0.1167**	**0.1167**		**0.1167**	**0.1167**		**3,591.1689**	**3,591.1689**	**0.1213**		**3,594.2010**

3.6 4 Decommissioning New WTGs - 2053

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling					11.0673	0.0000	11.0673	1.1730	0.0000	1.1730			0.0000			0.0000
Vendor					1.8323	0.0000	1.8323	0.1839	0.0000	0.1839			0.0000			0.0000
Worker					107.8668	0.0000	107.8668	10.8270	0.0000	10.8270			0.0000			0.0000
Total					**120.7664**	**0.0000**	**120.7664**	**12.1839**	**0.0000**	**12.1839**			**0.0000**			**0.0000**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.7583	15.6416	20.1644	0.0379		0.8245	0.8245		0.8245	0.8245	0.0000	3,591.1689	3,591.1689	0.1213		3,594.2010
Total	**0.7583**	**15.6416**	**20.1644**	**0.0379**		**0.8245**	**0.8245**		**0.8245**	**0.8245**	**0.0000**	**3,591.1689**	**3,591.1689**	**0.1213**		**3,594.2010**

3.6 4 Decommissioning New WTGs - 2053

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling					2.1666	0.0000	2.1666	0.2848	0.0000	0.2848			0.0000			0.0000
Vendor					0.2994	0.0000	0.2994	0.0310	0.0000	0.0310			0.0000			0.0000
Worker					17.6235	0.0000	17.6235	1.8219	0.0000	1.8219			0.0000			0.0000
Total					**20.0895**	**0.0000**	**20.0895**	**2.1377**	**0.0000**	**2.1377**			**0.0000**			**0.0000**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					
Mitigated	0.1433	1.4176	1.7947	7.3600e-003	48.6764	5.1700e-003	48.6816	4.9266	4.8600e-003	4.9314		755.0056	755.0056	0.0480		756.2058
Unmitigated	0.1433	1.4176	1.7947	7.3600e-003	48.6764	5.1700e-003	48.6816	4.9266	4.8600e-003	4.9314		755.0056	755.0056	0.0480		756.2058

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Manufacturing	65.00	65.00	65.00	235,792	235,792
Total	65.00	65.00	65.00	235,792	235,792

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Manufacturing	13.80	6.20	6.20	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Manufacturing	0.490441	0.036099	0.183975	0.121725	0.015214	0.005252	0.022424	0.112230	0.002972	0.001873	0.006187	0.000783	0.000825

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Manufacturing	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Manufacturing	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0124	1.2100e-003	0.1329	1.0000e-005		4.7000e-004	4.7000e-004		4.7000e-004	4.7000e-004		0.2845	0.2845	7.5000e-004		0.3033
Unmitigated	0.0124	1.2100e-003	0.1329	1.0000e-005		4.7000e-004	4.7000e-004		4.7000e-004	4.7000e-004		0.2845	0.2845	7.5000e-004		0.3033

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0124	1.2100e-003	0.1329	1.0000e-005		4.7000e-004	4.7000e-004		4.7000e-004	4.7000e-004		0.2845	0.2845	7.5000e-004		0.3033
Total	**0.0124**	**1.2100e-003**	**0.1329**	**1.0000e-005**		**4.7000e-004**	**4.7000e-004**		**4.7000e-004**	**4.7000e-004**		**0.2845**	**0.2845**	**7.5000e-004**		**0.3033**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0124	1.2100e-003	0.1329	1.0000e-005		4.7000e-004	4.7000e-004		4.7000e-004	4.7000e-004		0.2845	0.2845	7.5000e-004		0.3033
Total	**0.0124**	**1.2100e-003**	**0.1329**	**1.0000e-005**		**4.7000e-004**	**4.7000e-004**		**4.7000e-004**	**4.7000e-004**		**0.2845**	**0.2845**	**7.5000e-004**		**0.3033**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

APPENDIX C-1

Biological Resources Technical Report

Biological Resources Technical Report
Mesa Wind Project Repower

Prepared for:

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October 2020

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Biological Resources Technical Report: Mesa Wind Energy Project

Aspen Environmental Group
October 2020

1.0 Introduction

This report presents the methods and results of focused surveys for desert tortoise and special-status plants in 2019, as well as biological surveys conducted between 2012 and 2017, at the proposed Mesa Wind Energy Project site, located on Bureau of Land Management (BLM) land in unincorporated Riverside County, California (Figure 1). This report provides baseline information on biological resources to support the BLM's environmental review of the proposed project.

1.1 Project Description

Mesa Wind Power Corporation (Mesa Corp), a subsidiary of Brookfield Renewable Energy (Brookfield), proposes to repower the existing Mesa Wind Project by replacing and upgrading wind energy generation equipment and facilities. The proposed project is summarized here and described in detail in the project Plan of Development.

The existing Mesa Wind project has a disturbance area of about 40 acres (including access roads, pad sites for wind turbine generators (WTGs), and operations and maintenance (O&M) facilities.

The repowering of Mesa Wind would remove the approximately 460 legacy turbines (129 that are still in operation) and install 11 new WTGs with a total power production of 30 megawatts (MW). The new WTGs would be entirely within the existing BLM right of way (ROW). Maximum rotor height of the proposed new WTGs would be 150 meters (492 feet). Figure 1 shows the ROW, proposed disturbance areas, and WTG locations. Figure 2 shows existing legacy turbine locations. The construction required to repower Mesa Wind would temporarily disturb part of the ROW for WTG work areas, laydown area, and temporary access roads, and permanently disturb a smaller area for new WTG foundations and slightly wider existing on-site roads. Part of the planned disturbance area are currently disturbed by the existing wind project, such as access roads and work areas. The O&M building would remain in the same location. The substation would remain in the same location but would require upgrades and potentially an expanded fenceline. Final disturbance acreage will be quantified in the project's Environmental Assessment and Initial Study / Mitigated Negative Declaration.

Currently, almost 90,000 feet (17 miles) of roadway are located on the site. During the repower, approximately 62,000 feet (11.7 miles) of roadway would be removed and reclaimed by scarifying the compacted road bed and planting native seeds during the appropriate season. Because the roads would be used at a later date to remove the legacy turbine foundations, major grading or moving of rocks would not occur. Approximately 28,000 feet (5.3 miles) of existing on-site roadway would be graded and widened to accommodate new WTG transport, and 4,100 feet (0.78 mile) of new access road would be constructed to the new WTG pads.

1.2 Project Location

The project site is located in the San Gorgonio Pass on public lands managed by the BLM. It is west of the Whitewater River and east of Cottonwood Creek, shown on the White Water USGS 7.5-minute topographic quad. The nearest proposed new WTG site and nearest existing legacy turbine are both approximately 0.5 miles west of the active Whitewater River channel. Elevation of the project area ranges from approximately 2,250 feet at the western site boundary to approximately 2,900 feet at the northeastern corner.

Most surrounding lands are natural open space, with the exception of an adjacent parcel to the southeast that is also in use for wind energy production. Nearby communities include the neighborhood accessed from Haugen-Lehmann Way, southwest of the site; the community of Bonnie Bell to the east; the community of Whitewater to the southeast; and the unincorporated community of Snow Creek, located 3.3 miles south of the Project site.

The Mesa Wind Project site is located on public lands managed by BLM, according to several applicable planning documents:

- California Desert Conservation Area (CDCA) Plan (BLM 1980, as amended)
- Northern and Eastern Colorado Desert Coordinated Management Plan (BLM 2002a, as amended)
- CDCA Coachella Valley Plan Amendment (BLM, 2002b)
- Desert Renewable Energy and Conservation Plan LUPA (BLM, 2016)

Part of the Project site is within the Whitewater River Area of Critical Environmental Concern (ACEC) and the Sand to Snow National Monument lands are adjacent to the Project site at the north, west, and east (Figure 3). The DRECP LUPA specifically allows for wind energy repowers within ACECs and Special Recreation Management Areas (SRMAs) if the repower project remains within the existing approved wind energy ROW and reduces environmental impacts.

The site is within the Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP) boundaries (CVAG 2007). The CVMSHCP includes mapped "modeled habitat" for certain covered species. Modeled habitat for the following three species is located within the Mesa Wind Project Area:

- Coachella Valley milk-vetch: 4.03 acre (of 41,098 acres of modeled habitat in the MSHCP area)
- Coachella Valley Jerusalem cricket: 4.03 acre (of 27,446 acres of modeled habitat in the MSHCP area)
- Desert tortoise: 401.25 acres (i.e., the entire ROW; of 587,926 acres of modeled habitat in the MSHCP area)

The CVMSHCP identifies several Conservation Areas within its coverage area. The western portion of the Mesa Wind site is within the Stubbe and Cottonwood Canyons Conservation Area, and the eastern area of the site is within the Whitewater Canyon Conservation Area of the CVMSHCP. For projects located on private lands within the MSHCP area, the CVMSHCP provides state and federal Endangered Species Act coverage for several listed species as well as mitigation coverage for multiple other special-status plants and animals. However, the BLM is not a permittee under the CVMSHCP and therefore the project would not be eligible for listed species take coverage under the CVMSHCP.

2.0 Methods

This Biological Resources Technical Report (BRTR) incorporates the results of biological surveys and literature review conducted between 2013 and 2019. Table 1 summarizes the surveys that have been conducted for the Mesa Wind Energy Project.

Table 1. Biological Surveys Conducted for the Mesa Wind Repower Project 2013-2019

Survey/Study	Dates	Survey Area	Reference
General reconnaissance surveys	April 9, 10, and 18, 2013	Entire site	This BRTR
Vegetation mapping	April 9, 10, and 18, 2013	Entire site	This BRTR
Focused botanical surveys	April 9, 10, and 18, 2013 (below average rainfall) May 24, 30, and 31, 2019 (above average rainfall)	Entire site	This BRTR
Bird use count surveys	Fall: September 15 to December 15, 2012 Spring: February 1 to April 15, 2013 Winter: December 16, 2012 to January 31, 2013 Summer: April 16, 2013 to August 31, 2013	Three observation points within the site representing 6 survey areas	Bloom Biological Inc. 2013a
Small bird count surveys	Fall: September 15 to October 31, 2012 Spring: March 1 to May 9, 2013 Winter: December 15, 2012 to February 15, 2013 Summer: May 10 to June 10, 2013	13 survey stations within the site	Bloom Biological Inc. 2013a
Special-status bird surveys	1-2 times per month between September 2012 through August 2013	All areas within 300 feet (100 meters) of all current and proposed Project-related roads and structures, including the main access road, beginning at the west gate and facilities building	Bloom Biological Inc. 2013a
Golden eagle use and fatality prediction analysis	Golden eagle observations made concurrently with all surveys in 2012-2013, 2015-2016, and incidental observations reported from the site.	Entire site	Bloom Biological Inc. 2013a Bloom Biological Inc. 2020 WEST 2020
Golden eagle nest surveys	2013 and June 2019	10-mile radius surrounding site	Bloom Biological Inc. 2013a Bloom Biological Inc. 2013b WEST 2016
Large bird use surveys	Weekly between November 2015 and November 2016.	Three fixed-point survey stations selected to provide 100% visual coverage of all proposed turbine locations within the site	WEST 2017

Table 1. Biological Surveys Conducted for the Mesa Wind Repower Project 2013-2019

Survey/Study	Dates	Survey Area	Reference
Bat activity surveys	June 28, 2016 through October 1, 2017	Acoustic monitoring sensors affixed to two meteorological (met) towers located in desert scrub land cover types representative of potential turbine locations.	WEST 2018

2.1 Literature Review

Prior to field surveys, Aspen biologists reviewed available literature to identify special-status biological resources known from the vicinity. The literature and databases listed below were reviewed.

- CNDDB (CDFW 2019a) for the following 7.5-minute USGS topographic quads: Cabazon, Catclaw Flat, Desert Hot Springs, Lake Fulmor, Morongo Valley, Palm Springs, San Gorgonio Mountain, San Jacinto Peak, and White Water;
- CNPS Electronic Inventory of Rare and Endangered Vascular Plants of California (CNPS 2019), for the same topographic quads;
- Coachella Valley Multiple Species Habitat Conservation Plan (CVAG 2007);
- List of California BLM Sensitive Animals and Plant Species (BLM 2014; 2012); and
- Environmental documents previously prepared for earlier repower proposals on the Mesa Wind site including the Biological Opinion (USFWS 2009a), and the general biological resources report prepared by Natural Resource Associates Inc. (NRA Inc. 2008).

In addition, Aspen discussed prior wildlife observations with on-site operations manager Rowland Griese. Those observations are included in the text discussions of desert tortoise, golden eagle, and desert bighorn sheep.

2.2 Field Surveys

2.2.1 Reconnaissance Wildlife and Botanical Surveys (2013)

Field surveys in 2013 covered a study area of approximately 85 acres, including then-proposed temporary and permanent disturbance areas and access roads. Surveys consisted of walking controlled-intuitive transects (according to BLM 2009) throughout all proposed permanent and temporary impact areas as then proposed within the study area.

All plant and wildlife species noted were recorded in field notes. All plant species observed were identified in the field or collected for later identification. Plants were identified using keys, descriptions, and illustrations in regional references such as Baldwin et al. (2002; 2012). All species noted in the study area are included in the attached species list (Attachment 4). In conformance with California Department of Fish and Wildlife (CDFW) guidelines (CDFG 2009) and (BLM 2009), surveys (a) were conducted during flowering seasons for the special-status plants known from the area, (b) were floristic in nature, (c) were consistent with conservation ethics, (d) systematically covered all habitat types on the ROW, and (e) were well documented, by this report and by voucher specimens to be deposited at Rancho Santa Ana Botanic Garden.

Rainfall: Average annual precipitation recorded at the Cabazon weather station (Station No. 041250), located approximately 5.5 miles west of the study area, is 15.72 inches (39.9 cm; WRCC 2013). Annual precipitation from the 2012-2013 rainfall year (July 1 through June 30) at the Cabazon weather station was 5.17 inches (13.13 cm; WRCC 2013). Due to low rainfall during the 2012-13 season, certain herbaceous plants, potentially including special-status plants, may not have been evident during the 2013 botanical surveys.

2.2.2 Focused Desert Tortoise and Botanical Surveys (2019)

Focused concurrent field surveys during 2019 provided 100 percent visual coverage of all safely accessible areas within the field survey coverage area (see Figure 4), conducted by walking along parallel transects at 10-meter intervals. The survey dates, field team, and weather conditions for each date are listed in Table 2. During the field surveys, all plant and wildlife species noted were recorded in field notes and sensitive species locations were recorded using hand-held GPS units.

Table 2. 2019 Focused Survey Dates and Team

				Weather Conditions**					
		Time		Temp (°F)		Winds (mph)		Cloud Cover	
Date	Biologist*	Start	End	Start	End	Start	End	Start	End
10-Apr	AD, BL, JA, JW, SL	845	1500	60	76	8-10	8-10	Clear	Clear
16-Apr	AD, BL, JA, SL	630	1245	48	54	14-17	30-40	80%	Clear
17-Apr	AD, BL, JA, SL	700	1400	50	77	3-5	13-16	Clear	Clear
23-Apr	AD, BL, JA, SL	630	1400	53	92	2-4	4-7	Clear	Clear
25-Apr	AD, BL, JA, SL	630	1400	71	84	8-12	2-4	Clear	Clear
10-May	AD, BL, GS, JA	630	1400	71	84	8-12	2-4	Clear	Clear

*Temperature and wind speed measured with Kestrel 3000.
**AD= Adam DeLuna, BL= Brian Leatherman, GS= Greg Stratton JA= Jacob Aragon, JW= Justin Wood, SL= Sandy Leatherman. Resumes for the survey team are provided in Attachment 7.

The field surveys conformed to full coverage desert tortoise protocol surveys (USFWS 2010a). All tortoise sign (e.g., live tortoises, burrows/pallets, tracks, scat, or other indication of current or previous tortoise occurrence) observed was recorded. The condition of burrows was categorized according to the following class designations (USFWS 2009b):

- Class 1. Currently active, with desert tortoise or recent desert tortoise sign;
- Class 2. Good condition (no evidence of recent use), definitely desert tortoise;
- Class 3. Deteriorated condition (including collapsed burrows), definitely desert tortoise;
- Class 4. Good condition - possibly desert tortoise; and
- Class 5. Deteriorated condition (including collapsed burrows), possibly desert tortoise.

Lovich and Daniels (2000) have reported that desert tortoises excavate or occupy burrows beneath concrete foundations at the Mesa Wind site. Most of the legacy turbines, as well as electrical boxes or other infrastructure, are supported by concrete slab foundations allowing for burrow construction beneath them. Some of the legacy turbines are built on deep concrete pier foundations where there is no accessible soil for burrow excavation. In addition to the parallel transects, each concrete foundation on the site was inspected by Jacob Aragon for potential desert tortoise burrows. A total of 441 concrete foundations were inspected; 347 of these supported active or inactive legacy turbines or supported lattice steel structures without turbines. The other 94 foundations either supported electrical infrastructure or were no longer in use (such as former turbine foundations where the lattice structure was no longer present).

The project switchyard and adjacent SCE substation are fenced and were not accessed or inspected. Similarly, foundations within a fenced microwave station located on a hilltop within the project site, but not part of the Mesa Wind Project Repower, were not accessed, although no potential tortoise burrows were visible from outside the fence.

The botanical surveys conformed to the complete coverage method as described in the Survey Protocols for Special Status Plants which has been developed by BLM-California (BLM 2009b). This method was developed to survey for special status plants on projects that must comply with BLM policy, the National Environmental Policy Act (NEPA), and the Endangered Species Act (ESA). As described above, botanical surveys were also conducted in conformance with California Department of Fish and Wildlife guidelines (CDFG 2009). Plants of uncertain identity were collected and identified later using keys, descriptions, and illustrations in Baldwin et al. (2012), the Jepson eFlora database of California plants (Jepson Flora Project 2018), and other regional references. All plant species observed during the surveys are listed in Attachment 4.

Rainfall: Rainfall during 2018-2019 rainy season was above average at 18.53 inches (47.07 cm; WRCC 2019). Due to the above-average rainfall during the 2018-19 season and widely-reported exceptional flowering season ("superbloom"), the 2019 survey results fulfill the BLM's requirements for complete spring-season botanical surveys (confirmed via email 19 Mar 2019).

2.2.3 Vegetation

Vegetation maps were prepared by drawing tentative vegetation-type boundaries onto high-resolution aerial images during the 2013 site visits, then digitizing these boundaries into GIS, and confirming the mapping on a subsequent 2013 site visit by Justin Wood. The 2013 polygons were reviewed and updated by Wood in 2019.

Vegetation in the study area was difficult to distinguish on aerial images due to homogeneous vegetation structure throughout much of the site. The smallest mapping unit was approximately 0.25 acre; GIS data for most mapped vegetation boundaries is accurate to within 3 feet. Any vegetation map is subject to imprecision for several reasons:

- Vegetation types tend to intergrade on the landscape so that there are no true boundaries in the vegetation itself. In these cases, a mapped boundary represents best professional judgment.
- Vegetation types as they are named and described tend to intergrade; that is, a given stand of real-world vegetation may not fit into any named type in the classification scheme used. Thus, a mapped and labeled polygon is given the best name available in the classification, but this name does not imply that the vegetation unambiguously matches its mapped name.
- Vegetation tends to be patchy. Small patches of one named type are often included within mapped polygons of another type. The size of these patches varies, depending on the minimum mapping units and scale of available aerial imagery.
- Photo interpretation of some types is difficult, such as distinguishing brittlebush scrub from California sagebrush-California buckwheat scrub.

Invasive plants. Several non-native and invasive plants species were common throughout the site, particularly several species in the mustard family (e.g., Sahara mustard, shortpod mustard) and grass family (e.g., slender wild-oat, red brome, cheatgrass, and Mediterranean schismus). They tended to be most common at the upstream side of culverts or other sites that may briefly impound storm flows. All non-native species are indicated by an asterisk in Attachment 4 (Species List).

2.2.4 Avian Surveys

Bird surveys were conducted by Bloom Biological Inc. (BBI), including bird use counts (long-period point counts, principally for golden eagles and other raptors), small bird counts (structured point count surveys), and special-status bird surveys (repeated meandering transects throughout the site). Study designs were based on pre-permitting assessment criteria for biological resources as recommended in the U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines (USFWS 2012). BBI conducted field surveys from September 2012 through August 2013 to evaluate the abundance, diversity, and patterns of use of birds and other vertebrates on and in proximity to the proposed project site across seasons. Detailed methodology is described in the *Mesa Wind Project 2012-2013 Final Avian Survey Report* (BBI 2013a).

Additional avian surveys were conducted by Western Ecosystems Technology, Inc. (WEST) between November 2015 and November 2016. These surveys focused on large birds and eagles. The principal objectives of the large bird/eagle observation surveys were: 1) to provide site-specific avian resource and use data that would be useful in evaluating potential impacts of the proposed Project on diurnal raptors and other large bird groups; and 2) to collect data to evaluate the temporal and spatial use of the Mesa site specifically by golden eagles to support development of an Eagle Conservation Plan for the Project, if deemed warranted. Weekly fixed-point large bird/eagle surveys were conducted at three surveys stations located throughout the Project from November 13, 2015, through November 7, 2016. Detailed methodology is described in *Large Bird Use Surveys for the Mesa Wind Energy Repower Project, Riverside County, California Final Report* (WEST 2017).

A compilation of known golden eagle nests within a 10-mile radius of the Project site was prepared in coordination with USFWS and BBI (see Figure 5). Field surveys to identify golden eagle nesting activity were conducted during June 2019 by BBI, using a combination of helicopter surveys and the Palm Springs Aerial Tram.

Special-status species observed during all avian surveys are included in Table 4. See Attachment 4 for a complete list of all species observed on the site.

2.2.5 Bat Activity Surveys

Bat acoustic surveys were conducted at the Mesa Wind site to estimate levels of bat activity throughout the year. Acoustic surveys were conducted between June 28, 2016, and October 1, 2017, at two meteorological (met) towers located in desert scrub land cover types representative of potential turbine locations (see Figure 6). AnaBat™ SD1 and SD2 detectors were paired at each met tower, with one placed near the ground at 1.5 meters (five feet) and one elevated to 45 meters (148 feet) above ground level. The raised detector was placed to sample bat activity near the potential rotor-swept zone (Rintz et al. 2018). Special-status bats detected during acoustic surveys are included in Table 4. See Attachment 4 for a complete list of all species observed on the site.

3.0 Results

Based upon review of the literature, databases, and field surveys identified above, Aspen biologist Justin Wood compiled a list of special-status species that are present or may be found in the project vicinity. Plant and wildlife species classified as one or more of the following are considered special-status species in this report:

- Listed, proposed for listing, or candidates for listing as threatened or endangered under the federal Endangered Species Act (ESA);

- Listed as threatened or endangered, or candidates for listing under the California Endangered Species Act (CESA);
- Designated by BLM as Sensitive Plants, "all plant species that are currently on List 1B of the CNPS Inventory of Rare and Endangered Plants of California, are BLM sensitive species, along with others that have been designated by the California State Director" (BLM 2012; note that the CNPS Lists are now known as California Rare Plant Ranks, or CRPR);
- Designated by BLM as a Sensitive Animal or Plant;
- Plants listed as rare under the California Native Plant Protection Act;
- Meet the definition of rare or endangered under CEQA § 15380 (b) and (d);
- Considered special-status species in local or regional plans, policies, or regulations.

Three of the 7.5-minute USGS topographic quads (Lake Fulmor, San Gorgonio Mountain, and San Jacinto Peak) represent much higher elevations and very different habitats than those present on the project site, and CNDDB contains numerous records of special-status species from those quads that have no potential for occurrence in the study area. Therefore, these three quads were excluded from this report. Many of the special-status species identified in the remaining six quads are found only in specialized native habitats (e.g., wetlands, riparian, or high elevation mountains) that are not present in the project vicinity. These plants and animals are listed in Table 3 but are not addressed further in this report. Table 4 lists all special-status plants and animals known from comparable habitats within the region and summarizes their habitat, distribution, conservation status, and probability of occurrence on the site (based on geographic and elevational ranges, habitat conditions, and proximity to known locations).

Table 3. Special Status Species Not Addressed[1]

Latin Name	Common Name	Reason for Exclusion
PLANTS		
Allium marvinii	Yucaipa onion	No suitable clay soils present.
Almutaster pauciflorus	Alkali marsh aster	No suitable alkali meadow or seep habitat
Astragalus pachypus var. *jaegeri*	Jaeger's milk-vetch	East of geographic range.
Atriplex parishii	Parish's brittlescale	No suitable alkali playa or chenopod scrub habitat.
Boechera lincolnensis (*Arabis pulchra* var. *munciensis)*	Lincoln rockcress	No suitable carbonate soils; below elevational range.
Boechera parishii	Parish's rockcress	Below elevational range.
Calochortus palmeri var. palmeri	Palmer's mariposa-lily	No suitable meadow habitat.
Calochortus plummerae	Plummer's mariposa lily	East of geographic range.
Caulanthus simulans	Payson's jewel-flower	Well outside of known geographic range.
Chamaesyce arizonica (Euphorbia arizonica)	Arizona spurge	Outside of known range; no suitable sand flat habitat present.
Deinandra mohavensis	Mojave tarplant	Well outside of known range; no suitable chaparral habitat present.
Dodecahema leptoceras	Slender-horned spineflower	No suitable mature alluvial bench habitat.
Eriastrum harwoodii	Harwood's eriastrum	No suitable dune or stabilized windblown sand habitat.
Heuchera hirsutissima	Shaggy-haired alumroot	Below elevational range.
Heuchera parishii	Parish's alumroot	Below elevational range.
Horkelia cuneata var. puberula	Mesa horkelia	Well outside known geographic range.

Table 3. Special Status Species Not Addressed[1]

Latin Name	Common Name	Reason for Exclusion
Imperata brevifolia	California satintail	No suitable meadow or riparian habitat.
Ivesia argyrocoma var. argyrocoma	Silver-haired ivesia	Below elevational range.
Lilium parryi	Lemon lily	Below elevational range.
Linanthus jaegeri	San Jacinto linanthus	Below elevational range.
Linanthus orcutti	Orcutt's linanthus	East of geographic range.
Monardella robisonii	Robison's monardella	Well outside known geographic range.
Nemacaulis denudata var. gracilis	Slender cottonheads	No suitable aeolian sand habitat present.
Petalonyx linearis	Narrow-leaf sandpaper-plant	Well to west of extant geographic range.
Silene krantzii	Krantz's catchfly	Well below elevation range.
Stemodia durantifolia	Purple stemodia	No suitable wetland habitat present.
Streptanthus campestris	Southern jewel-flower	Well outside known geographic range.
Symphyotrichum defoliatum	San Bernardino aster	No suitable meadow or riparian habitat.
Thelypteris puberula var. sonorensis	Sonoran maiden fern	No suitable wetland habitat present.
Xylorhiza cognate	Mecca-aster	Well outside known geographic range.
INVERTEBRATES		
Bombus caliginosus	Obscure bumble bee	Outside of geographic range (Santa Barbara Co. and north). Historic record from Strawberry Valley is doubtful.
Calileptoneta oasa	Andreas Canyon leptonetid spider	Outside known geographic range (known from a single location near Palm Springs).
Dinacoma caseyi	Casey's June beetle	Outside known geographic range; no suitable alluvial silt deposits in project disturbance area.
Macrobaenetes valgum	Coachella giant sand treader cricket	No suitable aeolian sand habitat present.
AMPHIBIANS		
Anaxyrus californicus (Bufo californicus, Bufo microscaphus californicus)[2]	Arroyo toad	No suitable wash habitat with seasonal intermittent stream flows present.
Ensatina eschscholtzii klauberi	Large-blotched salamander	No suitable seep or mesic forest understory habitat.
Rana draytonii[3]	California red-legged frog	No suitable aquatic habitat present.
Rana muscosa[4]	Sierra Madre yellow-legged frog	No suitable aquatic habitat present.
REPTILES		
Aspidoscelis tigris stejnegeri	Coastal whiptail	East of the geographic range (the common desert subspecies occurs on site)
Phrynosoma mcallii	Flat-tailed horned lizard	No suitable aeolian sand habitat present.
Thamnophis hammondii	Two-striped garter snake	No suitable aquatic habitat present.
Uma inornata	Coachella Valley fringe-toed lizard	No suitable aeolian sand habitat present.
BIRDS		
Icteria virens	Yellow-breasted chat	No suitable riparian vegetation present.
Myiarchus tyrannulus	Brown-crested flycatcher	No suitable desert woodland or riparian vegetation present.
Piranga rubra	Summer tanager	No suitable riparian vegetation present.
Progne subis	Purple martin	No suitable woodland or forest habitat present.
Pyrocephalus rubinus	Vermilion flycatcher	No suitable riparian vegetation present.

Table 3. Special Status Species Not Addressed[1]

Latin Name	Common Name	Reason for Exclusion
Toxostoma crissale	Crissal thrasher	Outside known geographic range; minimal habitat present.
MAMMALS		
Chaetodipus fallax fallax	Northwestern San Diego pocket mouse	East of geographic range (desert subspecies is addressed in Table 4).
Dipodomys merriami parvus	San Bernardino kangaroo rat	Outside geographic range (San Bernardino and San Jacinto Valleys); no suitable alluvial wash habitat.
Ovis canadensis nelsoni (distinct population segment)	Peninsular bighorn sheep	Geographically restricted to the Peninsular Ranges, south of Interstate 10.
Perognathus longimembris bangsi	Palm Springs pocket mouse	West of geographic range.
Xerospermophilus tereticaudus chlorus	Palm Springs round-tailed ground squirrel	No suitable sand flat or mesquite habitats; restricted to the Coachella Valley.

1. Special status species reported from the region, but not addressed in this report due to habitat or geographic range.
2. Arroyo toad has been reported from the Whitewater River; that record has since been revised due to mis-identification (Ervin et al. 2013).
3. California red-legged frog occurs upstream at the former Whitewater Trout Farm about 2.5 miles north of the Project site.
4. There are no extant or historic reports of mountain yellow-legged from the Whitewater River watershed. Almost all perennial streams in the San Bernardino, San Gabriel, and San Jacinto Mountains are identified as suitable habitat as potential sites for re-introduction.

Table 4. Special-status Species of the Cabazon/Whitewater Area

Species Name	Habitat Requirements	Flowering or Activity Season	Conservation Status	Potential to Occur
PLANTS				
Abronia villosa var. *aurita* Chaparral sand verbena	Annual or perennial herb; sand, about 250-5300 ft. elev.; San Jacinto Mtns, Inland Empire, adj. Colorado Des, Orange & San Diego cos; mostly alluvial fans and benches in w Riverside Co; dunes in deserts.	Feb–Jul	Fed ESA: none BLM: sensitive CA: S2, 1B.1	Minimal; no suitable habitat on site; not seen during surveys.
Acmispon haydonii (Lotus haydonii) Pygmy lotus	Perennial herb; rocky, pinyon and juniper woodland, Sonoran Desert scrub; 1700-3940 ft. elev.; SE Peninsular ranges, SW Sonoran Desert, Baja California	Jan–Jun	Fed ESA: none BLM: sensitive CA: S3, 1B.3	Low; potentially suitable habitat; at margin of known range; not seen during surveys.
Ambrosia monogyra (Hymenoclea monogyra) Singlewhorl burrobush	Shrub or small tree; desert and inland cismontane flats, washes, alluvial fans; below about 1700 ft. elev.; San Bernardino Valley; San Diego Co., east to Texas and mainland Mexico	Aug–Nov	Fed ESA: none BLM: none CA: S2, 2B.2	Minimal; no suitable habitat on site; not seen during surveys.
Astragalus lentiginosus var*. coachellae* Coachella Valley milk-vetch	Annual or perennial herb; open sand, gen. dunes but also wash margins; below about 2200 ft. elev.; endemic to Coachella Valley. 4.03 ac of CVMSHCP modeled habitat in ROW but outside disturbance area	Feb. - May	Fed: END BLM: sensitive, Calif: S1 CRPR: 1B.2 MSHCP: covered	Low; not found during protocol field survey 2019; suitable habitat present but disjunct from aeolian sand in Coachella Valley

Table 4. Special-status Species of the Cabazon/Whitewater Area

Species Name	Habitat Requirements	Flowering or Activity Season	Conservation Status	Potential to Occur
Astragalus tricarinatus Triple-ribbed milk-vetch	Perennial herb; exposed rocky slopes, canyon walls, alluvial fans; Whitewater Canyon, Mission Creek, and Morongo Canyon areas; ±1500 to 5000 ft. elev.	Feb–May	Fed ESA: END BLM: sensitive CA: S2, 1B.2 MSHCP: covered	Low; potentially suitable habitat present but not observed; known from within one mile to the east.
Ayenia compacta California ayenia	Perennial herb; desert shrubland, gen. rocky sites, washes and mountain slopes below about 3600 ft. elev.; W low desert margins, Chuckwalla Valley, and E Mojave.	Mar–Apr	Fed ESA: none BLM: none CA: S3, 2B.3	Low; suitable habitat; not observed; at western margin of the known range.
Chorizanthe parryi var. *parryi* Parry's spineflower	Annual; shrublands; open sandy places on alluvial slopes below about 5600 ft. elev.; Inland Empire and also coastal LA Co., Banning Pass, Cajon Pass	Apr–Jun	Fed ESA: none BLM: sensitive CA: S2, 1B.1	Low; suitable habitat present; not observed; known from within one mile of the site.
Chorizanthe xanti var. *leucotheca* White-bracted spineflower	Annual; sandy soil, desert shrubland, pinyon-juniper woodland, about 1000-4000 ft. elev.; Mountains and foothills, Cajon Pass and Banning Pass areas; also reported from Liebre Mtns.	Apr-Jun	Fed ESA: none BLM: sensitive CA: S3, 1B.2	Low; minimal suitable habitat on site; not seen during surveys. known from within one mile of the site.
Euphorbia misera Cliff spurge	Low shrub; coastal bluffs (Orange and San Diego cos) and rocky desert slopes (Whitewater area, Riv. Co.), below about 1700 ft. elev.	Jan–Aug	Fed ESA: none BLM: none CA: S2, 2B.2	Minimal; marginal habitat; not observed; known from a single location east of Whitewater Canyon.
Linanthus maculatus subsp. *maculatus* (*Gilia maculata*) Little San Bernardino Mountains linanthus	Annual; sandy washes or dunes in desert shrubland habitats; Whitewater Cyn. through Joshua Tree Natl. Park; about 600–6800 ft. elev.	Mar–May	Fed ESA: none BLM: sensitive CA: S2, 1B.2 MSHCP: covered	Minimal; no suitable habitat on site; not seen during surveys; margin of the range.
Mentzelia tricuspis Spiny-hair blazing star	Annual; sandy or gravelly soil (exposed consolidated alluvial deposits), slopes and washes, Mojave desert scrub; 500-4200 ft. elev.; desert mts, east Sonoran Desert, to Utah, Arizona	Mar – May	Fed ESA: none BLM: none CA: S2, 2B.1	Low; marginal habitat; not observed; recent specimens from Whitewater and San Gorgonio within ca. 1 mile of site.
Penstemon pseudospectabilis subsp. *pseudospectabilis* Desert beardtongue	Perennial herb; sandy washes and rocky slopes in canyons; about 300-6400 ft. elev.; scattered locations, Mojave and Colo. Deserts in California and Arizona	Jan–May	Fed ESA: none BLM: none CA: S3, 2B.2	Low; suitable habitat; not detected; recent record from 4 miles south in Snow Creek.
Saltugilia latimeri (segr. from *Gilia [Saltugilia] australis*) Latimer's woodland gilia	Annual; chaparral and desert shrublands, arid mountains and foothills; about 1300-6200 ft. elev.; desert margins, Riv. Co to Inyo Co	Mar–June	Fed ESA: none BLM: sensitive CA: S3, 1B.2	Low; suitable habitat present; not detected during surveys.
Selaginella eremophila Desert spike-moss	Perennial herb; mountainous or hillside rock outcrops and crevices, about 600–3000 ft. elev.; lower desert-facing slopes of San Jacinto Mtns and adj. desert, to Texas and Baja	n/a	Fed ESA: none BLM: none CA: S3, 2B.2	Low; suitable habitat; not observed; margin of geographic range.

Table 4. Special-status Species of the Cabazon/Whitewater Area

Species Name	Habitat Requirements	Flowering or Activity Season	Conservation Status	Potential to Occur
INVERTEBRATES				
Bombus crotchii Crotch bumble bee	Colonial insect; open grassland and scrub; underground colonies, often in old rodent burrows. Many food plants including *Chaenactis, Lupinus, Phacelia, Salvia*, and *Eriogonum*. Much of southern and central CA, SW Nevada and Baja.	Spring - summer	Fed ESA: none BLM: none CA: S1S2	Moderate; suitable habitat and food plants present; historical records from within 5 miles.
Eremarionta morongoana Morongo (=Colorado) desertsnail	Terrestrial gastropod mollusk; found under rocks, sandy/gravelly washes; known only from a gulch on the north side of Morongo Pass, San Bernardino County, near Riverside County line.	Unknown	Fed ESA: none BLM: none CA: S1	Low (Cottonwood Creek only); suitable habitat; known from a single location 15 miles to the northeast.
Parnopes borregoensis Borrego parnopes cuckoo wasp	Chrysidid wasp; endemic to California; Sonoran and Mojave Deserts; desert scrub, creosotebush scrub, yucca and cholla cactus, saltbush, and desert dune communities	Unknown	Fed ESA: none BLM: none CA: S1S2	Low; suitable habitat; known from very few locations including one 15 miles to the northeast.
Stenopelmatus cahuilaensis Coachella Valley Jerusalem cricket	Open sand, gen. dunes and sandy/gravelly soils, endemic to Coachella Valley. 4.03 ac of CVMSHCP modeled habitat in ROW but outside disturbance area; site is outside mapped current distribution polygon (CVCC 2014)	Primarily winter (dependent on humidity and soil moisture)	Fed ESA: none BLM: none CA: S1S2 MSHCP: covered	Low. Modeled habitat present, although disjunct from similar aeolian sand within the Coachella Valley and outside the current distribution
REPTILES				
Anniella pulchra pulchra Silvery legless lizard	Mtns and valleys, Bay Area to N Baja (excluding desert); shrublands and woodlands, loose soils and leaf litter, below about 6500 ft. elev.	Spring–Fall	Fed ESA: none BLM: none CA: S3S4, SC	Low; suitable habitat; not observed; known from just west of project.
Aspidoscelis hyperythra (Cnemidophorus hyperythra) Orangethroat whiptail	Open coastal sage scrub, chaparral; SW California to S Baja, most populations in Riverside and San Diego Cos.; sea level to about 3000 ft. elev.	Spring–Summer	Fed ESA: none BLM: none CA: S2S3	Low; suitable habitat; not observed; one observation from Whitewater canyon
Crotalus ruber Red diamond rattlesnake	Chaparral, woodland, desert, rocky areas and dense vegetation; coastal San Diego Co. to E. slopes of the Peninsular range and north thru W. Riverside Co. into S. San Bernardino Co.; sea level to about 3000 ft. elev.	Mid-Spring–Mid-Fall	Fed ESA: none BLM: none CA: S3, SC	Moderate; suitable habitat; not observed; known from numerous collections in Whitewater Canyon.
Gopherus agassizii (Xerobates agassizi) Desert tortoise	Desert shrublands where soil suitable for burrows; Mojave and Sonoran des. (E Calif., S Nevada, W Ariz., and Sonora, Mexico)	Spring–Summer	Fed ESA: THR BLM: sensitive CA: THR, S2S3 MSHCP: covered	Present; sign observed in 2013 and 2019; animals observed in 2019.
Phrynosoma blainvillii (Phrynosoma coronatum blainvillii) Coast horned lizard	Forest, shrubland or grassland; sandy soils; W Calif. from LA Co S through N Baja Calif., below about 6000 ft. elev.	Spring–Summer	Fed ESA: none BLM: sensitive CA: S3S4, SC	Present; suitable habitat throughout; at margin of range.

Table 4. Special-status Species of the Cabazon/Whitewater Area

Species Name	Habitat Requirements	Flowering or Activity Season	Conservation Status	Potential to Occur
BIRDS				
Accipiter striatus Sharp-shinned hawk	Nests in forest and woodland, hunts in woods and open areas; breeds in Sierra Nevada and N, winters through US & Cent. Amer.	Winter	Fed ESA: none BLM: none CA: S4 (nesting)	Nesting: minimal Winter/Migration: present
Accipiter cooperii Cooper's hawk	Nests in forest and woodland, hunts in woods and open areas; breeds through most of US, winters south through Mexico	Year-around	Fed ESA: none BLM: none CA: S4 (nesting)	Nesting: minimal Winter/Migration: present
Aimophila ruficeps canescens Southern California rufous-crowned sparrow	Coastal sage scrub, open chaparral; S Calif. and NW Baja Calif.; not migratory	Year - around	Fed ESA: none BLM: none CA: S3	Present; observed during 2013 surveys
Aquila chrysaetos Golden eagle	Nests in remote trees and cliffs; forages over shrublands and grasslands; breeds throughout W N America, winters to E coast	Year-around	Fed: Eagle Protection Act BLM: sensitive CA: S3, FP	Nesting: minimal Year-around foraging or flyover: present
Asio otus Long-eared owl	Breed in riparian woodlands; forage (nocturnally) over open land; sea level to about 6000 ft. elev.; through N America and Eurasia	Year-around	Fed ESA: none BLM: none CA: S3?, SC (nesting)	Nesting: minimal Winter/Migration: present
Athene cunicularia (*Speotyto cunicularia*) Burrowing owl	Nests mainly in rodent burrows, usually in open grassland or shrubland; forages in open habitat; increasingly uncommon in S Calif.; through W US and Mexico	Year-around	Fed ESA: none BLM: sensitive CA: S3, SC (burrow sites) MSHCP: covered	High; suitable habitat present; occurs in surrounding area; not detected during surveys.
Buteo regalis Ferruginous hawk	Forages over grassland and shrubland; winters in W and SW N Amer. (breeds in Great Basin and N plains)	Winter	Fed ESA: none BLM: none CA: S3S4 (winter)	Nesting: minimal Winter/Migration: present
Buteo swainsonii Swainson's hawk	Breeds in open habitats (e.g., grassland), Central Valley and W Mojave Desert (Calif.) and east to cent. US, S. Canada, New Mexico; winters in S America	Spring–Summer	Fed ESA: none BLM: sensitive CA: THR, S3	Nesting: minimal Migration: present
Calypte costae Costa's hummingbird	Breeds throughout central and southern CA, east through S AZ and south through Baja CA and Sonora, Mexico. Desert and chaparral shrublands.	Year-round	Fed ESA: none BLM: none CA: S4	Present. Observed during 2019 surveys Nesting: High
Chaetura vauxi Vaux's swift	Breeds central Calif. and northward, in coastal and montane forests; winters in Central and S America	Spring and fall migration. seasons	Fed ESA: none BLM: none CA: SC S3 (nesting)	Nesting: minimal Winter/Migration: present
Circus hudsonius Northern harrier	Breeds colonially in marshlands, San Diego and northward; winters to south through Central Amer.; forages over open terrain; N America and Eurasia	Winter; rare in summer	Fed ESA: none BLM: none CA: SC, S3 (nesting)	Nesting: minimal Winter/Migration: present

Table 4. Special-status Species of the Cabazon/Whitewater Area

Species Name	Habitat Requirements	Flowering or Activity Season	Conservation Status	Potential to Occur
Coccyzus americanus Western yellow-billed cuckoo	Large patches of riparian forest and woodland, usually near surface water; historically common in floodplain habitats. Reported in nearby Whitewater River corridor during summer but apparently not breeding.	Spring–Fall	Fed ESA: THR BLM: Sensitive CA: END, S1	Nesting: Minimal; no suitable habitat on or adjacent to the site; Migration: Potential flyover or stopover
Cypseloides niger Black swift	Breeds on cliffs, often at waterfalls	Spring–fall	Fed ESA: none BLM: none CA: S2, SC (nesting)	Nesting: minimal Winter/Migration: low
Setophaga petechia (*Dendroica petechia*) Yellow warbler	Breeds in willow and cottonwood riparian habitat, near sea level to 9000 ft. elev.; much of N Amer.; sensitive in S Calif. due to habitat loss & cowbird parasitism; winters Mexico to S Amer.	Spring–summer	Fed ESA: none BLM: none CA: SC S3S4 (nesting) MSHCP: covered	Nesting: minimal Winter/Migration: present
Empidonax traillii Willow flycatcher (incl. subspecies *extimus*, southwestern willow flycatcher)	Breeds in dense riparian forests & shrublands; scattered locations in Arizona, California, and North Baja; near sea level to about 8000 ft. elevation; winters in Central America. Reported in nearby Whitewater River corridor during migratory and marginal breeding season (breeding status unknown).	Spring–Fall	Fed ESA: END (ssp *extimus* only) BLM: Sensitive CA: END, S1S2 MSHCP: covered	Nesting: Minimal; no suitable habitat on or adjacent to the site; Migration: Potential flyover or stopover
Eremophila alpestris actia California horned lark	Open, flat lands incl. sparse sagebrush or grassland, meadows, alkali flats; wide elev. range; breeds in western Calif (San Diego Co through Humboldt Co) and Baja Calif; winters in same range	Summer	Fed ESA: none BLM: none CA: S4	Nesting: minimal Winter/Migration: present
Falco columbarius Merlin	Uncommon wintering species in S Calif. desert and valleys (breeds in northern N America and Eurasia)	Winter	Fed ESA: none BLM: none CA: S3S4 (winter)	Nesting: minimal Winter/Migration: present
Falco mexicanus Prairie falcon	Nests on high cliffs, forages primarily over open lands; throughout arid western US and Mexico	Year-around	Fed ESA: none BLM: none CA: S4 (nesting)	Nesting: minimal Year-around foraging and flyover: present
Falco peregrinus American peregrine falcon	Nests on high cliffs, generally near water bodies; feed on birds (esp. shorebirds & waterfowl); widespread but rare worldwide	Spring–Summer	Fed ESA: delisted BLM: none Calif: FP, S3S4 (nesting)	Nesting: minimal Winter/Migration: present
Haliaeetus leucocephalus Bald eagle	Breed in large trees, usually near major rivers or lakes; winters more widely; scattered distribution in N America; esp. coastal regions	Winter	Fed: Eagle Protection Act BLM: sensitive CA: END, S3, FP (nesting and wintering)	Nesting: minimal Winter/Migration: present

Table 4. Special-status Species of the Cabazon/Whitewater Area

Species Name	Habitat Requirements	Flowering or Activity Season	Conservation Status	Potential to Occur
Lanius ludovicianus Loggerhead shrike	Woodlands, shrublands, open areas with scattered perch sites; not dense forest; widespread in N America; valley floors to about 7000 ft. elev.	Year-around	Fed ESA: none BLM: none CA: S4, SC (nesting)	Present. Suitable habitat throughout area, observed during several field surveys.
Pandion haliaetus Osprey	Nests in northern N America and Mexican coastlines near large water bodies, preys primarily on fish; winters in central Calif to S America;	Spring–Fall	Fed ESA: none BLM: none CA: S4	Nesting: minimal Winter/Migration: present
Plegadis chihi White-faced ibis	Freshwater and brackish marsh; breeding range scattered in W N America incl. central & S Calif wetlands; winters in Mexico & to S	Year-around	Fed ESA: none BLM: none CA: S3S4 (rookery sites)	Nesting: minimal Winter/Migration: present
Polioptila californica californica Coastal California gnatcatcher	Primarily coastal sage scrub below about 2,000 feet elev.; southwestern California, Ventura County to northern Baja California; inland to San Gorgonio Pass area (e.g., Banning)	Year-around	Fed ESA: THR BLM: Sensitive CA: SC, S2	Moderate. Margin of geogr. range (reported by BLM staff at adjacent Pacific Crest Trail)
Polioptila melanura Black-tailed gnatcatcher	Desert shrublands, gen. nests in shrub thickets along washes; occas. in open scrub (esp. in winter); Calif. deserts, to W Texas, Baja, and central Mexico	Year-around	Fed ESA: none BLM: none CA: S3S4	Present. Suitable habitat mainly near dry washes; observed in 2019.
Spinus lawrencei Lawrence's goldfinch	CA coastal ranges, western Sierra Nevada, desert margins through northern Baja CA; winters in AZ and Sonora. Shrublands and woodlands usually near water.	Year-around	Fed ESA: none BLM: none CA: S3S4 (nesting)	Present. Suitable habitat mainly near dry washes; observed in 2019.
Toxostoma lecontei LeConte's thrasher	Calif. deserts, SW Central Val. & Owens Val., east to Utah, Arizona; open shrubland, often sandy or alkaline flats	Year-around	Fed ESA: none BLM: none CA: S3, SC MSHCP: covered	Low; suitable habitat present; not detected during recent surveys; historically known from the project vicinity.
Vireo bellii pusillus Least Bell's vireo	Summer resident of southern California in low riparian habitats in vicinity of water or dry river bottoms; found below 2000 ft; nests placed along margins of bushes or on twigs projecting into pathways, usually willow, mesquite, baccharis. Occurs during breeding and migratory season in modeled habitat in nearby Whitewater River corridor,	Spring–Fall	Fed ESA: END BLM: sensitive CA: END MSHCP: covered	Nesting: minimal. No potential habitat on site. Winter/Migration: potential stopover or flyover
MAMMALS				
Antrozous pallidus Pallid bat	Rock outcrops of shrublands, mostly below about 6000 ft. elev.; Calif, SW N Amer through interior Oregon and Washington; hibernates in winter	Warm season	Fed ESA: none BLM: sensitive CA: S3, SC	Present; detected on site during 2016-2017 acoustic bat surveys
Chaetodipus fallax pallidus (Perognathus f. pallidus) Pallid San Diego pocket mouse	Open shrublands and sandy areas; deserts and desert-facing foothills, LA Co. south to N Baja Calif.	Spring–Fall (Winter dormant)	Fed ESA: none BLM: none CA: S3S4, SC	Low; suitable habitat present; known from the vicinity of the study area.

Table 4. Special-status Species of the Cabazon/Whitewater Area

Species Name	Habitat Requirements	Flowering or Activity Season	Conservation Status	Potential to Occur
Corynorhinus (Plecotus) townsendii Townsend's big-eared bat (incl. "pale," "western," and other subspecies)	Many habitats throughout Calif and W N Amer, scattered pop'ns in E; day roosts in caves, tunnels, mines; feed primarily on moths	Year-around	Fed ESA: none BLM: sensitive CA: S2, SC	Present; detected on site during 2016-2017 acoustic bat surveys
Euderma maculatum Spotted bat	Desert (cool seasons) to pine forest (summer), much of SW N Amer. but very rare; roosts in deep crevices in cliffs, feeds on moths captured over open water	Not known	Fed: none BLM: Sensitive Calif: S3, SC	Low potential for roosting or foraging on site; potential flyover
Eumops perotis californicus Western mastiff bat	Lowlands (with rare exceptions); cent. and S Calif., S Ariz., NM, SW Tex., N Mexico; roost in deep rock crevices, forage over wide area; recorded in 2016 at nearby wind site	Year-around	Fed: none BLM: Sensitive Calif: S3S4, SC	Low potential for roosting on site; high potential for foraging in area
Lasiurus blossevillii Western red bat	Shasta Co. to the Mexican border, W of the Sierra Nevada. Winters in lowlands and coastal regions south of SF Bay. Roosts in forests and woodlands. Feeds over grasslands, shrublands, open woodlands and forests, and croplands. Generally not found in desert areas.	Spring/Fall migration	Fed ESA: none BLM: none CA: S3, SC	Present; detected on site during 2016-2017 acoustic bat surveys.
Lasiurus xanthinus (Nycteris ega xanthina) Western (Southern) yellow bat	Mexico and Cent. Amer., to S AZ; Riv., Imperial and San Diego Cos.; riparian and wash habitats; roosts in trees; evidently migrates from Calif. during winter	Year-around?	Fed ESA: none BLM: none CA: S3, SC MSHCP: covered	Roosting: minimal Foraging: low (not detected)
Macrotus californicus (M. waterhousii) California leaf-nosed bat	Arid lowlands, S Calif., S and W Ariz., Baja Calif. and Sonora, Mexico; roost in mine-shafts, forage over open shrublands	Year-around	Fed: none BLM: Sensitive Calif: S3	Low potential for roosting on site; high potential for foraging in area
Myotis evotis Long-eared myotis	Much of the western US, southern Canada and N Baja Calif.; generally forested lands, also shrublands; roosts in broken rock outcrops, crevices, structures, crevices, mines and tunnels; feeds on large insects.	Year-around?	Fed: none BLM: Sensitive Calif: S3	Low potential for roosting on site; moderate to high potential for foraging in area
Myotis thysanodes Fringed myotis	Widespread in CA, but generally not in Central Valley and deserts. Wide variety of habitats; sea level to higher mountains. Optimal habitats are pinyon-juniper, valley foothill hardwood and hardwood-conifer, generally at 1300-2200 m (4000-7000 ft).	Year-around?	Fed ESA: none BLM: sensitive CA: S3	Present; detected on site during 2016-2017 acoustic bat surveys.
Myotis velifer Cave myotis	S Calif through Arizona to TX and Mexico; generally roosts in caves; feeds over water or riparian vegetation	Spring - Summer	Fed: none BLM: Sensitive Calif: S1, SC	Minimal potential for roosting on site; moderate potential for flyover to access foraging habitat

Table 4. Special-status Species of the Cabazon/Whitewater Area

Species Name	Habitat Requirements	Flowering or Activity Season	Conservation Status	Potential to Occur
Myotis yumanensis Yuma myotis	Widespread in CA, uncommon in deserts, many habitats, sea level to 3300 m (11,000 ft), but uncommon above 2560 m (8000 ft); feeds over open water.	Year-around	Fed ESA: none BLM: sensitive CA: S4	Present; detected on site during 2016-2017 acoustic bat surveys.
Nyctinomops femorosaccus (Tadarida femorosaccus) Pocketed free-tailed bat	Deserts and arid lowlands, SW US, Baja Calif., mainland Mexico; Roost mainly in crevices of high cliffs; forage over water and open shrubland	Year-around	Fed ESA: none BLM: none CA: S3, SC	Present; detected on site during 2016-2017 acoustic bat surveys.
Nyctinomops macrotis (Tadarida molossa) Big free-tailed bat	Roosts in crevices of rocky cliffs, scattered localities in W N. Amer. through Cent. Amer.; ranges widely from roost sites; often forages over water	Year-around (?)	Fed ESA: none BLM: none CA: S3, SC	Roosting: minimal Foraging: moderate (not detected)
Ovis canadensis nelsoni Nelson's bighorn sheep	Open shrublands and conifer forest, remote mountains; scattered populations in desert mountains and surrounding ranges, incl. Transverse and Peninsular ranges	Year-around	Fed ESA: none BLM: sensitive CA: S3, FP (selected populations)	Present; observed on the site during 2013 surveys. Sign observed in northeast-ern part of the site.
Perognathus longimembris brevinasus Los Angeles pocket mouse	Open shrublands, grasslands; often sandy alluvial benches; S Calif. valleys, LA, SW San Bernardino and W Riverside Cos.	Year-around (?)	Fed ESA: none BLM: none CA: S1S2, SC	Low (Cottonwood Creek only); marginal habitat; not observed.
Vulpes macrotis arsipus Desert kit fox	Arid areas with grasslands, agricultural lands, or scattered shrubby vegetation. Requires open, level areas with loose-textured, sandy loamy soils for digging dens. SW US and northern Mexico.	Year-around	Fed ESA: none BLM: none CA: Fully Protected Furbearer	Moderate; potentially suitable habitat throughout.
Taxidea taxus American badger	Mountains, deserts, interior valleys where burrowing animals are avail as prey and soil permits digging; through-out cent and W N Amer	Year-around	Fed ESA: none BLM: none CA: S3, SC	Present; suitable habitat present; sign observed in 2019 (9 burrows found in northeastern part of the site).

General references (botany): Baldwin et al. 2012; CDFW 2019a, b, CNPS 2019; CCH 2019
General references (wildlife): American Ornithologists Union 1998 (including supplements through 2011); Barbour and Davis 1969; CDFW 2019a; Feldhammer et al. 2003; Gannon 2003; Garrett and Dunn 1981; Grinnell and Miller 1944; Hall 1981; Hatfield et al. 2019; Jennings and Hayes 1994; Pierson and Rainey 1988; Sibley 2000; Stebbins 2003; Wilson and Ruff 1999.

Conservation Status

Federal designations: (federal ESA, USFWS).
END: Federally listed, endangered.
THR: Federally listed, threatened.
Candidate: Sufficient data are available to support federal listing, but not yet listed.
Proposed: Formally proposed for federal status shown.

Federal designations: (federal Bald and Golden Eagle Protection Act, US Fish and Wildlife Service).
Eagle Protection Act: Bald and Golden Eagle Protection Act.

Bureau of Land Management Designations:
Sensitive: Species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA. BLM Sensitive species also include all federal Candidate species and federal Delisted species which were so designated within the last 5 years, and CRPR 1B plant species that occur on BLM lands.

State designations: (CESA, CDFG)
END: State listed, endangered.

THR: State listed, threatened.
RARE: State listed as rare (applied only to certain plants).
SC: California species of special concern. Considered vulnerable to extinction due to declining numbers, limited geographic ranges, or ongoing threats.
FP: Fully protected. May not be taken or possessed without permit from CDFG.

CDFG Natural Diversity Data Base Designations: Applied to special-status plants and sensitive plant communities; where correct category is uncertain, CDFG uses two categories or question marks.
S1: Fewer than 6 occurrences or fewer than 1000 individuals or less than 2000 acres.
S1.1: Very threatened
S1.2: Threatened
S1.3: No current threats known
S2: 6-20 occurrences or 1000-3000 individuals or 2000-10,000 acres (decimal suffixes same as above).
S3: 21-100 occurrences or 3000-10,000 individuals or 10,000-50,000 acres (decimal suffixes same as above).
S4: Apparently secure in California; this rank is clearly lower than S3 but factors exist to cause some concern, i.e., there is some threat or somewhat narrow habitat. No threat rank.
S5: Demonstrably secure or ineradicable in California. No threat rank.
SH: All California occurrences historical (i.e., no records in > 20 years).
SX: Presumed extirpated in California.

California Native Plant Society (CNPS) Rare Plant Rank designations. Note: According to CNPS (http://www.cnps.org/cnps/rareplants/ranking.php), plants ranked as CRPR 1A, 1B, and 2 meet definitions as threatened or endangered and are eligible for state listing. That interpretation of the state Endangered Species Act is not in general use.
1A: Plants presumed extinct in California.
1B: Plants rare and endangered in California and throughout their range.
2: Plants rare, threatened or endangered in California but more common elsewhere in their range.
3: Plants about which we need more information; a review list.
4: Plants of limited distribution; a watch list.

California Rare Plant Rank Threat designations:
.1 Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)
.2 Fairly endangered in California (20-80% occurrences threatened)
.3 Not very endangered in California (<20% of occurrences threatened or no current threats known)

Definitions of occurrence probability: Estimated occurrence probabilities based literature sources cited earlier and field surveys and habitat analyses reported here.
Present: Observed on the site by qualified biologists.
Expected: Not observed or recorded on the site, but very likely present during at least a portion of the year.
High: Habitat is a type often utilized by the species and the site is within the known range of the species.
Moderate: Site is within the known range of the species and habitat on the site is a type occasionally used.
Low: Site is within the species' known range but habitat is rarely used, or the species was not found during focused surveys covering less than 100% of potential habitat or completed in marginal seasons.
Minimal: No suitable habitat on the site; or well outside the species' known elevational or geographic ranges; or a focused study covering 100% of all suitable habitat, completed during the appropriate season and during a year of appropriate rainfall, did not detect the species.
Unknown: No focused surveys have been performed in the region, and the species' distribution and habitat are poorly known.

3.1 Special-status Plants

Listed Threatened or Endangered Plants

This section describes plant species reported from the region that are listed as threatened or endangered under the federal ESA or CESA. One federally listed endangered plant, triple-ribbed milk-vetch, has been reported in Whitewater Canyon, just east of the project disturbance area. Other listed threatened or endangered plant species of the low desert region (e.g., Coachella Valley milk-vetch) grow on wind-blown sands to the east, well outside the study area and are not addressed in this report. No listed threatened or endangered plant species, species proposed for listing, or candidates for listing have been documented from the study area.

Coachella Valley milk-vetch: Coachella Valley milk-vetch is an annual or short-lived perennial endemic to the Coachella Valley. It is federally listed as endangered, a BLM sensitive species, and ranked as CRPR 1B.

It is primarily found on loose aeolian (wind transported) or, less-often, in alluvial (water transported) sands, on dunes or flats and along disturbed margins of sandy washes. There is no designated critical habitat for Coachella Valley milk-vetch on the Project site (USFWS 2011a). A patch of CVMSHCP-modeled habitat for Coachella Valley milk-vetch is within the ROW but outside the proposed disturbance area (see Figure 3). This area is located at the top of a "sand ramp" just above a steep eroded slope. Vegetation is creosote bush scrub. No Coachella Valley milk-vetch were located in the modeled habitat (or elsewhere on the Project site) during 2019 linear transect protocol surveys or during 2013 controlled-intuitive surveys. Based on the results of these field surveys, Coachella Valley milk-vetch is not expected to occur on the site, and there is no suitable or modeled habitat within the proposed disturbance area.

Triple-ribbed milk-vetch: Triple-ribbed milk-vetch is found in arroyos, canyons, and hillsides between about 1,400 and 4,000 feet elevation. It grows in Whitewater Canyon just east of the project disturbance area and in nearby canyons, hills, and mountains to the east (Baldwin et al. 2012) including Morongo Canyon and Mission Canyon and one disjunct site some 40 miles south at Agua Alta Canyon (White 2004). It is very rare, and several known locations consist of only a single plant. Prior to 2004, almost all known occurrences consisted of a few scattered plants in alluvial wash or on adjacent slopes. More recently, occurrences consisting of much larger numbers of plants have been documented, all on unusual upland gravelly substrates. One of these is in the Whitewater River watershed at about 3900 ft. elevation (White 2004), one is near Catclaw Flat (Amsberry and Meinke 2007), and there are one or more similar sites in Joshua Tree National Park (LaDoux, pers. comm.). There also is a record of a few small plants near the Super Creek decorative rock quarry, about a mile east of the Project site, growing on parent material that was visually unlike other upland or alluvial occurrences (personal observation). Based on knowledge of its upland occurrences, it now appears that the alluvial wash occurrences originated from seed dispersed downstream from the much larger upland populations higher in the watersheds. Triple-ribbed milk-vetch is covered under the Coachella Valley Multiple Species Habitat Conservation Plan. There is no CVMSHCP-modeled habitat within the ROW and Aspen did not locate triple-ribbed milk-vetch during our surveys. Habitat suitability is difficult to evaluate (due to occurrences on upland and alluvial sites, with little more characterization of substrate). Potentially suitable habitat is present in the project disturbance area but there is a low potential that it may grow in the study area due to negative results of field surveys.

BLM Sensitive Plants

The BLM (2012) maintains a list of sensitive plant species, including species that are rare, declining, or dependent on specialized habitats. The list includes all plants ranked by CNPS and CDFW as CRPR 1B. The BLM manages sensitive species to provide protections comparable to species that may become listed as threatened or endangered (i.e., candidate species for federal listing). None of these species has been documented from the Mesa Wind site and none are expected to occur there (Table 4).

Other Special-Status Plants

In addition to the statutes and policies described above, several public agencies and private entities maintain lists of plants and animals of conservation concern. The CDFW compiles these species including CDFW and CNPS rankings as CRPR 2, 3, or 4 in its compendium of "Special Plants" (CDFW 2019b). These plants are treated here as "special-status species." None of these species has been documented from the Mesa Wind site and none are expected to occur there (Table 4).

3.2 Special-status Wildlife

Listed Threatened or Endangered Wildlife

This section includes species listed as threatened or endangered under CESA or ESA. Three listed threatened or endangered species, the desert tortoise, coastal California gnatcatcher, and Swainson's hawk, have been observed in or adjacent to the study area. Other listed species of the region are either limited to riparian and aquatic habitats (e.g., southwestern willow flycatcher, least Bell's vireo, and western yellow-billed cuckoo) or aeolian sands (e.g., Coachella Valley fringe-toed lizard). Note that recent studies indicate that southwestern willow flycatchers generally do not migrate over the southern California desert (BLM 2017 and citations therein). However, other willow flycatcher subspecies (state listed but not federally listed) may pass through the area during migration. Identification of subspecies is difficult and may necessitate hearing the calls. Identification of willow flycatchers subspecies seen during migration, including birds found dead, is usually not possible.

Desert Tortoise. The desert tortoise is listed as threatened under CESA, and the Mojave population (i.e., west of the Colorado River) is listed as threatened under the federal ESA. East of the Colorado River, the desert tortoise's range extends into the Arizona deserts, and south through Sonora (Mexico). All wild desert tortoises in California are part of the state and federally listed Mojave population.

The USFWS reviewed desert tortoise biology and population status in the recent Revised Recovery Plan (USFWS 2011). The following summary is based on that review and literature cited therein. Desert tortoises spend much of their lives in burrows. They enter brumation during autumn. In late winter or early spring, they emerge from over-wintering burrows and typically remain active or partially active through the fall. Activity decreases in summer, but tortoises often emerge during summer to drink and to take advantage of seasonal food availability during the few weeks following late summer rains. They may become dormant during extended periods of summer heat and dryness. A single tortoise may have a dozen or more burrows within its home range, and different tortoises may use these burrows at different times. Even during their active seasons, they are inactive during much of the day or night, within burrows or at "palettes" (partially sheltered flattened areas, often beneath shrubs or large rocks) or other shaded sites.

The size of desert tortoise home ranges varies with respect to location and resource availability and may fluctuate over time. Male tortoises' home ranges can be as large as 200 acres, while females' long-term home ranges may be less than half that size. Over its lifetime, a desert tortoise may use more than 1.5 square miles of habitat and may make periodic forays of several miles at a time.

Tortoises are long-lived and grow slowly. They require 13 to 20 years to reach sexual maturity. Their reproductive rates are low, though their reproductive lifespan is long. Mating may occur both during spring and fall. The number of clutches (sets of eggs laid at a single time) and number of eggs that a female desert tortoise produces is dependent on habitat quality, seasonal food and water availability, and the animal's physiological condition. Egg-laying takes place primarily between April and July; the female typically lays 2-14 (average 5-6) eggs, which are buried near the mouth of a burrow or beneath a shrub. The eggs typically hatch 90 to 120 days later, between August and October. Clutch success rates are unknown and nest predation rates are variable, but predation appears to be an important cause of clutch failure.

Desert tortoises and their sign have been overserved in throughout the site (including both the northeastern and southwestern portions) and the access road southwest of the site over many years (R. Griese, pers. comm.). Desert tortoises at the Mesa Wind site have been studied extensively. Researchers conducted focused desert tortoise surveys of the Mesa Wind Project in 1997, 1998, 1999, 2000, 2009, and

2010. The total number of tortoises censused increased with each survey (31, 42, 49, 59, 63, and 69 tortoises, respectively) (Lovich et al. 2011). Researchers found 136 individuals (48 adult tortoises and 88 hatchling and immature tortoises) and 32 active desert tortoise burrows on 868 acres on and around the 401-acre ROW, primarily around the roads and turbines of the existing wind farm (1999 data, summarized by USFWS 2009a). Based on their census methods, Lovich et al. (2011) estimated a total population of 96 desert tortoises (all age classes) in their study area, and an estimated density of 15.4 tortoises per square km. The tortoise detection methods are not described in the publications but included repeated observations of previously tagged animals and appears to consist of more lengthy and labor-intensive field efforts than the USFWS (2009b) presence/absence protocol. During NRA's desert tortoise surveys in 2008, four tortoises as well as burrows and scat were observed, and it was estimated that there were between eight and twelve tortoises within the project disturbance area (NRA Inc. 2008). They all were located in the northeastern part of the ROW, including one tortoise and burrow located along the access road southwest of the O&M building. Desert tortoises at the Mesa Wind site constructed burrows under shrubs (41% of burrows were located under shrubs), but also constructed burrows under anthropogenic features in the landscape (e.g., roads, concrete foundations associated with wind energy turbines and transformers) (Lovich and Daniels 2000). A disproportionate number of desert tortoise burrows were located near roads and concrete foundations associated with wind energy turbines and transformers as opposed to available undisturbed habitat in the vicinity. These results suggest that well-planned wind energy development and operations may be compatible with desert tortoise conservation (Lovich and Daniels 2000).

There have been two known human-caused desert tortoise mortalities on the Project site. One was a vehicle strike on the publicly-accessible road southwest of the O&M building in approximately 1995, and the other was trapped in a culvert during a rainstorm in approximately 2008 (R. Griese, pers. comm.; see Figure 2).

Desert tortoise numbers at the site have apparently declined since the 2010 field season. Focused surveys for desert tortoise in 2019 detected three living tortoises and several burrows and scat within the field survey coverage area, listed in Table 5. All the desert tortoises and sign were located in the northeastern portion of the site.

Table 5. Desert Tortoise Observations (2019)

Date	Sign	UTM	Notes
April 16, 2019	potential burrow	11 S 531664 3756501	Class 5 burrow: possibly an old tortoise burrow, slightly collapsed and in poor condition
April 17, 2019	burrow	11 S 531334 3756482	Class 2 burrow: Definitely tortoise. 150mm H x 350mm W x 2ft D. No sign observed.
April 17, 2019	scat	11 S 531161 3756513	Three pieces of scat observed in general area, all >12mm = adult. Appears to be of this year.
April 17, 2019	individual	11 S 531133 3756518	Adult female greater than 200mm in length. Old epoxy mark on RC4.
April 17, 2019	individual	11 S 531132 3756527	Adult male greater than 200mm in length. Notch on LM2, old tag (illegible) on RC4.
April 23, 2019	burrow	11 S 531283 3757208	Class 2 burrow: definitely tortoise. 170 mm H x 390mm W x greater than 4ft D. No sign observed.
April 23, 2019	burrow	11 S 531144 3757236	Class 1 burrow: currently active with fresh tracks and freshly dug burrow. 180mm H x 280mm W x 450mm D.
April 23, 2019	scat	11 S 531156 3757207	Scat possibly of this year, faded but soft green inside with scent. >12mm = adult.

Table 5. Desert Tortoise Observations (2019)

Date	Sign	UTM	Notes
April 25, 2019	burrow	11 S 531099 3756546	Class 2 burrow: definitely tortoise. 140 mm H x 220 mm W x 350 mm D, good condition not recently used.
April 25, 2019	individual	11 S 531079 3756595	Adult female 1/2 out of burrow, Tag on RC4 "150"; slightly sunken scutes on left side.
April 25, 2019	scat	11 S 531030 3756521	Scat of this year >12mm = adult. Fresh scat black with glaze.
May 7, 2019	potential burrow	11 S 531668 3757522	Class 5 burrow: under concrete foundation
June 10, 2019	potential burrow	11 S 531351 3757693	Class 5 burrow: under concrete foundation
June 10, 2019	potential burrow	11 S 531348 3757706	Class 5 burrow: under concrete foundation
June 14, 2019	potential burrow	11 S 531497 3757076	Class 5 burrow: under concrete foundation
June 14, 2019	potential burrow	11 S 531527 3756927	Class 5 burrow: under concrete foundation
June 14, 2019	potential burrow	11 S 531236 3757347	Class 5 burrow: under concrete foundation
June 14, 2019	potential burrow	11 S 531524 3756560	Class 5 burrow: under concrete foundation
June 14, 2019	potential burrow	11 S 531490 3756546	Class 5 burrow: under concrete foundation
June 14, 2019	potential burrow	11 S 531342 3756528	Class 5 burrow: under concrete foundation

A total of 441 concrete foundations (i.e., all Project-related foundations except those within fenced the switchyard, including legacy turbine foundations and other electrical infrastructure foundations) were inspected for potential tortoise burrows. Nine of these had suitable desert tortoise burrows beneath them, but none were occupied by desert tortoise. Attachment 6 includes a list and map of the foundations.

The Mesa Wind site is not within USFWS designated critical habitat for the desert tortoise and is also not within any BLM Desert Wildlife Management Areas (USFWS 1994). Desert tortoise is covered under the CVMSHCP.

Coastal California gnatcatcher. The coastal California gnatcatcher is listed as threatened under the ESA. Its geographic range is primarily coastal southern California from Ventura County, inland to the Santa Clarita area, Banning area, and southward through northwestern Baja California. Its habitat is coastal sage scrub largely composed of California sagebrush, California buckwheat, and other low-growing, drought-deciduous shrubs. The coastal California gnatcatcher, as well as several shrubs that are characteristic of its habitat, reach their inland range margins in the San Gorgonio Pass. In this area, the ranges of Coastal California gnatcatcher and the more common black-tailed gnatcatcher, may overlap. The black-tailed gnatcatcher occurs on the site and throughout the general area. Coastal California gnatcatcher has been reported by BLM staff along the Pacific Crest Trail, north of the Project site. There is a low possibility that coastal California gnatcatcher may occur on the Project site and, if so, most likely outside the breeding season during the dispersal phase of its life cycle.

Swainson's Hawk. Swainson's hawk is listed as threatened under the CESA. In California, it nests in the San Joaquin Valley, western Antelope Valley, and Owens Valley. It migrates to South America every fall and returns to California every spring. Swainson's hawk migrates along the Pacific flyway and several were observed over the project disturbance area during migration. The project disturbance area is well outside of the breeding range but Swainson's hawk may migrate over the site biannually. At least one Swainson's hawk was observed migrating over the project disturbance area during the fall of 2012 but it was not observed flying within the proposed rotor-swept zone for the new turbines (Bloom 2012).

Species Protected Under the Federal Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 U.S.C. §§ 668-668d; BGEPA) prohibits take of bald eagles and golden eagles. The BGEPA defines *take* to include "pursuing, shooting, shooting at, poisoning, wounding, killing, capturing, trapping, collecting, molesting, and disturbing." The USFWS (2007) further defines *disturb* 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."

Golden Eagle. Golden eagles are year-round residents throughout most of their range in the western United States. In the southwest, they are more common during winter when eagles that nest in Canada migrate south into the region. They breed from late January through August, mainly during late winter and early spring in the California deserts (Pagel et al. 2010). In the desert, they generally nest in steep, rugged terrain, often on sites with overhanging ledges, cliffs or large trees as cover. Golden eagles are wide-ranging predators, especially outside of the nesting season, when they don't need to return to tend eggs or young at their nests.

Golden eagle foraging habitat consists of open terrain such as grasslands, deserts, savanna, and early successional forest and shrubland habitats throughout the regional foothills, mountains, and deserts. They prey primarily on rabbits and rodents but will also take other mammals, birds, reptiles, and some carrion (Kochert et al. 2002).

The mountains and canyons surrounding the project disturbance area provide suitable golden eagle nesting habitat. The Mesa Wind site does not have suitable nesting habitat, but the entire site is suitable foraging habitat. There are several documented golden eagle nest locations within a 10-mile radius of the site including locations to the north in the San Bernardino Mountains and to the south, in the San Jacinto Mountains. The nearest previously recorded nest sites are about 2.5 miles of the Mesa Wind site (from USFWS data). There have been two known golden eagle fatalities on the site, one in the mid-1990s and one in approximately 2017, both in the southwestern part of the Project site (R. Griese, pers. comm.; see Figure 2).

In fall of 2012, BBI recorded a total of 121 observations of golden eagles flying over the site. This included 24 eagles that flew within the proposed rotor-swept elevational zone for the WTGs proposed at that time (BBI 2013a). In 2019, BBI viewed 27 possible golden eagle nests comprising 14 to 16 territories within a 10-mile radius of the Mesa Wind site. They found that 2019 was a relatively poor year for nest occupancy. They found evidence that one golden eagle nest had fledged young earlier in the year, and that another golden eagle nest had been active early in the nesting season but had not fledged young. A third potential golden eagle nest had apparently been active by either golden eagle or red-tailed hawk, without fledging young. BLM staff observed a juvenile golden eagle in the vicinity of the Project site in 2019.

Bald Eagle. Bald eagles are occasional migrants in southern California during the winter when birds from areas further to the north migrate south. There are a few year-round resident birds, regularly seen near Lake Hemet in Riverside County, and more recently Big Bear Lake in San Bernardino County and Irvine Lake in Orange County. A bald eagle was observed flying over the project disturbance area during field surveys (BBI 2013a).

Wildlife Species Fully Protected Under the California Fish and Game Code

Under the state Fish and Game Code, selected fish and wildlife species are designated as fully protected, prohibiting take except under permit for scientific purposes. Most of the designated fully protected species occur well outside the project vicinity, but several may be found in the study area. These are: golden eagle and bald eagle (discussed above, Species Protected under the Bald and Golden Eagle Protection Act), Nelson's bighorn sheep, and American peregrine falcon.

American Peregrine Falcon. Peregrine falcons were formerly listed under CESA and ESA but have been delisted under both acts. They are fully protected under the state Fish and Game Code. They are found irregularly in the region, generally during migratory and winter seasons. They feed primarily on birds captured during flight. Waterfowl and shorebirds make up a large proportion of their prey, and nest sites are often within foraging range of large water bodies. At least one American peregrine falcon was observed migrating over the project disturbance area during fall of 2012. It was observed at a high altitude and never entered the proposed rotor-swept zone for the new turbines (BBI 2013a).

Desert Bighorn Sheep. Desert bighorn sheep (also known as Nelson's bighorn sheep) are known from the Transverse Ranges, California Desert Ranges, Nevada, northern Arizona, and Utah. Its populations in the Peninsular Ranges (the Santa Rosa and San Jacinto Mountains, and southward into Baja California), south of the Mesa Wind site, are federally listed as a threatened distinct vertebrate population segment. The populations in the San Bernardino Mountains have no CESA or ESA listing status. Desert bighorn sheep is a BLM Sensitive Species and is fully protected under the state Fish and Game Code. Desert bighorn sheep were observed on the site during recent surveys (BBI 2013a) and are expected to forage on the site regularly. According to R. Griese (pers. comm.) they are regularly seen throughout the Project site.

BLM Sensitive Wildlife Species

The BLM maintains a list of Sensitive Wildlife Species, including species that are rare, declining, or dependent on specialized habitats (BLM 2014). It manages sensitive species to provide protections comparable to species that may become listed as threatened or endangered (i.e., candidate species for federal listing).

Burrowing Owl. The burrowing owl is a BLM Sensitive Species and a CDFW Species of Special Concern. As a native bird, it is also protected by the federal Migratory Bird Treaty Act (MBTA) and the California Fish and Game Code (below). It is a small, terrestrial owl of open country. During breeding season, it ranges throughout most of the western US. It occurs year-around in southern California, but may be more numerous during fall and winter, when migratory individuals from farther north join the regional resident population. Burrowing owls favor flat, open annual or perennial grassland or gentle slopes and sparse shrub or tree cover. They use the burrows of ground squirrels and other rodents for shelter and nesting. Availability of suitable burrows is an important habitat component. Where ground squirrel burrows are not available, the owls may use alternate burrow sites or man-made features (such as drain pipes, debris piles, or concrete slabs). In the California deserts, burrowing owls generally occur in low numbers in scattered populations, but they can be found in much higher densities near agricultural lands where rodent and insect prey tend to be more abundant (Wilkerson and Siegel 2011). Burrowing owl nesting season, as recognized by the California Burrowing Owl Consortium (CBOC 1993), is February 1 through August 31. Burrowing owls are covered under the Coachella Valley Multiple Species Habitat Conservation Plan. No burrowing owls or burrowing owl sign have been observed on the site, but suitable burrows are present and have been observed in the nearby area. There is a high potential that burrowing owls may occasionally occur on the Mesa Wind site, either during winter or during breeding season.

Coast horned lizard. Coast horned lizard (BLM Sensitive) is found throughout much of coastal southern California, inland as far as the southern Mojave Desert and to about 6000 feet elevation in the mountains. Coast horned lizards occur in sandy soils in a variety of shrubland, grassland, and woodland habitat types. They have been extirpated from much of their historic range by land use changes, but they remain fairly common in natural open space areas where their primary prey (native ants) are found. They have been documented from Whitewater Canyon to the east and from the vicinity of Cabazon to the southwest. Coast horned lizard was not observed on the site although habitat throughout the Mesa Wind site is suitable.

Bats. The BLM includes several bat species on its list of sensitive species. Four bat species detected on the Mesa Wind site are managed as BLM sensitive species: Pallid bat, Townsend's big-eared bat, fringed myotis, and Yuma myotis. One additional BLM sensitive bat species, western mastiff bat, was recorded in 2016 at a nearby wind project site. In addition, several of the bats known from the project vicinity are CDFW "Special Animals" (2018) as described below. The special-status bats of the local area roost in rock crevices, tunnels, or caves and one species (western yellow bat) roosts in the foliage of riparian trees. Roost sites may be used seasonally (e.g., inactive cool seasons) or daily (day roosts, used during inactive daylight hours). Maternity roosts are particularly important overall for bat life histories. Knowledge of bat distributions and occurrences is sparse. Bat life histories vary widely. Some species hibernate during winter or migrate south. During the breeding season, bats generally roost during the day, either alone or in communal roost sites, depending on species. All special-status regional bats are insectivorous, catching their prey either on the wing or on the ground. Some species feed mainly over open water where insect production is especially high, but others forage over open shrublands such as those found on the Mesa Wind site. Several special-status bats, including BLM sensitive species, are likely to forage over the site or fly over the site en route to foraging habitat elsewhere (Table 4). The metal lattice towers, disused turbines, and electrical vaults may provide some roosting habitat for common bat species, but the likelihood of sensitive bat species roosting on-site is low. The USGS Mineral Resources Data System (2019) reports several mines in the project vicinity including unnamed gravel pits, the Super Creek Quarry, and the Painted Hills Quarry. All of these are open pits or quarries, rather than subterranean mines. MRDS also reports gold claims or prospects on the site or in the vicinity but does not indicated active or abandoned mines at the claim sites. There is a vertical excavation about 4 feet wide and 10-15 feet deep in the northeastern part of the site and a horizontal excavation off-site about 0.5 mile northeast of the O&M building (R. Griese pers. comm.; see Figure 2). We are not aware of any caves or subterranean mines on the site or in the vicinity.

Other Special-Status Wildlife Species

In addition to the statutes and policies described above, several public agencies and private entities maintain lists of wildlife species of conservation concern. The CDFW compiles these in its compendium of "Special Animals" (2018). These species are treated here as special-status species.

Crotch Bumble Bee. Crotch bumble bee is a widespread secretive species that is known from more than two hundred locations over a broad geographic range (CNDDB 2019). It is typically found in openings in grassland and scrub habitats where it burrows into the ground and lives in colonies. It feeds on native plants including milkweed, pincushion, lupine, phacelia, sage, snapdragon, clarkia, bush poppy, and buckwheat. Many of these food plants are present in the vicinity of the Mesa Wind site and suitable burrowing or foraging is also present. Crotch bumblebee has a moderate potential to be present on the site.

Red Diamond Rattlesnake. Red diamond rattlesnakes live between sea level and about 5000 feet elevation throughout most of Orange County and western Riverside County, south through San Diego and Baja

California and inland to the Colorado Desert margins. Their habitats include coastal sage scrub, chaparral, and woodlands through most of their geographic range, and desert scrub at the eastern margins of their range. They are generally found around boulders and rock outcrops (Klauber 1972; Zeiner et al. 1988; Stebbins 2003). There are numerous records of red diamond rattlesnakes from Whitewater Canyon just east of the project disturbance area. Red diamond rattlesnakes have not been reported on the site, but habitat throughout the site appears suitable.

Raptors. In addition to the raptors discussed above, several other special-status birds of prey are found seasonally in the region, especially during winter and during migration. These include osprey, ferruginous hawk, Cooper's hawk, sharp-shinned hawk, northern harrier, prairie falcon, merlin, and long-eared owl (Table 4). All these species were observed migrating over the Mesa Wind site during surveys summarized here. None of these raptors are expected to nest on the site due to lack of suitable habitat, but all of them are expected to fly over the site and occasionally forage on the site. Suitable winter or migratory season foraging habitat for all of these raptors is widely available throughout the region.

Upland Perching Birds. Several upland perching bird species are included in the CDFW Special Animals compilation (2018). These include Costa's hummingbird, loggerhead shrike, LeConte's thrasher*,* black-tailed gnatcatcher*,* California horned lark, southern California rufous-crowned sparrow, and Lawrence's goldfinch*.* All of these species have been observed on the site during field surveys summarized in this report or are likely to occur on the site (based on their habitat and geographic range).

Migratory Riparian/Wetland Birds. Three additional special-status bird species were observed migrating over the project area during bird surveys: yellow warbler, Vaux's swift, and white-faced ibis.

Other Mammals. Several mammal species range widely through desert habitats, either among partially isolated mountain ranges (e.g., Desert bighorn sheep, above) or more often in valleys. These include American badger and desert kit fox. Desert kit fox is not listed as a special-status species by CDFW or USFWS, but it is protected under the California Code of Regulations (Title 14, § 460). Several American badger burrows were observed on the site in 2019 (see Figure 4, Field Survey Coverage and Results). Desert kit fox, although not observed, has a moderate to high probability of occurring on the site. Two special-status bats (in addition to the BLM sensitive bats addressed above) were detected on the site: pocketed free-tailed bat and western red bat.

3.3 Native Birds: Migratory Bird Treaty Act / California Fish and Game Code

The federal MBTA prohibits take of any migratory bird, including eggs or active nests, except as permitted by regulation (e.g., licensed hunting of waterfowl or upland game species). Under the MBTA, "migratory bird" is broadly defined as "any species or family of birds that live, reproduce or migrate within or across international borders at some point during their annual life cycle" and thus applies to most native bird species. California Fish and Game Code Section 3503 prohibits take, possession, or needless destruction of bird nests or eggs; Section 3503.5 prohibits take or possession of birds of prey or their eggs; and Section 3513 prohibits take or possession of any migratory nongame bird. With the exception of a few non-native birds such as European starling, the take of any birds or loss of active bird nests or young is regulated by these statutes. Most of these species have no other special conservation status as defined above.

The entire Mesa Wind site and surrounding area provides suitable nesting habitat for numerous resident and migratory bird species. BBI (2013a) reported a total of 90 species observed.

Many adult birds would flee from equipment during project construction; however, nestlings and eggs would be vulnerable. If initial site grading or brush removal were to take place during nesting season, then it would likely destroy bird nests, including eggs or nestling birds. For most birds, these impacts can be avoided by scheduling initial clearing and grading outside the nesting season. Or, if initial clearing and grading are undertaken during nesting season, work may be limited only to areas where no nesting birds are present, as documented by pre-construction nest surveys. One special-status species, the burrowing owl, is unlikely to flee the site during construction, even outside the nesting season, due to its characteristic behavior of taking cover in burrows. Avoidance of burrowing owls during initial clearing and grading necessitates pre-construction surveys for active burrows, and follow-up measures to "passively relocate" the owls if they are present. Passive relocation may require authorization from CDFW.

Some birds will be likely to nest in the project disturbance area during construction, even after initial grading and clearing. Depending on the species, birds may nest on the ground close to equipment; within the existing lattice structures; on foundations, structures, or construction trailers; or on idle vehicles or construction equipment left overnight or during a long weekend. The species most likely to nest in the project disturbance area during construction are common ravens, house finches, and mourning doves, all of which are protected by the MBTA and Fish and Game Code. Due to the high probability that birds may nest on site during construction, regular monitoring and nest site management may be necessary throughout the breeding season. Due to documented predation by common ravens on hatchling and juvenile desert tortoises, it is noteworthy that common ravens are seen regularly throughout the Project site and may use existing structures on the site for nesting. BBI (2013a) reported more than 1,800 common raven observations during their surveys, more than almost any other species observed.

Bird Migration in the San Gorgonio Pass

The San Gorgonio Pass is a high-use nocturnal flyway for migratory songbirds and possibly for migratory bats. Using a combination of electronic visual and radar technologies, McCrary et al. (1983) estimated 32 million birds flew through the Coachella Valley during spring of 1982, and recorded rates of 5,000–10,000 birds per hour through the Valley. A large proportion of these migratory birds would have migrated through the San Gorgonio Pass, at the northwest margin of the Coachella Valley. Migrating birds were recorded at altitudes ranging from 19 m to 1,483 m. Most migration was below 400 m (65%) and 12.9% was below 100 m.

3.4 Vegetation and Habitat

Vegetation mapping units (Figure 6), descriptions and names are based on alliance level nomenclature of Sawyer et al. (2009). Each vegetation type is also defined according to Holland (1986) and to Mayer and Laudenslayer (1988) whenever possible. One of the vegetation types (desert willow woodland) identified on the Mesa Wind access route, but not on the Project site, is classified as sensitive (CDFG 2020). Common names of plant species are used throughout the following descriptions; Latin names for each species may be found in Attachment 4 (Species List).

Brittlebush Scrub (*Encelia farinosa* Shrubland Alliance)**.** This vegetation is characterized by the dominance of brittlebush. It is the most abundant vegetation on site and is found primarily on exposed, west- and south-facing slopes. Many other species were observed within brittlebush scrub but were present in either low numbers or in small patches. Other species observed included California jointfir, cheesebush, California buckwheat, beavertail cactus, Mojave yucca, and chaparral yucca. Brittlebush is a common to dominant species in desert shrublands and in coastal scrub of the interior valleys west of the project vicinity. On the study area, brittlebush scrub is similar to descriptions of Riversidean Sage Scrub (Holland 1986), Coastal Scrub (De Becker 1988) and Desert Scrub (Laudenslayer and Boggs 1988).

California Juniper Woodland (*Juniperus californica* Woodland Alliance)**.** This vegetation is characterized by the dominance of California juniper. Within the site it is found primarily on north-facing slopes and in the lower portions of several of the drainages. Additional species observed within juniper woodland include sugar sumac, Parry's jujube, chamise, California buckwheat, Mojave yucca, and narrow-leaved goldenbush. This vegetation matches descriptions of Semi-Desert Chaparral and Cismontane Juniper Woodland and Scrub (Holland 1986) and best matches the habitat description for Mixed Chaparral (England 1988).

California Sagebrush–California Buckwheat Scrub (*Artemisia californica–Eriogonum fasciculatum* Shrubland Alliance**).** This vegetation is characterized by the co-dominance of California sagebrush and California buckwheat. Within the site it is most common on disturbed soils such as along road cuts and adjacent to graded areas. Additional species, similar to those listed above in brittlebush scrub, are also found in low numbers. This vegetation matches descriptions of Riversidean Sage Scrub and Upper Sonoran Subshrub Scrub (Holland 1986) and best matches the habitat description for Coastal Scrub (De Becker 1988).

Creosote Bush–Brittlebush Scrub (*Larrea tridentate–Encelia farinosa* Shrubland Alliance**).** This vegetation is characterized by the co-dominance of creosote bush and brittlebush. It is found primarily on the eastern portion of the site on areas with relatively flat topography. Other species present include white bursage, Parry's jujube, Mojave yucca, narrow-leaved goldenbush, silver cholla, and California buckwheat. This vegetation best matches the description of Sonoran Creosote Bush Scrub (Holland 1986) and the habitat description of Desert Scrub (Laudenslayer and Boggs 1988).

Desert Willow Woodland (*Chilopsis linearis* Woodland Alliance). This vegetation is characterized by the dominance of desert willow. It is not found within the limits of the Mesa Wind ROW but is along the access road, west of the site where the road crosses Cottonwood Creek. Other species observed within this vegetation include California broomsage, cheesebush, brittlebush, and punctate rabbit-brush. This vegetation best matches the description of Mojave Desert Wash Scrub (Holland 1986) and Desert Wash (Laudenslayer 1988). Desert willow woodland has a State rank of S3 which indicates that it is a sensitive natural community and impacts should be addressed during the CEQA review process (CDFW 2020).

Unvegetated/Ruderal. The remainder of the study area is occupied by roads, cleared areas, and building or O&M pads for the existing wind turbines. These areas are primarily unvegetated but there are some ruderal species present, including red brome, red-stemmed filaree, and schismus grass. In addition, there are several native shrubs on and adjacent to the building pads, such as California buckwheat, narrow-leaved goldenbush, and deerweed. These areas do not match published vegetation descriptions.

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Attachment 1 – Figures

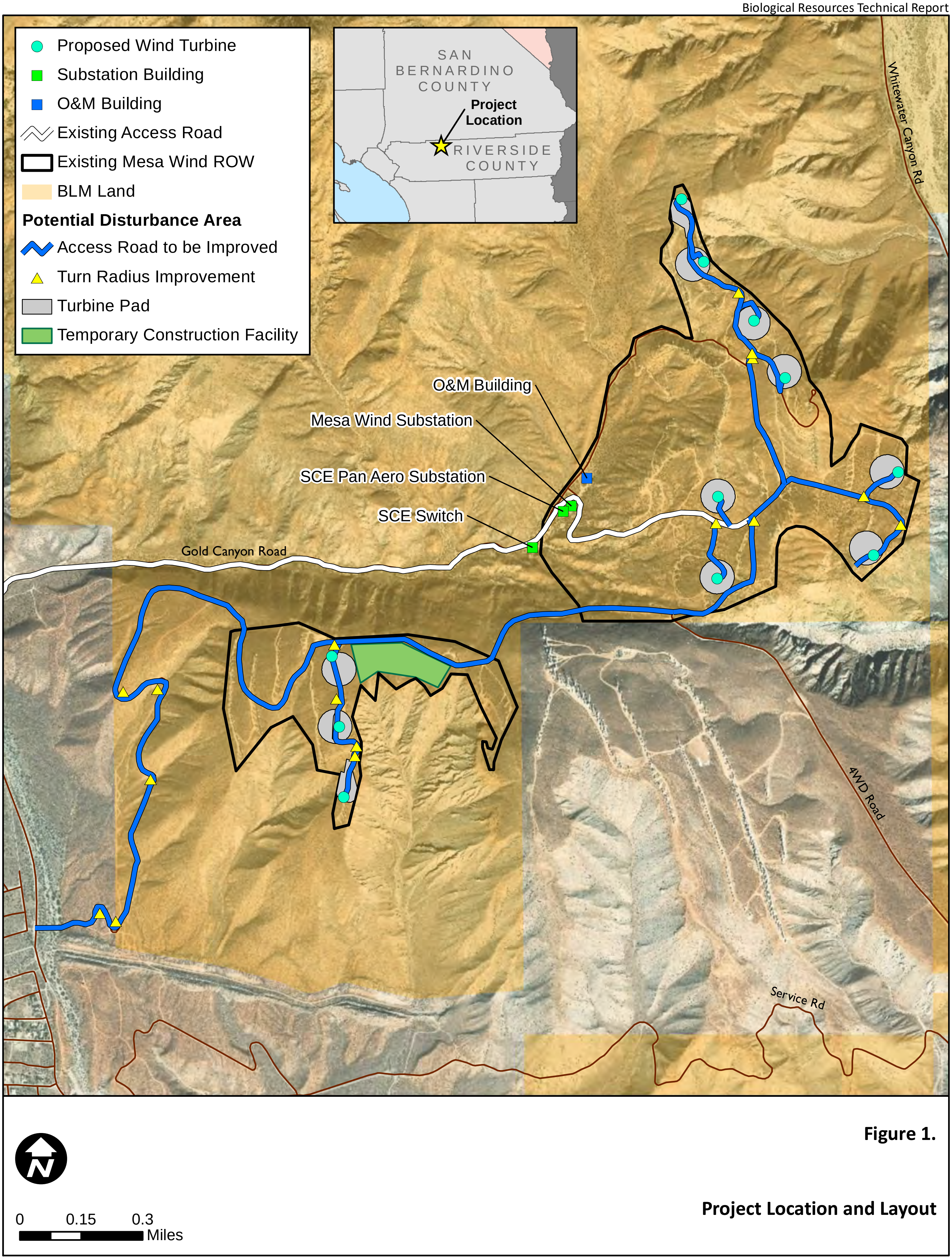


Figure 1.

Project Location and Layout

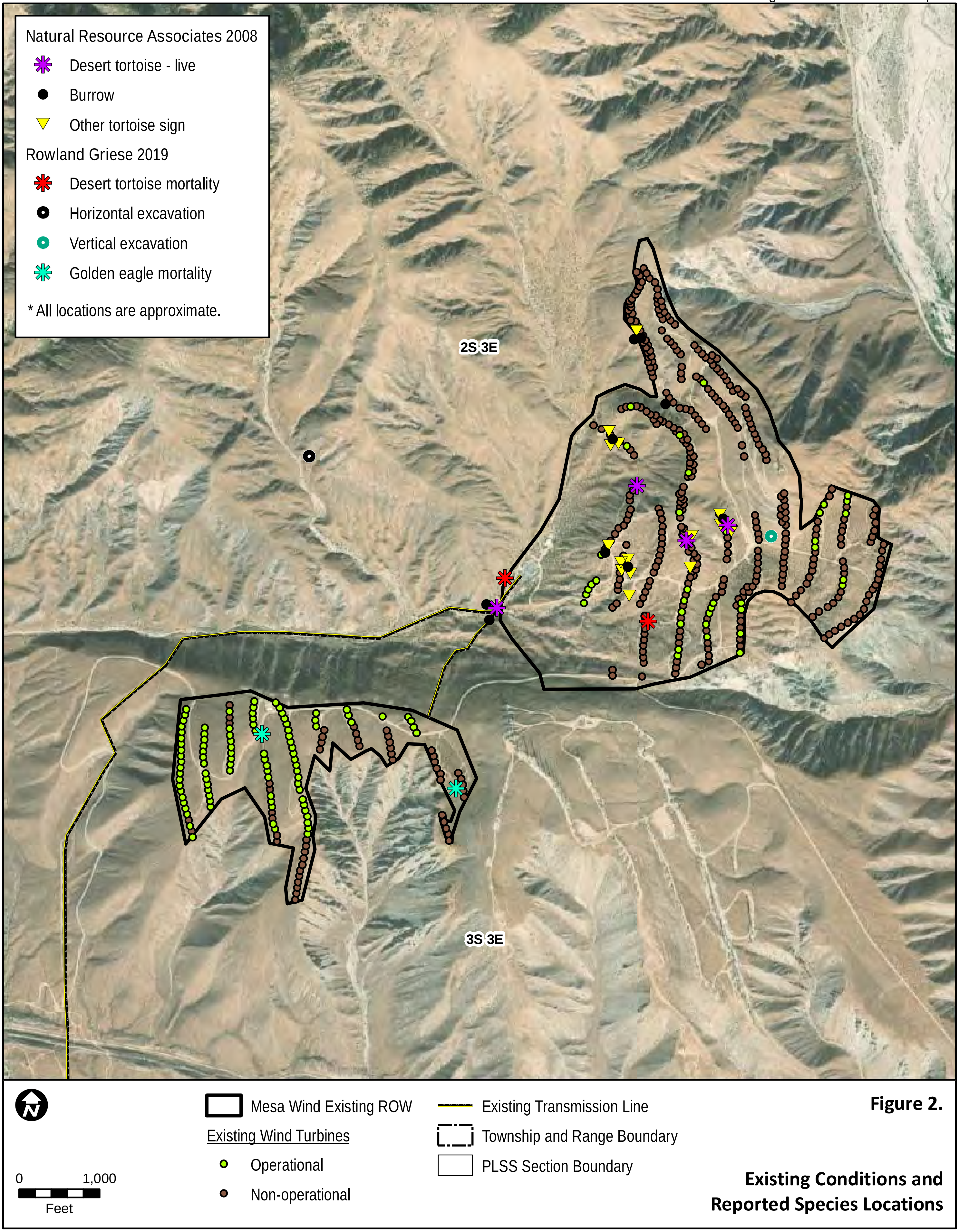


Figure 2.

Existing Conditions and Reported Species Locations

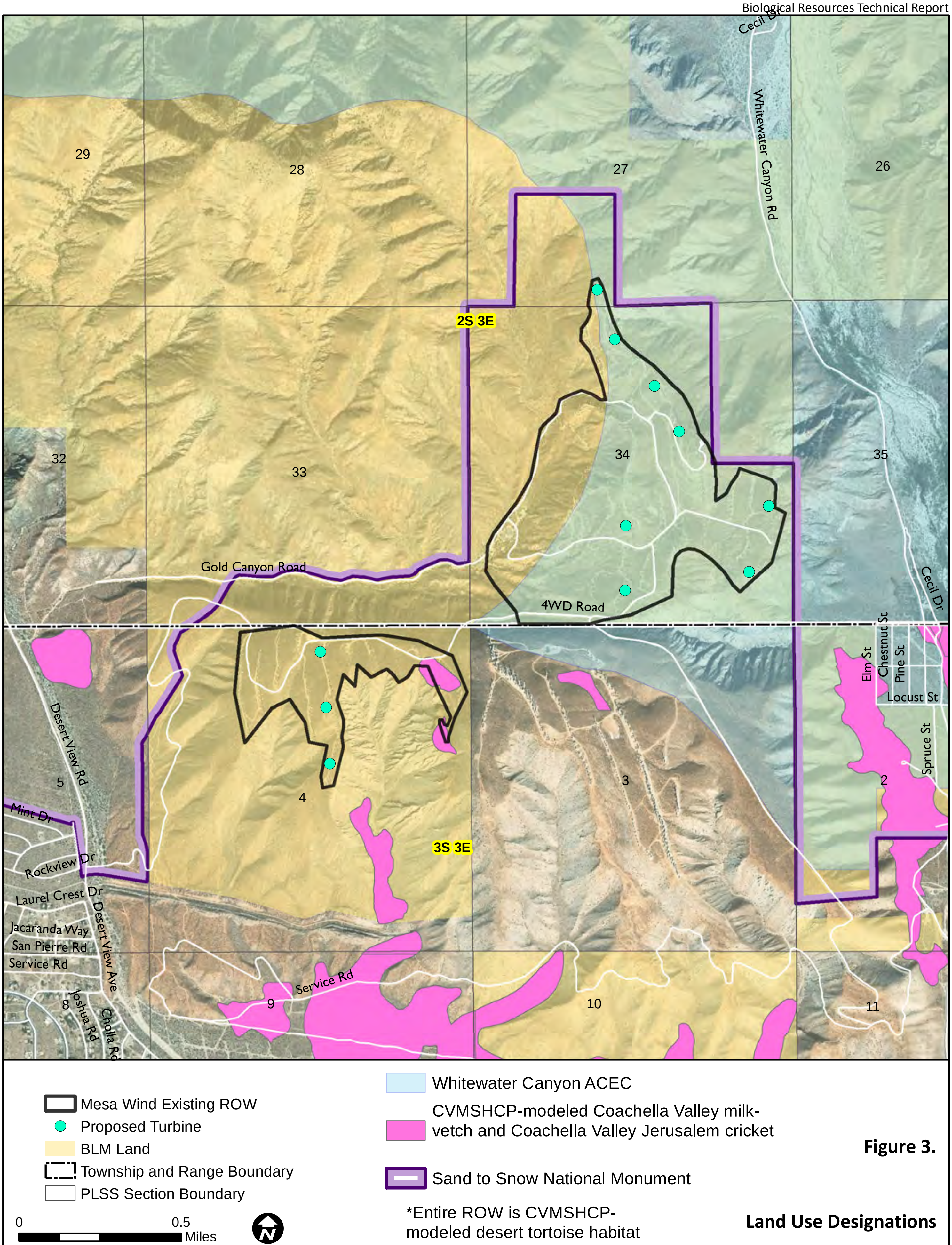


Figure 3.

Land Use Designations

March 2020

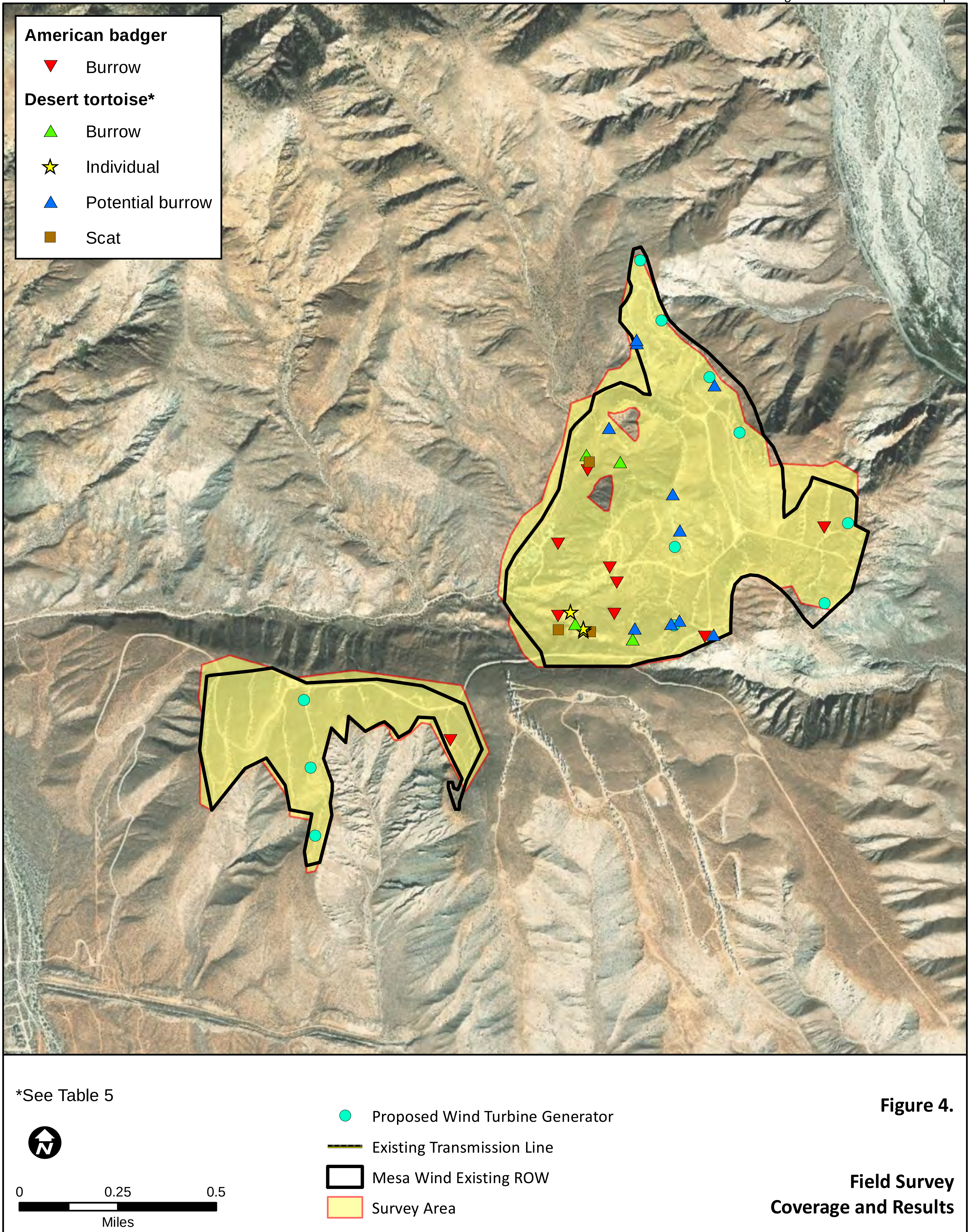
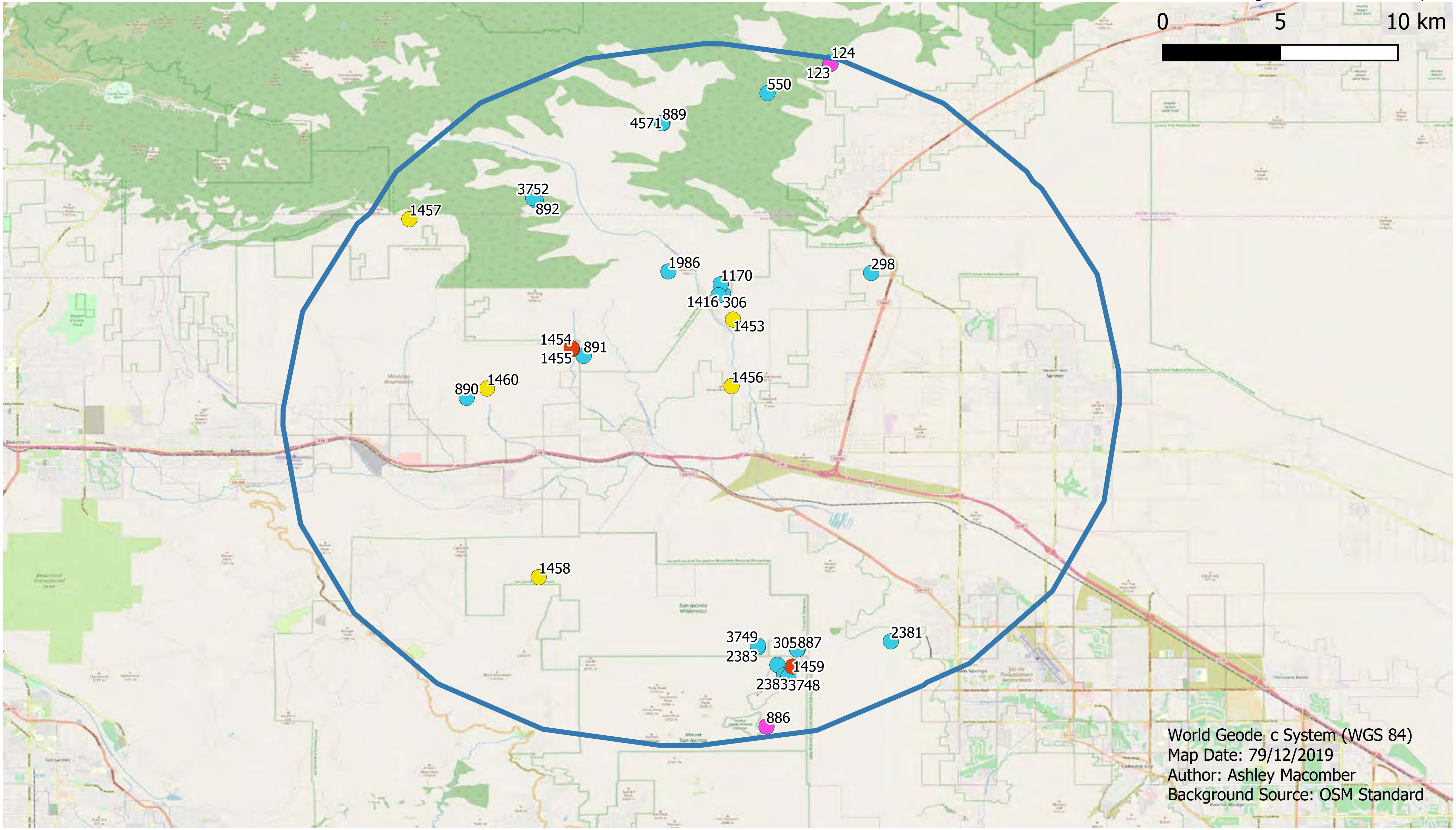


Figure 4.

Field Survey Coverage and Results



MESA_10_mile_buffer
Active GOEA Nests*
New GOEA Nests (Inactive)*
New Potential Future GOEA Nests (currently other species)*
Confirmed Historical GOEA Nests (Inactive)*

* see Table 1 for further information

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Figure 5.

Golden Eagle Nest Survey Results 2019

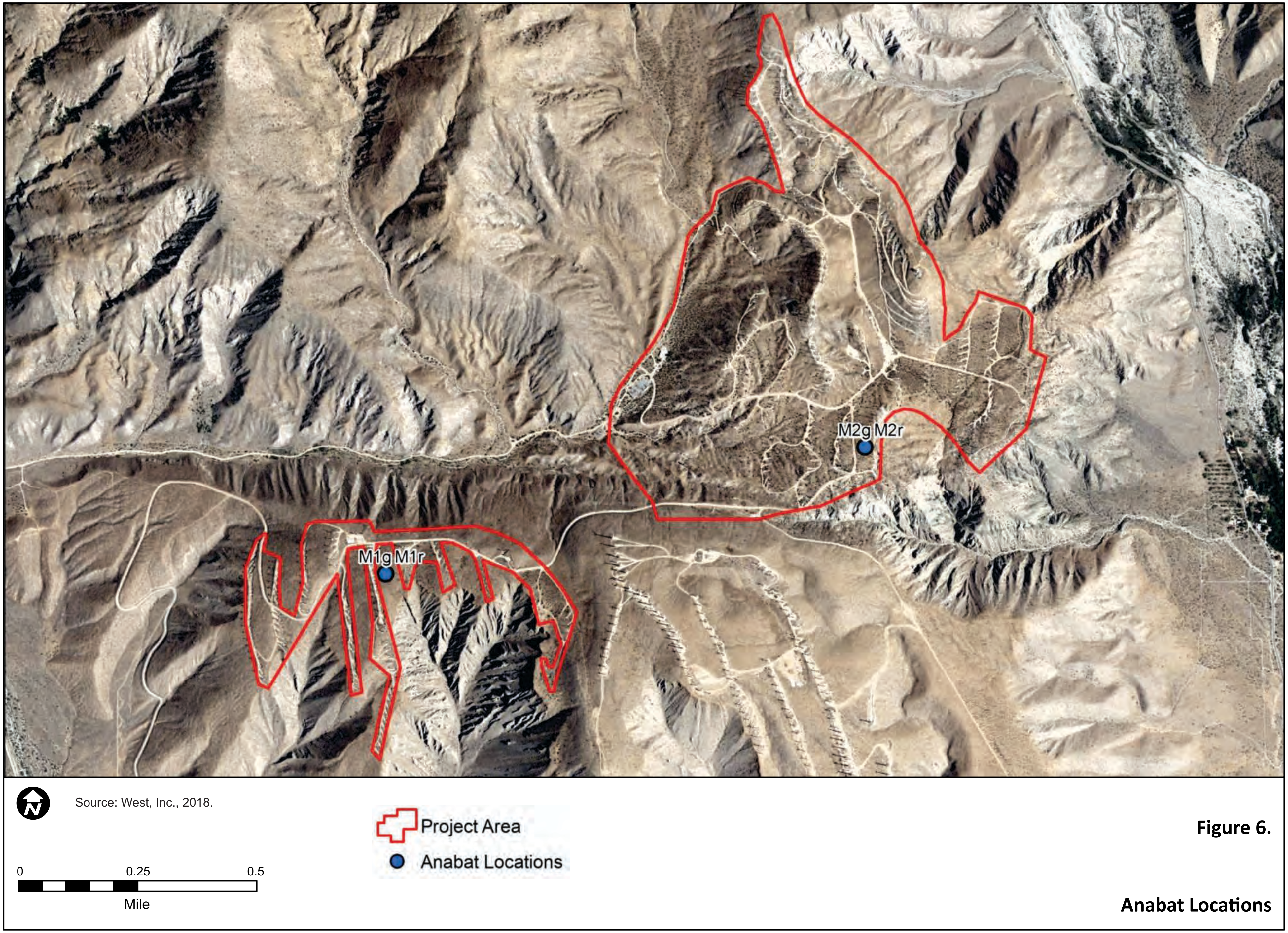


Figure 6.

Anabat Locations

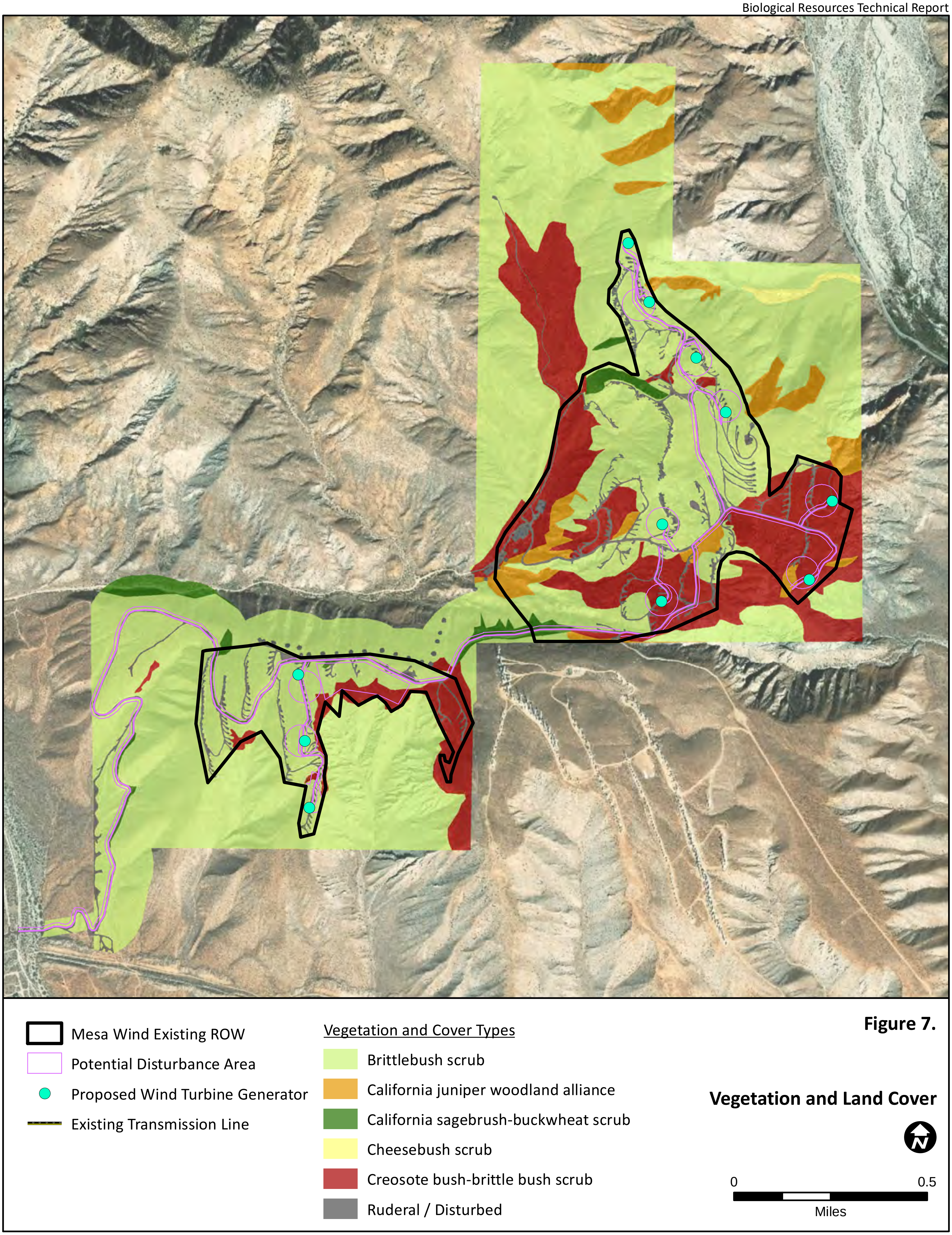
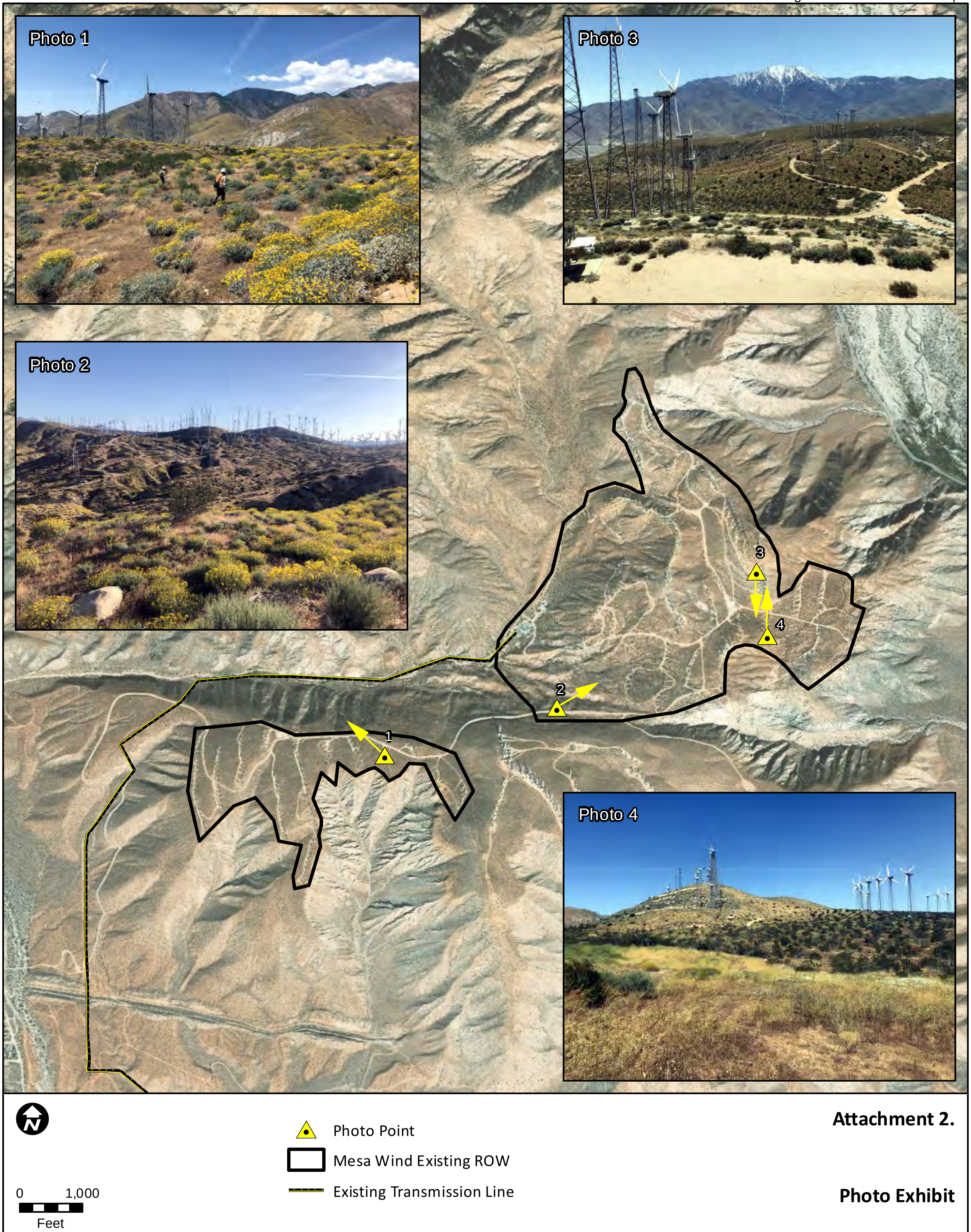


Figure 7.

Vegetation and Land Cover

Attachment 2 – Photo Exhibit



Attachment 2.

Photo Exhibit

Attachment 3 – California Natural Diversity Data Base Records

Query Criteria: Quad IS (Cabazon (3311687) OR Catclaw Flat (3411616) OR Desert Hot Springs (3311685) OR Lake Fulmor (3311677) OR Morongo Valley (3411615) OR Palm Springs (3311675) OR San Gorgonio Mtn. (3411617) OR San Jacinto Peak (3311676) OR White Water (3311686))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Abronia villosa var. aurita chaparral sand-verbena	PDNYC010P1	None	None	G5T2?	S2	1B.1
Accipiter cooperii Cooper's hawk	ABNKC12040	None	None	G5	S4	WL
Acmispon haydonii pygmy lotus	PDFAB2A0H0	None	None	G3	S3	1B.3
Aimophila ruficeps canescens southern California rufous-crowned sparrow	ABPBX91091	None	None	G5T3	S3	WL
Allium marvinii Yucaipa onion	PMLIL02330	None	None	G1	S1	1B.2
Almutaster pauciflorus alkali marsh aster	PDASTEL010	None	None	G4	S1S2	2B.2
Ambrosia monogyra singlewhorl burrobrush	PDAST50010	None	None	G5	S2	2B.2
Anniella stebbinsi southern California legless lizard	ARACC01060	None	None	G3	S3	SSC
Antennaria marginata white-margined everlasting	PDAST0H1G0	None	None	G4G5	S1	2B.3
Antrozous pallidus pallid bat	AMACC10010	None	None	G5	S3	SSC
Aquila chrysaetos golden eagle	ABNKC22010	None	None	G5	S3	FP
Arenaria lanuginosa var. saxosa rock sandwort	PDCAR040E4	None	None	G5T5	S2	2B.3
Arizona elegans occidentalis California glossy snake	ARADB01017	None	None	G5T2	S2	SSC
Asio otus long-eared owl	ABNSB13010	None	None	G5	S3?	SSC
Aspidoscelis hyperythra orange-throated whiptail	ARACJ02060	None	None	G5	S2S3	WL
Aspidoscelis tigris stejnegeri coastal whiptail	ARACJ02143	None	None	G5T5	S3	SSC
Astragalus lentiginosus var. coachellae Coachella Valley milk-vetch	PDFAB0FB97	Endangered	None	G5T1	S1	1B.2
Astragalus pachypus var. jaegeri Jaeger's milk-vetch	PDFAB0F6G1	None	None	G4T1	S1	1B.1

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Astragalus tricarinatus triple-ribbed milk-vetch	PDFAB0F920	Endangered	None	G2	S2	1B.2
Athene cunicularia burrowing owl	ABNSB10010	None	None	G4	S3	SSC
Atriplex parishii Parish's brittlescale	PDCHE041D0	None	None	G1G2	S1	1B.1
Ayenia compacta California ayenia	PDSTE01020	None	None	G4	S3	2B.3
Boechera johnstonii Johnston's rockcress	PDBRA060Y0	None	None	G1	S1	1B.2
Boechera lincolnensis Lincoln rockcress	PDBRA061M3	None	None	G4G5	S3	2B.3
Boechera parishii Parish's rockcress	PDBRA061C0	None	None	G2	S2	1B.2
Boechera peirsonii San Bernardino rockcress	PDBRA06053	None	None	G1	S1	1B.2
Bombus caliginosus obscure bumble bee	IIHYM24380	None	None	G4?	S1S2	
Bombus crotchii Crotch bumble bee	IIHYM24480	None	None	G3G4	S1S2	
Botrychium crenulatum scalloped moonwort	PPOPH010L0	None	None	G4	S3	2B.2
Buteo regalis ferruginous hawk	ABNKC19120	None	None	G4	S3S4	WL
Calileptoneta oasa Andreas Canyon leptonetid spider	ILARAU6020	None	None	G1	S1	
Calochortus palmeri var. munzii San Jacinto mariposa-lily	PMLIL0D121	None	None	G3T3	S3	1B.2
Calochortus palmeri var. palmeri Palmer's mariposa-lily	PMLIL0D122	None	None	G3T2	S2	1B.2
Calochortus plummerae Plummer's mariposa-lily	PMLIL0D150	None	None	G4	S4	4.2
Carex occidentalis western sedge	PMCYP039M0	None	None	G4	S3	2B.3
Castilleja lasiorhyncha San Bernardino Mountains owl's-clover	PDSCR0D410	None	None	G2?	S2?	1B.2
Caulanthus simulans Payson's jewelflower	PDBRA0M0H0	None	None	G4	S4	4.2
Chaenactis parishii Parish's chaenactis	PDAST200D0	None	None	G3G4	S3	1B.3
Chaetodipus californicus femoralis Dulzura pocket mouse	AMAFD05021	None	None	G5T3	S3	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Chaetodipus fallax fallax northwestern San Diego pocket mouse	AMAFD05031	None	None	G5T3T4	S3S4	SSC
Chaetodipus fallax pallidus pallid San Diego pocket mouse	AMAFD05032	None	None	G5T34	S3S4	SSC
Charina umbratica southern rubber boa	ARADA01011	None	Threatened	G2G3	S2S3	
Chorizanthe parryi var. parryi Parry's spineflower	PDPGN040J2	None	None	G3T2	S2	1B.1
Chorizanthe xanti var. leucotheca white-bracted spineflower	PDPGN040Z1	None	None	G4T3	S3	1B.2
Corynorhinus townsendii Townsend's big-eared bat	AMACC08010	None	None	G3G4	S2	SSC
Crotalus ruber red-diamond rattlesnake	ARADE02090	None	None	G4	S3	SSC
Cypseloides niger black swift	ABNUA01010	None	None	G4	S2	SSC
Deinandra mohavensis Mojave tarplant	PDAST4R0K0	None	Endangered	G2	S2	1B.3
Desert Fan Palm Oasis Woodland Desert Fan Palm Oasis Woodland	CTT62300CA	None	None	G3	S3.2	
Dinacoma caseyi Casey's June beetle	IICOLX5010	Endangered	None	G1	S1	
Dipodomys merriami parvus San Bernardino kangaroo rat	AMAFD03143	Endangered	None	G5T1	S1	SSC
Dodecahema leptoceras slender-horned spineflower	PDPGN0V010	Endangered	Endangered	G1	S1	1B.1
Draba saxosa Southern California rock draba	PDBRA110Q2	None	None	G2G3	S2S3	1B.3
Ensatina eschscholtzii klauberi large-blotched salamander	AAAAD04013	None	None	G5T2?	S3	WL
Eremarionta morongoana Morongo (=Colorado) desertsnail	IMGASB9070	None	None	G1G3	S1	
Eriastrum harwoodii Harwood's eriastrum	PDPLM030B1	None	None	G2	S2	1B.2
Eriogonum kennedyi var. alpigenum southern alpine buckwheat	PDPGN083B1	None	None	G4T3	S3	1B.3
Euphorbia arizonica Arizona spurge	PDEUP0D060	None	None	G5	S3	2B.3
Euphorbia misera cliff spurge	PDEUP0Q1B0	None	None	G5	S2	2B.2
Falco mexicanus prairie falcon	ABNKD06090	None	None	G5	S4	WL

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Galium angustifolium ssp. jacinticum San Jacinto Mountains bedstraw	PDRUB0N04C	None	None	G5T2?	S2?	1B.3
Galium californicum ssp. primum Alvin Meadow bedstraw	PDRUB0N0E6	None	None	G5T2	S2	1B.2
Glaucomys oregonensis californicus San Bernardino flying squirrel	AMAFB09021	None	None	G5T1T2	S1S2	SSC
Gopherus agassizii desert tortoise	ARAAF01012	Threatened	Threatened	G3	S2S3	
Halictus harmonius haromonius halictid bee	IIHYM75010	None	None	G1	S1	
Heuchera hirsutissima shaggy-haired alumroot	PDSAX0E0J0	None	None	G3	S3	1B.3
Heuchera parishii Parish's alumroot	PDSAX0E0S0	None	None	G3	S3	1B.3
Horkelia cuneata var. puberula mesa horkelia	PDROS0W045	None	None	G4T1	S1	1B.1
Hulsea vestita ssp. pygmaea pygmy hulsea	PDAST4Z077	None	None	G5T1	S1	1B.3
Icteria virens yellow-breasted chat	ABPBX24010	None	None	G5	S3	SSC
Imperata brevifolia California satintail	PMPOA3D020	None	None	G4	S3	2B.1
Ivesia argyrocoma var. argyrocoma silver-haired ivesia	PDROS0X021	None	None	G2T2	S2	1B.2
Ivesia callida Tahquitz ivesia	PDROS0X040	None	Rare	G1	S1	1B.3
Lampropeltis zonata (parvirubra) California mountain kingsnake (San Bernardino population)	ARADB19062	None	None	G4G5	S2?	WL
Lanius ludovicianus loggerhead shrike	ABPBR01030	None	None	G4	S4	SSC
Lasiurus xanthinus western yellow bat	AMACC05070	None	None	G5	S3	SSC
Lilium parryi lemon lily	PMLIL1A0J0	None	None	G3	S3	1B.2
Linanthus jaegeri San Jacinto linanthus	PDPLM08030	None	None	G2	S2	1B.2
Linanthus maculatus ssp. maculatus Little San Bernardino Mtns. linanthus	PDPLM041Y1	None	None	G2T2	S2	1B.2
Macrobaenetes valgum Coachella giant sand treader cricket	IIORT22020	None	None	G1G2	S1S2	
Malaxis monophyllos var. brachypoda white bog adder's-mouth	PMORC1R010	None	None	G4?T4	S1	2B.1

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Meesia uliginosa broad-nerved hump moss	NBMUS4L030	None	None	G5	S3	2B.2
Mentzelia tricuspis spiny-hair blazing star	PDLOA031T0	None	None	G4	S2	2B.1
Mesquite Bosque Mesquite Bosque	CTT61820CA	None	None	G3	S2.1	
Mojave Riparian Forest Mojave Riparian Forest	CTT61700CA	None	None	G1	S1.1	
Monardella nana ssp. leptosiphon San Felipe monardella	PDLAM180F2	None	None	G4G5T2Q	S2	1B.2
Monardella robisonii Robison's monardella	PDLAM180K0	None	None	G3	S3	1B.3
Myiarchus tyrannulus brown-crested flycatcher	ABPAE43080	None	None	G5	S3	WL
Nemacaulis denudata var. gracilis slender cottonheads	PDPGN0G012	None	None	G3G4T3?	S2	2B.2
Neotamias speciosus speciosus lodgepole chipmunk	AMAFB02172	None	None	G4T2T3	S2S3	
Neotoma lepida intermedia San Diego desert woodrat	AMAFF08041	None	None	G5T3T4	S3S4	SSC
Nyctinomops femorosaccus pocketed free-tailed bat	AMACD04010	None	None	G4	S3	SSC
Nyctinomops macrotis big free-tailed bat	AMACD04020	None	None	G5	S3	SSC
Onychomys torridus ramona southern grasshopper mouse	AMAFF06022	None	None	G5T3	S3	SSC
Oreonana vestita woolly mountain-parsley	PDAPI1G030	None	None	G3	S3	1B.3
Ovis canadensis nelsoni desert bighorn sheep	AMALE04013	None	None	G4T4	S3	FP
Ovis canadensis nelsoni pop. 2 Peninsular bighorn sheep DPS	AMALE04012	Endangered	Threatened	G4T3Q	S1	FP
Oxytropis oreophila var. oreophila rock-loving oxytrope	PDFAB2X0H3	None	None	G5T4T5	S2	2B.3
Parnassia cirrata var. cirrata San Bernardino grass-of-Parnassus	PDSAX0P030	None	None	G5T2	S2	1B.3
Parnopes borregoensis Borrego parnopes cuckoo wasp	IIHYM73010	None	None	G1G2	S1S2	
Penstemon pseudospectabilis ssp. pseudospectabilis desert beardtongue	PDSCR1L562	None	None	G4G5T4	S3	2B.2
Perognathus longimembris bangsi Palm Springs pocket mouse	AMAFD01043	None	None	G5T2	S2	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Perognathus longimembris brevinasus Los Angeles pocket mouse	AMAFD01041	None	None	G5T1T2	S1S2	SSC
Petalonyx linearis narrow-leaf sandpaper-plant	PDLOA04010	None	None	G4	S3?	2B.3
Phrynosoma blainvillii coast horned lizard	ARACF12100	None	None	G3G4	S3S4	SSC
Phrynosoma mcallii flat-tailed horned lizard	ARACF12040	None	None	G3	S2	SSC
Piranga rubra summer tanager	ABPBX45030	None	None	G5	S1	SSC
Polioptila californica californica coastal California gnatcatcher	ABPBJ08081	Threatened	None	G4G5T2Q	S2	SSC
Polioptila melanura black-tailed gnatcatcher	ABPBJ08030	None	None	G5	S3S4	WL
Potentilla rimicola cliff cinquefoil	PDROS1B2G0	None	None	G2	S1	2B.3
Progne subis purple martin	ABPAU01010	None	None	G5	S3	SSC
Psiloscops flammeolus flammulated owl	ABNSB01020	None	None	G4	S2S4	
Pyrocephalus rubinus vermilion flycatcher	ABPAE36010	None	None	G5	S2S3	SSC
Rana draytonii California red-legged frog	AAABH01022	Threatened	None	G2G3	S2S3	SSC
Rana muscosa southern mountain yellow-legged frog	AAABH01330	Endangered	Endangered	G1	S1	WL
Saltugilia latimeri Latimer's woodland-gilia	PDPLM0H010	None	None	G3	S3	1B.2
Selaginella eremophila desert spike-moss	PPSEL010G0	None	None	G4	S2S3	2B.2
Setophaga petechia yellow warbler	ABPBX03010	None	None	G5	S3S4	SSC
Sidalcea malviflora ssp. dolosa Bear Valley checkerbloom	PDMAL110FH	None	None	G5T2	S2	1B.2
Sidotheca emarginata white-margined oxytheca	PDPGN0J030	None	None	G3	S3	1B.3
Silene krantzii Krantz's catchfly	PDCAR0U2H0	None	None	G1	S1	1B.2
Southern Coast Live Oak Riparian Forest Southern Coast Live Oak Riparian Forest	CTT61310CA	None	None	G4	S4	
Southern Cottonwood Willow Riparian Forest Southern Cottonwood Willow Riparian Forest	CTT61330CA	None	None	G3	S3.2	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Southern Mixed Riparian Forest Southern Mixed Riparian Forest	CTT61340CA	None	None	G2	S2.1	
Southern Riparian Forest Southern Riparian Forest	CTT61300CA	None	None	G4	S4	
Stemodia durantifolia purple stemodia	PDSCR1U010	None	None	G5	S2	2B.1
Stenopelmatus cahuilaensis Coachella Valley jerusalem cricket	IIORT26010	None	None	G1G2	S1S2	
Streptanthus bernardinus Laguna Mountains jewelflower	PDBRA2G060	None	None	G3G4	S3S4	4.3
Streptanthus campestris southern jewelflower	PDBRA2G0B0	None	None	G3	S3	1B.3
Symphyotrichum defoliatum San Bernardino aster	PDASTE80C0	None	None	G2	S2	1B.2
Taraxacum californicum California dandelion	PDAST93050	Endangered	None	G1G2	S1S2	1B.1
Taxidea taxus American badger	AMAJF04010	None	None	G5	S3	SSC
Thamnophis hammondii two-striped gartersnake	ARADB36160	None	None	G4	S3S4	SSC
Thelypteris puberula var. sonorensis Sonoran maiden fern	PPTHE05192	None	None	G5T3	S2	2B.2
Toxostoma crissale Crissal thrasher	ABPBK06090	None	None	G5	S3	SSC
Toxostoma lecontei Le Conte's thrasher	ABPBK06100	None	None	G4	S3	SSC
Trichostema austromontanum ssp. compactum Hidden Lake bluecurls	PDLAM22022	Delisted	None	G3G4T1	S1	1B.1
Uma inornata Coachella Valley fringe-toed lizard	ARACF15010	Threatened	Endangered	G1Q	S1	
Vireo bellii pusillus least Bell's vireo	ABPBW01114	Endangered	Endangered	G5T2	S2	
Xerospermophilus tereticaudus chlorus Palm Springs round-tailed ground squirrel	AMAFB05161	None	None	G5T2Q	S2	SSC
Xylorhiza cognata Mecca-aster	PDASTA1010	None	None	G2	S2	1B.2

Record Count: 141

Attachment 4 – Species List

	Latin Name	Common Name
	VASCULAR PLANTS	
	Dicotyledons	
	SELAGINELLACEAE	SPIKE-MOSS FAMILY
	Selaginella bigelovii	Bigelow spike moss
	CUPRESSACEAE	CYPRESS FAMILY
	Juniperus californica	California juniper
	EPHEDRACEAE	EPHEDRA FAMILY
	Ephedra californica	Desert tea
1	*Ephedra nevadensis*	Nevada ephedra
	AMARANTHACEAE	AMARANTH FAMILY
*	*Amaranthus albus*	Tumbleweed
	ANACARDIACEAE	SUMAC or CASHEW FAMILY
	Rhus ovata	Sugar bush
	ASTERACEAE	ASTER FAMILY
	Acamptopappus sphaerocephalus	Rayless goldenhead
	Ambrosia acanthicarpa	Annual bur-sage
	Ambrosia dumosa	White bur-sage, burrobush
	Ambrosia salsols	Common burrobrush, cheesebush
	Artemisia californica	California sagebrush
	Bahiopsis parishii	Parish's goldeneye
	Bebbia juncea var. *aspera*	Sweetbush
	Brickellia californica	California brickellbush
	Chaenactis fremontii	Fremont pincushion
	Corethrogyne filaginifolia	California-aster, sand-aster
	Encelia farinosa	Brittlebush
	Encelia frutescens	Rayless encelia
	Encelia virginensis	Virgin River encelia
	Ericameria linearifolia	Interior goldenbush
	Ericameria nauseosa	Common rabbitbrush
	Ericameria paniculata	Black-banded rabbitbrush, punctate rabbitbrush
	Ericameria pinifolia	Pine-bush, pine goldenbush
	Eriophyllum wallacei	Wallace's woolly daisy
	Geraea canescens	Desert-sunflower
	Gutierrezia sarothre	Matchweed
	Isocoma acradenia	Alkali goldenbush
	Lasthenia gracilis	Goldfields
	Lasthenia californica	California goldfields
	Lepidospartum squamatum	Scale-broom
*	*Logfia gallica*	Daggerleaf cottonrose
	Malacothrix glabrata	Desert dandelion
	Rafinesquia neomexicana	Desert chicory
	Stephanomeria exigua	Wreath plant
	Stephanomeria pauciflora	Wire-lettuce, desert straw
	Tetradymia comosa	Hairy horsebrush
	Uropappus lindleyi	Silverpuffs
	BIGNONIACEAE	TRUMPET-CREEPER or JACARANDA FAMILY
	Chilopsis linearis ssp. *arcuata*	Desert-willow
	BORAGINACEAE	BORAGE OR WATERLEAF FAMILY
	Amsinckia intermedia	Large flower rancher's fiddleneck
	Amsinckia tessellata	Checker fiddleneck

	Cryptantha angustifolia	Narrow-leaved cryptantha
	Cryptantha barbigera	Bearded cryptantha
1	*Cryptantha micrantha*	Purpleroot cryptantha
	Cryptantha muricata	Prickly cryptantha
	Emmenanthe penduliflora	Whispering bells
	Eucrypta chrysanthemifolia	Spotted eucrypta
	Heliotropium curassavicum var. *oculatum*	Alkali heliotrope, salt heliotrope
	Nemophila menziesii	Baby blue eyes
	Pectocarya linearis ssp. *ferocula*	Narrow-toothed pectocarya, comb-bur
	Pectocarya platycarpa	Wide-toothed pectocarya, broad-fruited comb-bur
	Phacelia distans	Common phacelia
	Phacelia minor	Wild canterbury bells
BRASSICACEAE		MUSTARD FAMILY
*	*Brassica tournefortii*	Sahara mustard, wild turnip
*	*Hirschfeldia incana*	Shortpod mustard
	Lepidium nitidum	Shining peppergrass
*	*Sisymbrium orientale*	Hare's ear cabbage
	Streptanthella longirostris	Streptanthella
	Tropidocarpum gracile	Slender adobe-pod
CACTACEAE		CACTUS FAMILY
	Cylindropuntia echinocarpa	Silver cholla
	Cylindropuntia ramosissima	Pencil cholla
	Echinocereus engelmannii	Engelmann hedgehog cactus
	Opuntia basilaris var. *basilaris*	Beavertail cactus
CHENOPODIACEAE		GOOSEFOOT FAMILY
	Atriplex canescens	Four-wing saltbush
	Grayia spinosa	Spiny hop-sage
CLEOMACEAE		SPIDERFLOWER FAMILY
	Peritoma arborea	Bladderpod
CRASSULACEAE		STONECROP FAMILY
	Crassula connata	Pygmy-weed
	Dudleya lanceolata	Lance-leaved dudleya
	Dudleya saxosa spp. *aloides*	Desert dudleya
CROSSOSOMATACEAE		CROSSOSOMA FAMILY
	Crossosoma bigelovii	Bigelow's ragged rock flower
CUCURBITACEAE		GOURD FAMILY, CUCUMBER FAMILY
	Marah macrocarpa	Chilicothe, wild cucumber
EUPHORBIACEAE		SPURGE FAMILY
	Stillingia linearifolia	Linear-leaved stillingia
FABACEAE		LEGUME FAMILY, PEA FAMILY
	Acmispon glaber var. *glaber*	Deerweed
1	*Acmispon procumbens*	Silky deerweed
	Acmispon strigosus	Desert lotus
	Lupinus bicolor	Annual lupine
	Lupinus concinnus	Bajada lupine
	Lupinus sparsiflorus	Coulter's lupine
	Lupinus truncatus	Collar lupine
*	*Melilotus indicus*	Sourclover, India sweetclover
	Prosopis glandulosa var. *torreyana*	Honey mesquite
	Psorothamnus emoryi	Emory indigo-bush, dye-weed
	Senegalia greggii	Catclaw acacia

GERANIACEAE		GERANIUM FAMILY
*	*Erodium cicutarium*	Redstem filaree
KRAMERIACEAE		RHATANY FAMILY, KRAMERIA FAMILY
1	*Krameria bicolor*	White rhatany
LAMIACEAE		MINT FAMILY
	Salvia apiana	White sage
	Salvia columbariae	Chia
	Scutellaria mexicana	Bladder-sage, paper bag bush
LOASACEAE		LOASA FAMILY, STICK-LEAF FAMILY
	Mentzelia involucrata	Sand blazing star
MALVACEAE		MALLOW FAMILY
	Sphaeralcea ambigua var. *ambigua*	Apricot mallow, desert mallow
MONTIACEAE		MINER'S LETTUCE FAMILY, MONTIA FAMILY
	Calandrinia ciliata	Red maids
	Calyptridium monandrum	Pussypaws, common calyptridium
NYCTAGINACEAE		FOUR O'CLOCK FAMILY
	Abronia villosa var. *villosa*	Sand verbena
	Mirabilis laevis var. *villosa*	Desert wishbone bush
ONAGRACEAE		EVENING-PRIMROSE FAMILY
	Camissonia campestris	Field evening-primrose
	Camissoniopsis bistorta	California sun cup
	Camissoniopsis pallida	Pale suncup
	Eremothera boothii ssp. *condensata*	Booth's evening primrose
	Eulobus californica	California false mustard
PAPAVERACEAE		POPPY FAMILY
	Eschscholzia parishii	Parish's gold poppy
PLANTAGINACEAE		PLANTAIN FAMILY
	Plantago ovata	Desert plantain
POLEMONIACEAE		PHLOX FAMILY
	Eriastrum eremicum ssp. *eremicum*	Desert woolly-star
1	*Eriastrum sapphirinum*	Sapphire woollystar
	Gilia angelensis	Chaparral gilia, common gilia
	Gilia capitata	Blue field gilia
	Gilia ochroleuca ssp. *exilis*	Volcanic gilia
	Leptosiphon lemmonii	Lemmon's linanthus
	Leptosiphon liniflorus	Flax-flowered linanthus
POLYGONACEAE		BUCKWHEAT FAMILY
	Chorizanthe brevicornu	Brittle spine flower
	Eriogonum elongatum var. *elongatum*	Long-stem wild buckwheat, wand buckwheat
	Eriogonum fasciculatum	California buckwheat
	Eriogonum inflatum	Desert trumpet
	Lastarriaea coriacea	Leather spineflower
RANUNCULACEAE		BUTTERCUP FAMILY
	Delphinium parishii ssp. *parishii*	Parish's larkspur
RHAMNACEAE		BUCKTHORN FAMILY
	Ziziphus parryi var. *parryi*	Parry's jujube, lotebush
ROSACEAE		ROSE FAMILY
	Adenostoma fasciculatum	Chamise
	Prunus ilicifolia	Hollyleaf cherry
SOLANACEAE		NIGHTSHADE FAMILY
	Lycium andersonii	Anderson box-thorn
1	*Lycium cooperi*	Peach desert thorn

ZYGOPHYLLACEAE		CALTROP FAMILY
	Larrea tridentata	Creosote bush
Monocotyledons		
AGAVACEAE		CENTURY PLANT FAMILY, AGAVE FAMILY
	Hesperoyucca whipplei	Chaparral yucca
	Yucca schidigera	Mojave yucca
LILIACEAE		LILY FAMILY
**	*Calochortus plummerae*	Plummer's mariposa lily
POACEAE		GRASS FAMILY
*	*Avena barbata*	Slender wild oat
*	*Bromus berteroanus*	Chilean chess
*	*Bromus madritensis* ssp. *rubens*	Red brome
*	*Bromus tectorum*	Cheat grass
	Festuca microstachys	Small fescue
	Festuca octoflora	Sixweeks grass, slender fescue
	Hilaria rigida	Big galleta
*	*Hordeum murinum*	Wall barley, hare barley
	Poa secunda	Nevada blue grass, nodding blue grass
*	*Schismus barbatus*	Mediterranean schismus
	Stipa hymenoides	Sand rice grass, Indian rice grass
	Stipa speciosa	Desert needle grass
THEMIDACEAE		BRODIAEA FAMILY
	Dichelostemma capitatum	Blue dicks, wild hyacinth
VERTEBRATE ANIMALS		
REPTILIA		REPTILES
TESTUDINIDAE		LAND TORTOISES
**	*Gopherus agassizii*	Desert tortoise
IGUANIDAE		IGUANID LIZARDS
	Phrynosoma platyrhinos	Desert horned lizard
	Sceloporus magister	Desert spiny lizard
	Sceloporus occidentalis	Western fence lizard
	Uta stansburiana	Side-blotched lizard
XANTUSIIDAE		NIGHT LIZARDS
	Xantusia vigilis	Desert night lizard
TEIIDAE		WHIPTAILS
	Aspidoscelis tigris tigris	Great Basin whiptail
BOIDAE		BOAS AND PYTHONS
	Lichanura trivirgata	Rosy boa
COLUBRIDAE		COLUBRIDS
1	*Masticophis flagellum*	Coachwhip
	Pituophis catenifer	Gopher snake
VIPERIDAE		VIPERS
2	*Crotalus mitchellii*	Speckled rattlesnake
AVES		BIRDS
PELECANIDAE		PELICANS
	Pelecanus erythrorhynchos	American white pelican
PHALACROCORACIDAE		CORMORANTS
	Phalacrocorax auritus	Double-crested cormorant
THRESKIORNITHIDAE		IBISES AND SPOONBILLS
**2	*Plegadis chihi*	White-faced ibis

ANATIDAE		DUCKS, GEESE AND SWANS
	Branta canadensis	Canada goose
CATHARTIDAE		VULTURES
	Cathartes aura	Turkey vulture
ACCIPITRIDAE		HAWKS, EAGLES, HARRIERS
**2	*Pandion haliaetus*	Osprey
**2	*Elanus caeruleus*	White-tailed kite
**	*Aquila chrysaetos*	Golden eagle
**2	*Haliaeetus leucocephalus*	Bald eagle
**2,3	*Circus cyaneus*	Northern harrier
**2	*Accipiter striatus*	Sharp-shinned hawk
**	*Accipiter cooperii*	Cooper's hawk
**2	*Buteo swainsoni*	Swainson's hawk
	Buteo jamaicensis	Red-tailed hawk
**2,3	*Buteo regalis*	Ferruginous hawk
2	*Buteo lagopus*	Rough-legged hawk
FALCONIDAE		FALCONS
	Falco sparverius	American kestrel
**2	*Falco columbarius*	Merlin
**2,3	*Falco peregrinus*	Peregrine falcon
**2,3	*Falco mexicanus*	Prairie falcon
PHASIANIDAE		GROUSE AND QUAIL
	Alectoris chukar	Chukar
2,3	*Callipepla gambelii*	Gambel's quail
	Callipepla californica	California quail
COLUMBIDAE		PIGEONS AND DOVES
2	*Columba livia*	Rock dove
*	*Streptopelia decaocto*	Eurasian collared dove
	Zenaida macroura	Mourning dove
CUCULIDAE		CUCKOOS
	Geococcyx californianus	Greater roadrunner
STRIGIDAE		TYPICAL OWLS
**2	*Asio otus*	Long-eared owl
CAMPRIMULGIDAE		NIGHTJARS
	Chordeiles acutipennis	Lesser nighthawk
2	*Phalaenoptilus nuttallii*	Common poorwill
APODIDAE		SWIFTS
**2,3	*Chaetura vauxi*	Vaux's swift
	Aeronautes saxatalis	White-throated swift
TROCHILIDAE		HUMMINGBIRDS
	Calypte anna	Anna's hummingbird
**	*Calypte costae*	Costa's hummingbird
	Selasphorus sasin	Allen's hummingbird
PICIDAE		WOODPECKERS
2	*Picoides scalaris*	Ladder-backed woodpecker
	Picoides pubescens	Downy woodpecker
	Picoides villosus	Hairy woodpecker
	Colaptes auratus	Northern flicker
TYRANNIDAE		TYRANT FLYCATCHERS
	Empidonax wrightii	Gray flycatcher
	Sayornis nigricans	Black phoebe

	Sayornis saya	Say's phoebe
	Tyrannus vociferans	Cassin's kingbird
	Tyrannus verticalis	Western kingbird
ALAUDIDAE		LARKS
	Eremophila alpestris	Horned lark
HIRUNDINIDAE		SWALLOWS
	Tachycineta bicolor	Tree swallow
2	*Tachycineta thalassina*	Violet-green swallow
	Stelgidopteryx serripennis	Northern rough-winged swallow
	Hirundo pyrrhonota	Cliff swallow
2	*Hirundo rustica*	Barn swallow
CORVIDAE		CROWS AND JAYS
	Aphelocoma coerulescens	Scrub jay
	Corvus corax	Common raven
REMIZIDAE		VERDINS
	Auriparus flavipes	Verdin
AEGITHALIDAE		BUSHTITS
	Psaltriparus minimus	Bushtit
TROGLODYTIDAE		WRENS
	Campylorhynchus brunneicapillus	Cactus wren
	Salpinctes obsoletus	Rock wren
	Thryomanes bewickii	Bewick's wren
	Troglodytes aedon	House wren
MUSCICAPIDAE		THRUSHES AND ALLIES
	Regulus calendula	Ruby-crowned kinglet
	Polioptila caerula	Blue-gray gnatcatcher
**	*Polioptila melanura*	Black-tailed gnatcatcher
	Sialia mexicana	Western bluebird
	Catharus guttatus	Hermit thrush
	Turdus migratorius	American robin
	Chamaea fasciata	Wrentit
MIMIDAE		MOCKINGBIRDS AND THRASHERS
	Mimus polyglottos	Northern mockingbird
	Toxostoma redivivum	California thrasher
MOTACILLIDAE		WAGTAILS AND PIPITS
2	*Anthus spinoletta*	American pipit
BOMBYCILLIDAE		WAXWINGS
2	*Bombycilla cedrorum*	Cedar waxwing
PTILOGONATIDAE		SILKY FLYCATCHERS
	Phainopepla nitens	Phainopepla
LANIIDAE		SHRIKES
**	*Lanius ludovicianus*	Loggerhead shrike
STURNIDAE		STARLINGS
*	*Sturnus vulgaris*	European starling
VIREONIDAE		VIREOS
	Vireo huttoni	Hutton's vireo
EMBERIZIDAE		SPARROWS, WARBLERS, TANAGERS
	Vermivora celata	Orange-crowned warbler
	Vermivora ruficapilla	Nashville warbler
**2	*Setophaga petechia*	Yellow warbler
	Setophaga townsendi	Townsend's warbler
	Setophaga coronata	Yellow-rumped warbler

3	*Wilsonia pusilla*	Wilson's warbler
2	*Coccothraustes vespertinus*	Evening grosbeak
	Piranga ludoviciana	Western tanager
3	*Pheucticus melanocephalus*	Black-headed grosbeak
	Pipilo crissalis	California towhee
	Aimophila ruficeps	Rufous-crowned sparrow
	Spizella passerina	Chipping sparrow
	Chondestes grammacus	Lark sparrow
	Amphispiza bilineata	Black-throated sparrow
	Artemisiospiza nevadensis	Sagebrush sparrow
	Passerculus sandwichensis	Savannah sparrow
	Passerella iliaca	Fox sparrow
	Melospiza melodia	Song sparrow
	Melospiza lincolnii	Lincoln's sparrow
	Zonotrichia leucophrys	White-crowned sparrow
	Junco hyemalis	Dark-eyed junco
2	*Agelaius phoeniceus*	Red-winged blackbird
	Sturnella neglecta	Western meadowlark
	Euphagus cyanocephalus	Brewer's blackbird
FRINGILLIDAE		FINCHES
3	*Haemorhous cassinii*	Cassin's finch
	Haemorhous mexicanus	House finch
2	*Spinus pinus*	Pine siskin
	Spinus psaltria	Lesser goldfinch
	Spinus lawrencei	Lawrence's goldfinch
MAMMALIA		MAMMALS
VESPERTILIONIDAE		EVENING BATS
**3	*Antrozous pallidus*	Pallid bat
**3	*Corynorhinus townsendii*	Townsend's big-eared bat
3	*Eptesicus fuscus*	Big brown bat
**3	*Lasiurus blossevillii*	Western red bat
**3	*Lasiurus cinereus*	Hoary bat
3	*Myotis californicus*	California myotis
**3	*Myotis evotis*	Western long-eared myotis
**3	*Myotis lucifugus*	Little brown myotis
**3	*Myotis thysanodes*	Fringed myotis
**3	*Myotis volans*	Long-legged myotis
**3	*Myotis yumanensis*	Yuma myotis
3	*Pipistrellus hesperus*	Western pipistrelle
MOLOSSIDAE		FREE-TAILED BATS
3	*Tadarida brasiliensis mexicana*	Mexican free-tailed bat
LEPORIDAE		HARES AND RABBITS
	Lepus californicus deserticola	Black-tailed jackrabbit
	Sylvilagus audubonii	Desert cottontail
	Sylvilagus bachmani cinerascens	Brush rabbit
SCIURIDAE		SQUIRRELS
	Otospermophilus beecheyi	Beechey (California) ground squirrel
	Ammospermophilus leucurus	Antelope ground squirrel
GEOMYIDAE		POCKET GOPHERS
	Thomomys bottae	Botta pocket gopher
HETEROMYIDAE		POCKET MICE

	Dipodomys sp.	Kangaroo rat
	Dipodomys merriami	Merriam kangaroo rat
CRICETIDAE		RATS AND MICE
	Neotoma lepida lepida	Desert wood rat
MURIDAE		OLD WORLD RATS AND MICE
*	*Rattus rattus*	Black rat
CANIDAE		FOXES, WOLVES AND COYOTES
	Canis latrans	Coyote
MUSTELIDAE		WEASELS AND SKUNKS
**	*Taxidea taxus*	American badger
FELIDAE		CATS
	Felis concolor	Mountain lion
2	*Lynx rufus*	Bobcat
CERVIDAE		ELKS, MOOSE, CARIBOU, DEER
2	*Odocoileus hemionus*	Mule deer
BOVIDAE		SHEEP AND GOATS
2,3	*Ovis canadensis*	Bighorn

Non-native species are indicated by an asterisk. Special-status species are indicated by two asterisks. Species detected during surveys by NRA Inc. (2008) and not detected during recent surveys are indicated by a superscript 1, while those observed by Bloom Biological (2013) are indicated by a superscript 2, and those identified by WEST (2017) are indicated by a superscript 3. Other species may have been overlooked or inactive/absent because of the season (amphibians are active during rains, reptiles during summer, some birds (and bats) migrate out of the area for summer or winter, some mammals hibernate etc.). Taxonomy and nomenclature generally follow Stebbins (2003) for amphibians and reptiles, AOU (1998) for birds, and Jones et al. (1992) for mammals.

Attachment 5 – California Natural Diversity Data Base Report Forms

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
P.O. Box 944209
Sacramento, CA 94244-2090
CNDDB@wildlife.ca.gov

For Office Use Only
Source Code: ____ Quad Code: ____
Elm Code: ____ Occ No.: ____
EO Index: ____ Map Index: ____

Date of Field Work (mm/dd/yyyy): 04/17/2019

Clear Form | Print Form

California Native Species Field Survey Form

Scientific Name: Gopherus agassizii

Common Name: Desert tortoise

Species Found? (●) Yes ( ) No ____ If not found, why?

Total No. Individuals: 3 Subsequent Visit? (●) Yes ( ) No

Is this an existing NDDB occurrence? ____ Yes, Occ. # [X] No [ ] Unk.

Collection? If yes: ____ Number ____ Museum / Herbarium

Reporter: Justin Wood
Address: 615 N. Benson, Suite E
Upland, CA 91786
E-mail Address: Jwood@aspeneg.com
Phone: 909-568-5235

Plant Information
Phenology: ____ % vegetative ____ % flowering ____ % fruiting

Animal Information
3 # adults ____ # juveniles ____ # larvae ____ # egg masses ____ # unknown
[ ] wintering [ ] breeding [ ] nesting [ ] rookery [ ] burrow site [ ] lek [ ] other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)
Mesa Wind Farm, 1.2 miles west of the Whitewater River and 1.85 miles north of Interstate 10.

County: Riverside Landowner / Mgr: BLM
Quad Name: White Water Elevation: 2450 feet
T 2S R 3E Sec 34 , SW 1/4 of ____ 1/4, Meridian: H ( ) M ( ) S ( ) Source of Coordinates (GPS, topo. map & type): GPS
T ____ R ____ Sec ____ , ____ 1/4 of ____ 1/4, Meridian: H ( ) M ( ) S ( ) GPS Make & Model: Garmin eTrex
DATUM: NAD27 ( ) NAD83 ( ) WGS84 ( ) Horizontal Accuracy: 9 feet meters/feet
Coordinate System: UTM Zone 10 ( ) UTM Zone 11 (●) ***OR*** Geographic (Latitude & Longitude) ( )
Coordinates: Adult male (531133, 3756518); Adult female (531132, 3756527); Adult female (531079, 3756595)

Habitat Description (plants & animals) *plant communities, dominants, associates, substrates/soils, aspects/slope:*
Animal Behavior *(Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):*

All three tortoises were active, two were foraging and one was partially in a burrow. Habitat is mixed cresotoe bush and brittlebush scrub. Abundant annual forage present during 2019. Additonal sign including burrows and scat also observed. burrow (531334, 3756482); burrow (531283, 3757208); burrow (531144, 3757236); (531099, 3756546); scat (531161, 3756513); scat (531156, 3757207); and scat (531030, 3756521). Observatiosn were made between April 16 and April 25, 2019.

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ( ) Excellent (●) Good ( ) Fair ( ) Poor
Immediate AND surrounding land use: Wind energy production and open space
Visible disturbances: None
Threats: Vehicle collision
Comments: This population is known and well studied by Jeff Lovich (USGS).

Determination: *(check one or more, and fill in blanks)*
- [ ] Keyed (cite reference): ____
- [ ] Compared with specimen housed at: ____
- [ ] Compared with photo / drawing in: ____
- [X] By another person (name): Brian Leatherman
- [ ] Other: ____

Photographs: *(check one or more)*

	Slide	Print	Digital
Plant / animal	[ ]	[ ]	[ ]
Habitat	[ ]	[ ]	[ ]
Diagnostic feature	[ ]	[ ]	[ ]

May we obtain duplicates at our expense? ( ) yes ( ) no

Mail to:
California Natural Diversity Database
California Dept. of Fish & Wildlife
P.O. Box 944209
Sacramento, CA 94244-2090
CNDDB@wildlife.ca.gov

For Office Use Only

Source Code: ______ Quad Code: ______
Elm Code: ______ Occ No.: ______
EO Index: ______ Map Index: ______

Date of Field Work (mm/dd/yyyy): 04/10/2019

Clear Form | Print Form

California Native Species Field Survey Form

Scientific Name: *Taxidea taxus*

Common Name: American badger

Species Found? (●) Yes ( ) No ______ If not found, why?

Total No. Individuals: 0 Subsequent Visit? ( ) Yes (●) No

Is this an existing NDDB occurrence? ______ Yes, Occ. # [X] No [ ] Unk.

Collection? If yes: ______ Number ______ Museum / Herbarium

Reporter: Justin Wood
Address: 615 N. Benson, Suite E
Upland, CA 91786
E-mail Address: Jwood@aspeneg.com
Phone: 909-568-5235

Plant Information

Phenology: ______ % vegetative ______ % flowering ______ % fruiting

Animal Information

______ # adults ______ # juveniles ______ # larvae ______ # egg masses ______ # unknown

[ ] wintering [ ] breeding [ ] nesting [ ] rookery [X] burrow site [ ] lek [ ] other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)

Mesa Wind Farm, 1.2 miles west of the Whitewater River and 1.85 miles north of Interstate 10.

County: Riverside Landowner / Mgr: BLM

Quad Name: White Water Elevation: 2500 feet

T 2S R 3E Sec 34 , ___ 1/4 of ___ 1/4, Meridian: H( ) M( ) S( ) Source of Coordinates (GPS, topo. map & type): GPS

T ___ R ___ Sec ___ , ___ 1/4 of ___ 1/4, Meridian: H( ) M( ) S( ) GPS Make & Model: Garmin eTrex

DATUM: NAD27 ( ) NAD83 ( ) WGS84 ( ) Horizontal Accuracy: 9 feet meters/feet

Coordinate System: UTM Zone 10 ( ) UTM Zone 11 (●) *OR* Geographic (Latitude & Longitude) ( )

Coordinates: Badger burrows at the following coordinates: 532116, 3756938; 531629, 3756492; 531258, 3756585; 531268, 3756713; 531240, 3756775; 531150, 3757172; 531029, 3756576; 531029, 3756872; and 530589, 3756069

Habitat Description (plants & animals) *plant communities, dominants, associates, substrates/soils, aspects/slope:*
Animal Behavior *(Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):*

Nine badger burrows present within the Mesa Wind Farm. No badgers observed. Habitat is mixed cresotoe bush and brittlebush scrub. Observatiosn were made between April 10 and April 25, 2019.

Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population): ( ) Excellent (●) Good ( ) Fair ( ) Poor

Immediate AND surrounding land use: Wind energy production and open space

Visible disturbances: None

Threats: Vehicle collision

Comments:

Determination: *(check one or more, and fill in blanks)*

[ ] Keyed (cite reference): ______
[ ] Compared with specimen housed at: ______
[ ] Compared with photo / drawing in: ______
[X] By another person (name): Brian Leatherman
[ ] Other: ______

Photographs: *(check one or more)*

	Slide	Print	Digital
Plant / animal	[ ]	[ ]	[ ]
Habitat	[ ]	[ ]	[ ]
Diagnostic feature	[ ]	[ ]	[ ]

May we obtain duplicates at our expense? ( ) yes ( ) no

Attachment 6 – Inventory of existing foundations

Inventory of potential desert tortoise burrows at existing foundations

Locn	Structure	Structure #	Burrow	Notes	Locn	Structure	Structure #	Burrow	Notes
1	WTG	R2 x 6	None		51	Electric	F2 T8	None	
2	WTG	R2 x 7	None		52	Electric	4 x 13	Burrow present	Small Mammal
3	WTG	R2 x 8	None		53	WTG	R6 x 57	None	
4	WTG	R2 x 9	None		54	WTG	R6 x 56	None	
5	WTG	R2 x 10	None		55	Empty pad	R6 x 55	None	
6	Electric	3 x 3	None		56	WTG	R6 x 54	None	
7	WTG	R2 x 11	None		57	WTG	R6 x 55	None	
8	WTG	R2 x 12	None		58	WTG	R6 x 53	None	
9	WTG	R2 x 13	None		59	Electric	none	None	
10	WTG	R2 x 14	None		60	WTG	R6 x 51	None	
11	WTG	R2 x 17	None		61	WTG	R6 x 50	None	
12	WTG	R2 x 18	None		62	WTG	R6 x 49	None	
13	Electric	3 x 4	None		63	Electric	3 x 5	None	
14	WTG	R2 x 19	None		64	WTG	R6 x 48	None	
15	WTG	R2 x 20	None		65	WTG	R6 x 47	None	
16	WTG	R2 x 21	Burrow present	Small Mammal	66	WTG	R6 x 46	None	
17	WTG	R2 x 22	None		67	WTG	R6 x 35	None	
18	WTG	R2 x 23	None		68	WTG	R6 x 36	None	
19	WTG	R2 x 24	None		69	WTG	R6 x 37	None	
20	WTG	R2 x 25	None		70	WTG	R6 x 38	None	
21	WTG	R3 x 25	None		71	WTG	R6 x 39	None	
22	WTG	R3 x 24	None		72	Empty pad	R6 x 40	None	
23	WTG	R3 X 23	None		73	WTG	R6 x 41	None	
24	WTG	R3 x 22	None		74	WTG	R6 x 42	None	
25	WTG	R3 x 21	None		75	Electric	3 x 7	Burrow present	Potential DT
26	Electric	3 x 6	None		76	WTG	R6 x 43	Burrow present	Potential DT
27	Control Box	none	None		77	WTG	R6 x 44	None	
28	WTG	R3 x 20	None		78	Empty pad	R6 x 45	None	
29	WTG	R3 x 19	None		79	WTG	R5 x 57	None	
30	WTG	R3 x 18	None		80	WTG	R5 x 56	None	
31	WTG	R3 x 17	Burrow present	Small Mammal	81	Electric	none	None	
32	Electric	301	None		82	WTG	R5 x 55	None	
35	Electric	F2 T10	None		83	WTG	R5 x 54	None	
36	Control Box	none	None		84	WTG	R5 x 53	None	
37	Electric	F3 T1	None		85	WTG	R5 x 51	None	
38	Electric	3 x 2	None		86	WTG	R5 x 52	None	
39	Empty pad	none	None		87	WTG	R5 x 50	None	
40	Empty pad	none	None		88	WTG	R5 x 49	None	
41	WTG	R5 x 33	None		89	WTG	R5 x 48	None	
42	WTG	R4 x 10	None		90	WTG	R5 x 47	None	
43	Empty pad	R4 x 9	None		91	WTG	R5 x 45	None	
44	Empty pad	R4 x 8	None		92	WTG	R5 x 46	None	
45	Steel containe	none	None		93	WTG	R5 x 44	None	
46	WTG	R5 x 34	None		94	WTG	R5 x 41	None	
47	Electric	none	Burrow present	Potential DT	95	WTG	R5 x 35	None	
48	WTG	none	None		96	WTG	R5 x 36	None	
49	Electric	2 x 5	None		97	WTG	R5 x 37	None	
50	Control Box	none	None		98	WTG	R5 x 38	None	

Inventory of potential desert tortoise burrows at existing foundations

Locn	Structure	Structure #	Burrow	Notes	Locn	Structure	Structure #	Burrow	Notes
99	WTG	R5 x 39	None		148	WTG	R7 x 27	None	
100	Electric	none	None		149	WTG	R6 x 24	None	
101	Control Box	none	None		150	WTG	R6 x 23	None	
102	WTG	R5 x 43	None		151	WTG	R6 x 22	None	
103	WTG	R5 x 42	None		152	WTG	R6 x 20	None	
104	Electric	none	None		153	Electric	220	None	
105	WTG	R6 x 27	None		154	WTG	R6 x 21	None	
106	WTG	R6 x 28	None		155	WTG	R6 x 17	Burrow present	Small Mammal
107	Electric	2 x 9	None		156	WTG	R6 x 18	None	
108	WTG	R6 x 29	None		157	WTG	R6 x 18	None	
109	WTG	R6 x 30	None		158	Electric	none	None	
110	WTG	R6 x 31	None		159	WTG	none	None	
111	WTG	R6 x 32	None		160	Electric	404	None	
112	WTG	R6 x 33	None		161	Empty pad	none	None	
113	WTG	R6 x 34	None		162	WTG	R7 x 18	None	
114	WTG	R7 x 56	None		163	WTG	R7 x 19	None	
115	Empty pad	none	None		164	Empty pad	R7 x 26	None	
116	Electric	none	None		165	WTG	R7 x 25	Burrow present	Potential DT
117	WTG	R7 x 53	None		166	WTG	R7 x 24	None	
118	Empty pad	R7 x 52	None		167	Electric	405	None	
119	WTG	R7 x 51	None		168	Empty pad	R7 x 23	Burrow present	Potential DT
120	WTG	R7 x 50	None		169	WTG	R7 x 22	None	
121	WTG	R7 x 49	None		170	Empty pad	R7 x 21	None	
122	WTG	R7 x 48	None		171	WTG	R7 x 20	None	
123	WTG	R7 x 47	None		172	WTG	R8 x 8	None	
124	WTG	R7 x 46	None		173	WTG	R8 x 7	None	
125	WTG	R7 x 45	None		174	WTG	R8 x 6	None	
126	WTG	R7 x 44	None		175	WTG	R8 x 5	None	
127	Electric	none	None		176	Empty pad	R8 x 9	None	
128	WTG	R7 x 43	None		177	Empty pad	R8 x 10	None	
129	WTG	R7 x 42	None		178	WTG	R8 x 22	None	
130	WTG	R7 x 41	None		179	Empty pad	none	None	
131	Electric	3 x 9	None		180	Electric	504	None	
132	WTG	R7 x 40	None		181	Control Box	none	None	
133	WTG	R7 x 39	None		182	WTG	R8 x 27	None	
134	WTG	R7 x 38	None		183	WTG	R8 x 26	None	
135	WTG	R7 x 37	None		184	WTG	R8 x 25	None	
136	WTG	R7 x 36	None		185	Electric	505	None	
137	WTG	R7 x 35	None		186	WTG	R8 x 24	None	
138	WTG	R7 x 34	None		187	WTG	R10 x 15	None	
139	Control Box	none	None		188	WTG	R10 x 14	None	
140	Electric	509	None		189	WTG	R10 x 13	None	
141	WTG	R7 x 33	None		190	WTG	R10 x 12	None	
142	WTG	R7 x 32	None		191	WTG	R10 x 11	None	
143	WTG	R7 x 31	None		192	WTG	R10 x 19	None	
144	WTG	R7 x 30	None		193	Electric	502	None	
145	Electric	510	Burrow present	Potential DT	194	WTG	R10 x 18	None	
146	WTG	R7 x 29	None		195	WTG	R10 x 17	None	
147	WTG	R7 x 28	None		196	WTG	R10 x 16	None	

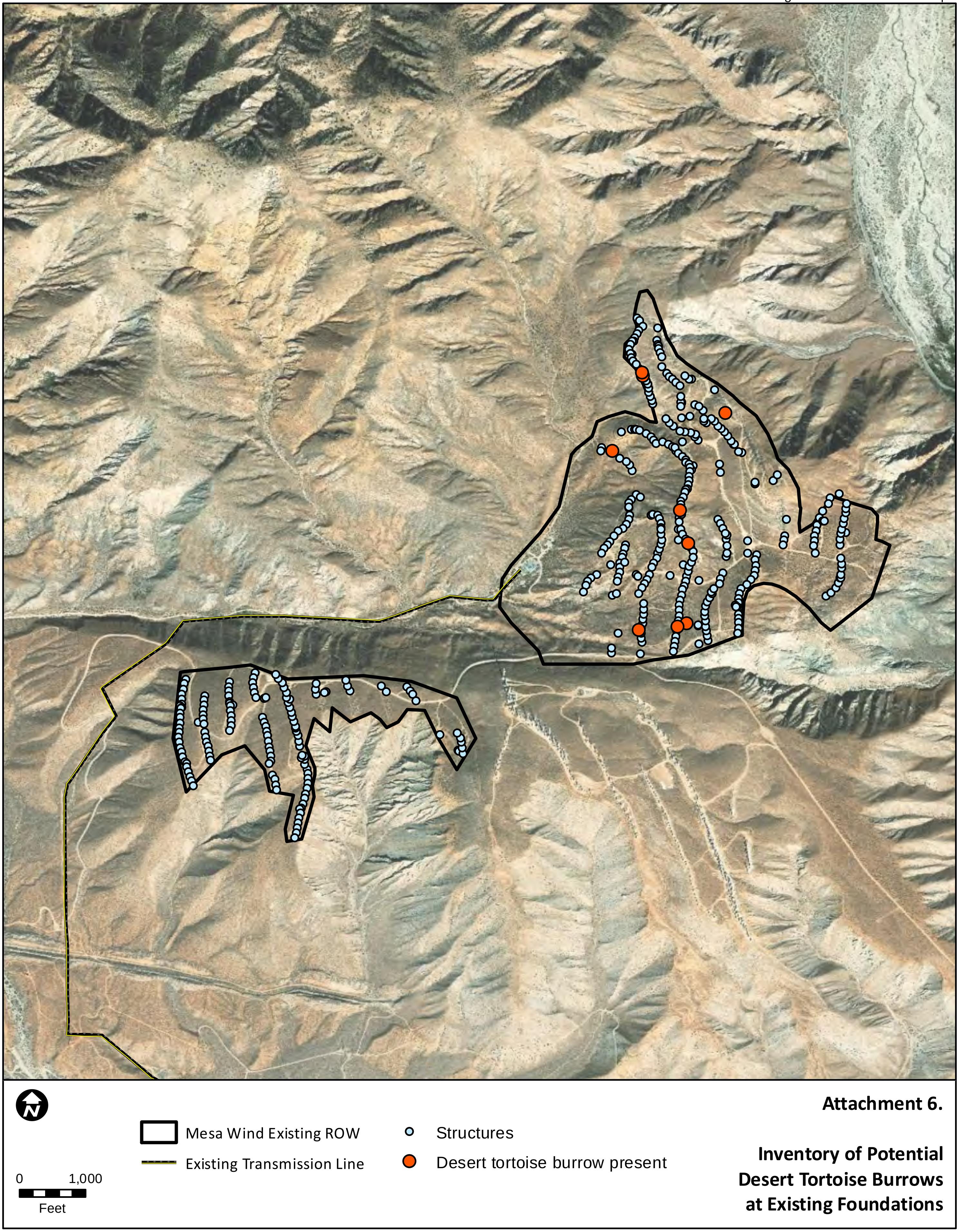
Inventory of potential desert tortoise burrows at existing foundations

Locn	Structure	Structure #	Burrow	Notes	Locn	Structure	Structure #	Burrow	Notes
197	WTG	R10 x 10	None		246	WTG	R7 x 7	None	
198	WTG	R10 x 9	None		247	WTG	R7 x 6	Burrow present	Potential DT
199	WTG	R10 x 8	None		248	WTG	R7 x 5	None	
200	WTG	R10 x 7	None		249	WTG	R7 x 4	None	
201	WTG	R10 x 6	None		250	WTG	R7 x 3	None	
202	Electric	608	None		251	WTG	R7 x 2	None	
203	WTG	R10 x 5	None		252	WTG	R7 x 1	None	
204	WTG	R10 x 4	None		253	WTG	R8 x 10	None	
205	WTG	R10 x 3	None		254	WTG	R8 x 11	None	
206	WTG	R10 x 2	None		255	WTG	R8 x 12	None	
207	WTG	R10 x 1	None		256	Electric	none	Burrow present	Potential DT
208	WTG	R9 x 13	None		257	WTG	R8 x 13	None	
209	Empty pad	R9 x 12	None		258	WTG	R8 x 14	None	
210	WTG	R9 x 11	None		259	WTG	R8 x 15	None	
211	WTG	R9 x 10	None		260	WTG	R8 x 16	None	
212	Empty pad	R9 x 9	None		261	WTG	R8 x 17	None	
213	WTG	R9 x 8	None		262	WTG	R8 x 18	Burrow present	Small Mammal
214	WTG	R9 x 7	None		263	WTG	R6 x 1	None	
215	WTG	R9 x 6	None		264	WTG	R6 x 2	None	
216	WTG	R9 x 5	None		265	WTG	R6 x 3	None	
217	Electric	none	None		266	WTG	R6 x 4	None	
218	WTG	R9 x 3	None		267	Electric	402	None	
219	WTG	R9 x 4	None		268	Control Box	none	None	
220	Electric	none	None		269	WTG	R6 x 5	None	
221	Control Box	none	None		270	WTG	R6 x 6	None	
222	WTG	R8 x 4	None		271	WTG	R6 x 7	None	
223	WTG	R8 x 3	None		272	WTG	R6 x 8	None	
224	WTG	R8 x 2	None		273	WTG	R6 x 9	None	
225	WTG	R8 x 1	None		274	WTG	R6 x 10	None	
226	WTG	R8 x 19	None		275	WTG	R6 x 11	None	
227	WTG	R10 x 20	None		276	WTG	R6 x 12	None	
228	WTG	R10 x 21	None		277	Electric	2 x 11	None	
229	WTG	R10 x 22	None		278	WTG	R6 x 13	None	
230	WTG	R10 x 23	None		279	WTG	R6 x 16	None	
231	WTG	R10 x 24	None		280	WTG	R6 x 15	None	
232	Control Box	none	None		281	Empty pad	R6 x 14	None	
233	Electric	501	Burrow present	Small Mammal	282	Electric	308	None	
234	WTG	R10 x 25	None		283	WTG	R5 x 17	None	
235	Electric	501	None		284	WTG	R5 x 16	None	
236	Electric	401	None		285	WTG	R5 x 15	None	
237	WTG	R7 x 15	None		286	WTG	R5 x 14	None	
238	WTG	R7 x 14	None		287	WTG	R5 x 13	None	
239	WTG	R7 x 13	None		288	WTG	R5 x 12	None	
240	WTG	R7 x 12	None		289	WTG	R5 x 11	None	
241	WTG	R7 x 11	None		290	WTG	R5 x 10	None	
242	WTG	R7 x 10	None		291	WTG	R5 x 9	None	
243	WTG	R7 x 9	None		292	WTG	R5 x 8	None	
244	Electric	401	Burrow present	Potential DT	293	WTG	R5 x 7	None	
245	WTG	R7 x 8	None		294	Electric	403	None	

Inventory of potential desert tortoise burrows at existing foundations

Locn	Structure	Structure #	Burrow	Notes	Locn	Structure	Structure #	Burrow	Notes
295	Pad, Concrete	R5 x 6	None		343	WTG	R22 x 2	None	
296	WTG	R5 x 5	None		344	WTG	R22 x 1	None	
297	WTG	R5 x 4	None		345	WTG	R21 x 11	None	
298	WTG	R5 x 3	None		346	WTG	R21 x 10	None	
299	WTG	R5 x 2	None		347	WTG	R21 x 9	None	
300	WTG	R5 x 1	None		348	WTG	R21 x 8	None	
301	WTG	R8 x 9	None		349	WTG	R21 x 7	None	
302	WTG	R9 x 1	None		350	Electric	407	None	
303	WTG	R9 x 2	None		351	Control Box	none	None	
304	WTG	R23 x 23	None		352	WTG	R21 x 6	None	
305	WTG	R23 x 22	None		353	WTG	R21 x 5	None	
306	WTG	R23 x 21	None		354	WTG	R21 x 4	None	
307	WTG	R23 x 20	None		355	WTG	R21 x 3	None	
308	WTG	R23 x 19	None		356	WTG	R21 x 2	None	
309	WTG	R23 x 18	None		357	WTG	R21 x 1	None	
310	Electric	213	None		358	WTG	R20 x 22	None	
311	Control Box	none	None		359	WTG	R20 x 21	None	
312	WTG	R23 x 17	None		360	WTG	R20 x 20	None	
313	WTG	R23 x 16	None		361	WTG	R20 x 19	None	
314	WTG	R23 x 15	None		362	WTG	R20 x 18	None	
315	WTG	R23 x 14	None		363	WTG	R20 x 17	None	
316	WTG	R23 x 13	None		364	Electric	209	None	
317	WTG	R23 x 12	None		365	Control Box	none	None	
318	WTG	R23 x 11	None		366	WTG	R20 x 16	None	
319	WTG	R23 x 10	None		367	WTG	R20 x 15	None	
320	WTG	R23 x 9	None		368	WTG	R20 x 14	None	
321	WTG	R23 x 8	None		369	WTG	R20 x 13	None	
322	WTG	R23 x 7	None		370	WTG	R20 x 12	None	
323	WTG	R23 x 6	None		371	Pad, Concrete	R20 x 11	None	
324	Electric	212	None		372	Pad, Concrete	R20 x 10	None	
325	WTG	R23 x 5	None		373	WTG	R20 x 9	None	
326	Pad, Concrete	R23 x 4	None		374	WTG	R20 x 8	None	
327	WTG	R23 x 3	None		375	WTG	R20 x 7	None	
328	WTG	R23 x 2	None		376	Electric	208	None	
329	WTG	R23 x 1	None		377	WTG	R20 x 4	None	
330	Electric	408	None		378	WTG	R20 x 3	None	
331	WTG	R22 x 14	None		379	WTG	R20 x 2	None	
332	WTG	R22 x 13	None		380	WTG	R20 x 1	None	
333	WTG	R22 x 12	None		381	WTG	R19 x 15	None	
334	WTG	R22 x 11	None		382	WTG	R19 x 14	None	
335	WTG	R22 x 10	None		383	WTG	R19 x 13	None	
336	WTG	R22 x 9	None		384	WTG	R19 x 12	None	
337	WTG	R22 x 8	None		385	WTG	R19 x 11	None	
338	WTG	R22 x 7	Burrow present	Small Mammal	386	WTG	R19 x 10	None	
339	WTG	R22 x 6	None		387	WTG	R19 x 9	None	
340	WTG	R22 x 5	None		388	WTG	R19 x 8	None	
341	WTG	R22 x 4	None		389	WTG	R19 x 7	None	
342	WTG	R22 x 3	None		390	Electric	208	None	

Locn	Structure	Structure #	Burrow	Notes
391	WTG	R19 x 6	None	
392	WTG	R19 x 5	None	
393	WTG	R19 x 4	None	
394	WTG	R19 x 3	None	
395	WTG	R19 x 2	None	
396	WTG	R19 x 1	None	
397	WTG	R19 x 16	None	
398	WTG	R19 x 17	None	
399	Electric	206	None	
400	Control Box	none	None	
401	WTG	R19 x 18	None	
402	WTG	R19 x 19	None	
403	WTG	R19 x 20	None	
404	WTG	R19 x 21	None	
405	WTG	R19 x 22	None	
406	Electric	406	None	
407	WTG	R19 x 23	None	
408	WTG	R19 x 24	None	
409	WTG	R19 x 25	None	
410	WTG	R19 x 26	None	
411	WTG	R19 x 27	None	
412	WTG	R19 x 28	None	
413	Electric	206	None	
414	WTG	R19 x 29	None	
415	WTG	R19 x 30	None	
416	WTG	R19 x 31	None	
417	WTG	R19 x 32	None	
418	WTG	R19 x 33	None	
419	WTG	R19 x 34	None	
420	Control Box	none	None	
421	Electric	203	None	
422	WTG	R18 x 5	None	
423	WTG	R18 x 6	None	
424	WTG	R18 x 7	None	
425	WTG	R17 x 5	None	
426	WTG	R17 x 6	None	
427	WTG	R17 x 7	None	
428	WTG	R16 x 8	None	
429	Electric	201	None	
430	WTG	R15 x 4	None	
431	WTG	R15 x 3	None	
432	WTG	R15 x 2	None	
433	WTG	R15 x 1	None	
434	WTG	R15 x 11	None	
435	Control Box	none	None	
436	Electric	202	None	
437	WTG	R14 x 1	None	
438	WTG	R14 x 2	None	
439	WTG	R14 x 3	None	
440	WTG	R14 x 4	None	
441	WTG	R14 x 5	None	



Attachment 6.

Inventory of Potential Desert Tortoise Burrows at Existing Foundations

Attachment 7 – Field Team Resumes

Justin M. Wood
Senior Biologist

Academic Background

Master of Science in Biological Sciences, California State Polytechnic University, Pomona, 2011
BS, Biology, California State Polytechnic University, Pomona, 2006

Professional Experience

Justin M. Wood has seventeen years of experience with biological surveys, botanical surveys, jurisdictional delineations, CEQA and NEPA reporting, and mitigation monitoring in California and the western U.S. He holds Master's and Bachelor's degrees in biology from California State Polytechnic University, Pomona. For his master's thesis he worked with his advisor Dr. Jonathan Baskin to develop and implement a 12-month study to document the impacts from and recovery of a stream diversion channel in Santa Paula Creek, Ventura County. He has extensive experience conducting focused special-status fish surveys throughout southern California and holds a federal 10(a)(1)(A) recovery permit for conducting surveys for the federally threatened Santa Ana sucker. In addition to his experience with native fish, he is also an exceptional field botanist and has conducted dozens of focused plant surveys throughout southern California. He specializes in botanical surveys and has a special interest in the flora of Southern California. He is experienced with the regional flora, including rare, threatened, and endangered species. He recently completed his Field Botanist Certification through the California Native Plant Society and is the current serving as the president of the Southern California Botanist. His knowledge of California natural history is broad and includes aquatic life, upland wildlife species, and vascular plants. Wood has extensive experience conducting general and focused wildlife surveys for reptiles, amphibians, fish, mammals, and birds. He has extensive experience working throughout Orange County.

Aspen Environmental Group..2009-present
The following project summaries represent some of the projects Mr. Wood was been involved in over the past ten years with Aspen Environmental Group.

- **Alamitos Bay Pump Station Discharge Pipe Replacement, Los Angeles County Department of Public Works (2017-present).** Mr. Wood is the lead biologists assigned to this project. He conducted special-status plant and wildlife surveys and habitat assessments. He has also mapped vegetation and assessed the site for state jurisdictional waters. He assisted with the preparation of a biological resources memorandum and has served as lead author for the biological resource's sections of the CEQA document. The project is in the coastal zone, within Long Beach and will replace a stormwater discharge pipe in Alamitos Bay.
- **San Gabriel Tower Improvement Project, Metropolitan Water District (2018-present).** Mr. Wood is one of several biologists assigned to this project. He conducted special-status plant and wildlife surveys. He has also mapped vegetation and assessed the site for state jurisdictional waters. He assisted with the preparation of a biological resources technical report that will be used as a constraints assessment to help guide the project development and planning. The project is in San Gabriel Canyon, just below Morris Reservoir, in Los Angeles County.
- **Azusa Canyon Flume Project, City of Pasadena Department of Water and Power (2017-2018).** Mr. Wood served as the lead field biologist to conduct focused botanical and biological surveys along approximately 6 miles of the Azusa Canyon Flume. The flume was installed prior to 1900 and repairs are needed to continue to operate it and the hydroelectric powerplant that it provides water to. The

City of Pasadena is currently working with the Federal Energy Regulatory Commission and the Angeles National Forest to permit the project and needed repairs.

- **Ventura River Levee (VR-1) Improvement Project, Ventura County Watershed Protection District (2018).** Mr. Wood is the lead botanist on the project and conducted protocol-level rare plant surveys of the project area that extends from the Pacific Ocean inland approximately 2.5 miles. The survey included an assessment of all Ventura County locally sensitive plant species. He also mapped vegetation throughout the project area according to the latest methods and classifications used by CDFW and CNPS. Mr. Wood is also currently assisting with the preparation of the biological resources section of the EIR for a levee improvement project along the Ventura River in Ventura.
- **Littlerock Dam and Reservoir Restoration Project EIR/EIS-BE/BA, Palmdale Water District/US Forest Service (2010-present).** Mr. Wood conducted focused special-status plant and wildlife surveys and created vegetation maps for the sediment removal activities associated with the Littlerock Dam and Reservoir in the Angeles National Forest. Mr. Wood also surveyed the project area and access routes for invasive plants and helped prepare a weed management plan. Mr. Wood also conducted the field investigation to support a jurisdictional declination report and project permitting.
- **Lake Gregory Dam Rehabilitation Project, San Bernardino County Special Districts Department (2014-present).** Mr. Wood conducted focused surveys for special-status plants and animals for the proposed project. Lake Gregory is located in the San Bernardino Mountains approximately 14 miles north of the City of San Bernardino in the community of Crestline. The Lake Gregory Dam Rehabilitation Project consists of the construction of physical improvements to the dam, earthen material excavation from borrow sites, earthen material hauling and processing, relocation of utilities on Lake Drive, and interim traffic detour routes.
- **Santa Clara River Levee (SCR-3) Improvement Project, Ventura County Watershed Protection District (2013-present).** Mr. Wood surveyed the project site for special-status plants and assisted with the preparation of the biological resources section of the EIR for a levee improvement project along the Santa Clara River in Ventura. He is also assisted with conducting pre-construction surveys for project construction and providing support to the biological monitors throughout the duration of construction.
- **Virginia Colony Biological Assessment and Constraints Analysis, Ventura County Watershed Protection District (2011-2012).** Mr. Wood surveyed the project site for special-status plants and is assisted with the preparation of a Biological Technical Report and Constraints Analysis for the proposed Virginia Colony Detention Basin Project in Moorpark, CA.
- **Sespe Creek Levee Improvement Initial Study, MND and EA, Ventura County Watershed Protection District (2011-2012**). Mr. Wood surveyed the project site for special-status plants and is one of the biologists that prepared the biological resources section of the Initial Study and EA for a levee improvement project on the east side of Sespe Creek just north of the Hwy. 126 bridge.
- **Avila Point Development Project, County of San Luis Obispo (2013-2015).** Mr. Wood surveyed the project site for special-status plants, assessed habitat for special-status wildlife, and mapped vegetation. He also assisted in the preparation of the biological resources section of the EIR for the development of an old tank farm property owned by Chevron in San Luis Obispo County.
- **San Gorgonio Canyon Water Conveyance System (2015-present).** Mr. Wood conducted special-status plant surveys and assessed the habitat for special-status wildlife species. Surveys were conducted over more than 15 miles of water conveyance infrastructure in the San Bernardino Mountains. Wood also coordinated with the botanist, biologist, and hydrologist from the San

Bernardino National Forest. Surveys were completed to support the project which includes SCE's hydroelectric project license surrender and subsequent transfer of facilities local agencies.

- **Calleguas Projects Off-Site Mitigation Project, Ventura County Watershed Protection District (2017-present).** Mr. Wood monitored non-native plant removal and container plant installation at the habitat restoration site located along Calleguas Creek at Upland Road in Camarillo. He also conducted annual vegetation monitoring and assisted with the preparation of the annual reports for 2017 and 2018.
- **Santa Ana Sucker Translocation Plan, San Bernardino Valley Municipal Water District (2015-present),** Mr. Wood is on a team of several consultants and various resource agencies developing a translocation plan for the federally threatened Santa Ana sucker. Mr. Wood has assisted with preparation of the plan and was also one of the key team members responsible for conducting Santa Ana sucker habitat assessments in a number of tributaries to the Santa Ana River including Plunge Creek, City Creek, Alder Creek and others. The translocation plan is being developed in coordination with the U.S. Fish and Wildlife Service as part of the recovery plan for the species.
- **Santa Ana Sucker Microhabitat Analysis and Report, San Bernardino Valley Municipal Water District (2016).** Mr. Wood served as the project manager and one three biologists assigned to the project to write a micro-habitat report summarizing habitat data collected in Big Tujunga Canyon. The report was prepared to guide habitat creation associated with the Sterling Natural Resource Center wastewater treatment plant being developed by the SBVMWD.
- **Mojave River Conservation Lands, San Bernardino County Department of Public Works (2016-present).** Mr. Wood is the lead biologist responsible for conducting biological surveys, mapping vegetation, and completing a jurisdictional delineation of a nearly 300-acre County property within the Mojave River of San Bernardino County.
- **Rialto Channel Jurisdictional Delineation, San Bernardino County Department of Public Works (2015 and 2018).** Mr. Wood conducted a field delineation of state and federally jurisdictional waters of State and waters of the U.S. He also delineation the extent of the federal wetlands and prepared a Jurisdictional Delineation Report for three reaches of Rialto Channel, in support of state and federal permitting for the County's proposed improvements to the channel. In 2018, Mr. Wood re-mapped one of the three reaches and prepared a separate Jurisdictional Delineation Report.
- **Rimforest Storm Drain EIR, San Bernardino County Department of Public Works (2012-present).** Mr. Wood conducted biological surveys for a series of flood control structures in the community of Rimforest, California in San Bernardino County. The project will redirect flows that are currently causing extensive erosion to the Strawberry Creek Watershed to the south, north into Daley Canyon, a tributary of the Mojave River.
- **Hawker-Crawford Channel Biological Resources Technical Report and Jurisdictional Delineation, San Bernardino County Department of Public Works (2018).** Mr. Wood conducted a field delineation of state and federally jurisdictional waters of State and waters of the U.S. He also delineation the extent of the federal wetlands and prepared a Jurisdictional Delineation Report to support the County in obtaining state and federal permits for the proposed channel improvement project. Mr. Wood also surveyed the site for special-status plants and animals and prepared a biological resources technical report.
- **Donnell Basin IS/MND, San Bernardino County Department of Public Works (2013).** Mr. Wood wrote the Biological Resources Technical Report and biology sections of the Initial Study for a planned flood control basin in the town of Twentynine Palms, California. The Project will protect the town from large floods by increasing the capacity of an existing flood control basin.

- **Institution Road Improvement and Maintenance Project (2015-present**). Mr. Wood completed special-status species surveys along a one-mile road improvement project that crossed the Cajon Wash in San Bernardino County. He also mapped vegetation and assessed potential for special-status species to be found within the project area. He is the lead biologist for conducting a delineation of potentially jurisdictional state and federal waters and was the primary author of the delineation report and a biological resources technical report for the project.
- **Barren Ridge Renewable Transmission Project, Los Angeles Department of Water and Power (2015-present)**. Mr. Wood is one of several biologists assigned to this project. He has conducted special-status plant surveys, special-status plant relocations, and nesting bird surveys. He has also mapped non-native species and state jurisdictional waters. He worked closely with staff from the Angeles National Forest and the Department of Public Works to implement mitigation measures to protect and relocate special-status plants.
- **San Luis Transmission Project, Western Area Power Administration (2016-present).** Mr. Wood served as lead botanist to coordinate focused special-status plant surveys of the project to construct a new transmission line (500 and 230 kV) between Western's Tracy and Dos Amigos substations. Mr. Wood was the primary author of the survey report and he also managed a field team of seven sub-consultants, completed field surveys, and coordinated with resource agencies. The project crosses through portions of Alameda, San Joaquin, Stanislaus, and Merced Counties, California.

Previous Experience 2001 to 2009

- **White & Leatherman BioServices 2001-2006**
- **Leatherman BioConsulting Inc. 2006-2008**
- **San Marino Environmental Associates 2004-2008**
- **Harmsworth and Associates.. 2006-2007**

Certifications & Permits

- California Native Plant Society, **Certified Field Botanist-#0011**
- Federal 10(a)(1)(A) recovery permit (**USFWS Permit TE-37481A-1**) for conducting surveys for federally threatened Santa Ana sucker.
- Federal 10(a)(1)(A) recovery permit (**USFWS Permit TE-009018-5**) for vouchering federally listed plants (Research Association permittee under RSABG permit).
- State Plant Voucher Collecting Permit (**No. 2081 (a)-17-033-V**) to voucher state listed plants.
- State Scientific Collecting Permit **(No. SC-12776)** for working with mammals, reptiles, amphibians, vernal pool invertebrates, terrestrial invertebrates, freshwater fishes, freshwater invertebrates, anadromous fishes, marine fishes, marine tidal plants, and marine tidal invertebrates.

Workshops

- Invasive plant management workshop, California Invasive Plant Council, 2009
- Vegetation mapping workshop. California Native Plant Society, 2011
- Bryophyte identification workshop. U.C. Berkeley/Jepson Herbaria, 2012
- Southwestern willow flycatcher workshop. Southern Sierra Research Station, 2013
- Yellow-billed cuckoo workshop. Southern Sierra Research Station, Blythe, CA, 2013
- Army Corps of Engineers Wetland Delineation Training, Wetland Training Institute, 2014
- CEQA 101 workshop, California Native Plant Society, 2018.

JACOB M. ARAGON
Associate Biologist

Academic Background

BA, Organismal Biology, Pitzer College, 2019
AS, Biological, Physical Sciences and Mathematics, Citrus College, 2013
Forestry Certificate, Citrus College, 2009

Professional Experience

Jacob M. Aragon has more than 10 years of experience with wildlife surveys, botanical surveys, reporting, and mitigation monitoring in southern California. He recently joined Aspen Environmental Group as an associate biologist and is based out of Aspen's Inland Empire Office. His knowledge of California natural history is broad and includes aquatic life, upland wildlife species, and vascular plants. His areas of expertise include bird surveys, biological monitoring, and reptile and amphibian surveys. He has extensive desert tortoise monitoring experience and attended the desert tortoise surveying and handling techniques workshop in 2012. He also has experience with revegetation planning and implementation, non-native species removal, freshwater fish surveys, and various habitat assessments. He has extensive experience working throughout southern California.

Aspen Environmental Group..2019-present

The following projects represent some of the projects Mr. Aragon was been involved in since recently joining Aspen Environmental Group.

- **Mesa Wind, Confidential Client (2019-present).** Mr. Aragon is part of a team of biologists completed focused desert tortoise and special-status plant surveys for the project. Five adult tortoises were encountered during the surveys. The project includes a wind re-power project. The project site includes approximately 400 acres of on public lands managed by the BLM within Riverside County.
- **Alta Mesa Wind, Confidential Client (2019-present).** Mr. Aragon is part of a team of biologists completed focused desert tortoise and special-status plant surveys for the project. The project includes a wind re-power project. The project site includes approximately 300 acres of private land within Riverside County.
- **Littlerock Dam and Reservoir Restoration Project, Palmdale Water District/US Forest Service (2019-present).** Mr. Aragon is part of a team of biologists conducting biological compliance monitoring and wildlife surveys for the sediment removal activities associated with the Littlerock Dam and Reservoir in the Angeles National Forest.
- **Santa Ana River Mainstem Project, U.S. Army Corps of Engineers (2019-present).** Mr. Aragon is serving as a biological monitor on the U.S. Army Corps of Engineers' Santa Ana River Mainstem Project. He has completed focused surveys for least Bell's vireo, burrowing owl, nesting birds, and southwestern pond turtle. He has also mapped vegetation and assessed habitat for special-status species. He has worked on several of the project components located within the Prado Basin and downstream along the Santa Ana River.
- **Live Oak Dam Rehabilitation Project, Los Angeles County Public Works (2019-present).** Mr. Aragon is assisting with nesting bird surveys for the dam rehabilitation project. He also assisted with the

preparation of the nesting bird management plan and is the lead biological monitor responsible for the day to day compliance monitoring.

- **Calleguas Projects Off-Site Mitigation Project, Ventura County Watershed Protection District (2019-present).** Mr. Aragon conducted vegetation surveys and assisted with the report preparation for the habitat restoration site located along Calleguas Creek at Upland Road in Camarillo.
- **Fuel Modification Project, Angeles National Forest (2019-present).** Mr. Aragon is part of a team of biologists completing biological surveys for a proposed fuel modification project in the Liebre Mountains. Surveys being completed include a habitat assessment for spotted owl, focused special-status plant surveys, and general wildlife surveys.
- **Mojave River Conservation Lands, San Bernardino County Department of Public Works (2019-present).** Mr. Aragon is assisting with land management of the 200-acre conservation lands within the Mojave River, downstream of Victorville. He is monitoring non-native plant removal during the nesting season. He is also assisting with regular vegetation monitoring and photo documentation.
- **Santa Ana Sucker Translocation Site Evaluations, San Bernardino Valley Municipal Water District (2019-present).** Mr. Aragon is part of a team of biologists assessing five translocation sites for Santa Ana sucker in the San Bernardino National Forest. The habitat assessments include a variety of habitat measurements using SWAMP-protocols. The site evaluation locations include Bear Creek, Deer Creek, Lytle Creek, Cajon Creek, and the upper Santa Ana River.

Previous Professional Experience 2011 to 2019

The following highlights some of the previous professional experiences that Mr. Aragon had prior to joining Aspen Environmental Group.

- **Associate Biologist, Harmsworth Associates (2012-2019).** Mr. Aragon served as a project manager and associate biologist for more than seven years on a variety of projects throughout Orange County and southern California. He conducted focused surveys for least Bell's vireo, desert tortoises, California gnatcatcher, burrowing owls, and other special-status birds. He was listed as an independent surveyor for California gnatcatcher under Harmsworth Associates recovery permits. He has extensive experience with mitigation monitoring, including nesting bird monitoring. He also conducted general flora and fauna surveys and habitat assessments for numerous special-status species.
- **Project Biologist, Endemic Environmental Services, Inc. (2012-2013).** Mr. Aragon served as a project biologist for several projects during 2012 and 2013. He conducted focused wildlife surveys and biological monitoring for several projects including the following:
  - **Desert Tortoise Monitoring, San Bernardino County Department of Public Works.** Mr. Aragon was one of several biologists that conducting construction monitoring and desert tortoise surveys on various San Bernardino County road resurfacing and grading projects centered around Barstow, CA. Tasks include site inspections, desert tortoise surveys, monitoring and reports. All active burrows were mapped on aerial photographs and flagged onsite.
- **Biological Field Technician, Harmsworth Associates (2011-2012).** Mr. Aragon started his career with Harmsworth Associates as a biological field technician. In this role he conducted biological and construction monitoring, nesting bird surveys, brown-headed cowbird trapping, and vegetation surveys.

- **Field Technician, Endemic Environmental Services (2012-2013).** Mr. Aragon work on a variety of projects for Endemic Environmental Services. These included desert tortoise monitoring, wildlife trapping and relocation (avian, turtle, and fishes), nesting bird surveys, biological monitoring, and extensive flora and fauna surveys on Camp Pendleton Marine Corps Base.

Workshops

- **California Rapid Assessment Method (CRAM) for Wetlands,** the California Wetlands Monitoring Workgroup, 2019
- **Desert tortoise surveying and handling techniques workshop**, the Desert Tortoise Council, 2012

LEATHERMAN BioConsulting, Inc.

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BRIAN LEATHERMAN
PRINCIPAL WILDLIFE BIOLOGIST

EDUCATION
California State University, Fullerton, California
Master of Arts, Biological Science, 1993.
Bachelor of Arts, Biological Science, 1991.

PROFESSIONAL EXPERIENCE
Leatherman BioConsulting, Inc. 2006 – present; White & Leatherman BioServices 2000-2006; Psomas and Associates, 1997-2000; Chambers Group 1996-1997; Dames and Moore 1993-1996; Independent Consulting Biologist 1991-1993. Primarily responsible for biological surveys, report preparation, project management, and agency coordination. Specialties include habitat assessments, general wildlife documentation, focused surveys for endangered species, construction and mitigation compliance monitoring, and wildlife corridor assessment and monitoring. Prepares biological technical reports to document field work and propose mitigation strategies to meet requirements of CEQA and NEPA, and to initiate formal consultation under the federal Endangered Species Act.

CERTIFICATIONS/PERMITS
- Section 10(a)(1)(A) Permit for Southwestern Willow Flycatcher, California Gnatcatcher, Western Yellow-billed Cuckoo, Least Bell's Vireo (Permit No. TE827493-9).
- California Department of Fish and Game Scientific Collecting/Trapping Permit SC-001567; MOU for Southwestern Willow Flycatcher, Western Yellow-billed Cuckoo, Least Bell's Vireo; nest monitoring for California gnatcatcher; trapping for southern rubber boa and southwestern pond turtle.

GENERAL EXPERIENCE

Mr. Leatherman has over twenty-five years of experience as a professional biologist conducting general and focused avian, herpetological, mammalian, and special status species surveys, and preparing biological reports and biological resources sections for environmental documents. His expertise lies in documenting wildlife diversity and habitat utilization, evaluating habitats for their potential to support rare, threatened, and endangered wildlife species, and analyzing impacts of proposed projects on biological resources. He has designed and implemented studies to monitor wildlife usage of restoration sites and movement corridors, and has developed and implemented relocation efforts for several special status species. He has monitored a variety small- and large-scale construction projects to ensure and document compliance with project permits or mitigation monitoring plans. A list of some of the special status species he has worked with includes the quino checkerspot butterfly, arroyo toad, California red-legged frog, southwestern pond turtle, desert tortoise, southwestern willow flycatcher, least Bell's vireo, California gnatcatcher, San Joaquin kit fox, and many others. More recently, his focus has been

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on projects that use science based survey techniques and applied biological principles on conservation lands and preserves to be managed for their biological resources.

REPRESENTATIVE PROJECT EXPERIENCE

Desert Tortoise Experience

Desert Tortoise Monitoring for Emergency Bridge Repair along National Trails Highway (Route 66), Amboy, San Bernardino Department of Public Works. Leatherman BioConsulting Inc. has been working with San Bernardino County Department of Public Works and Flood Control District under an on-call contract since 2011. Representative services provided include focused surveys for the Least Bell's Vireo, Southwestern Willow Flycatcher, Western Yellow-billed Cuckoo, and California Gnatcatcher, full time monitoring of the South Fork Lytle Creek Bridge Replacement Project and Maple Lane Drainage Improvement Project, Desert Tortoise monitoring for routine roadside grading in the eastern Mojave Desert, and operation of their Brown-headed Cowbird Trapping Program along the Mojave and Santa Ana Rivers systems. In the fall of 2014, severe thunderstorms resulted in major flooding in portions of the Mojave Desert, resulting in the complete failure or damage to numerous bridges along National Trails Highway (historic Route 66) between Ludlow and Essex in San Bernardino County. Leatherman BioConsulting, Inc. provided qualified desert tortoise biologists to monitor the emergency repair of over 50 bridges along a 60-mile stretch of National Trials Highway, which was closed for several months. Monitoring included conducting pre-construction nesting bird surveys prior to vegetation clearing upstream and downstream of the bridges, conducting clearance sweeps of access roads and bridges prior to beginning bridge repair work, conducting daily sweeps for desert tortoise in each active work area, and continually surveying National Trails Highway for desert tortoises in active work areas. Desert tortoises found on the road surface were continuously monitored by a biologist to ensure they weren't hit by road crews working in the areas. Over a dozen tortoises were monitored during the project.

Authorized Biologist for Desert Tortoise Clearance Survey for Western Mesquite Mines, Brawley, Imperial County, CA. Hernandez Environmental Services. 2017. Conducted clearance surveys for desert tortoise on an 1800-acre site for the Western Mesquite Gold Mine. The surveys were conducted as part of a biological opinion re-initiation process by the BLM, USFWS, and CDFW and followed the current clearance survey protocol. The surveys were conducted using 100% visual coverage surveys by walking parallel belt transects with five biologists throughout the project site searching for desert tortoise and associated sign. In addition, Mr. DeLuna assisted with burrow excavation.

Authorized Desert Tortoise Biologist, Mead-Adelanto Transmission Line, Los Angeles Department of Water and Power. Performed preconstruction surveys and monitored for desert tortoise for LADWP during construction of a 200-mile power line in the Mojave Desert through portions of Nevada and California. Provided education training to contractor personnel as needed to comply with conditions of the biological opinion. Filed compliance and tortoise report forms on a weekly basis. Tagged and processed dozens of desert tortoises, removed tortoises

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from construction zones, and excavated and constructed tortoise burrows. Mohave ground squirrels were observed in several locations during the monitoring effort.

Desert Tortoise Monitoring for Harper Lake Road Resurfacing Project, San Bernardino County, CA. 2013. Conducted construction monitoring for the desert tortoise along Harper Lake Road during the demolition and resurfacing of a 7-mile stretch of the road north of State Route 58. Monitoring was conducted along sections of the road that did not have tortoise fencing, and in areas where there were gaps in the tortoise fencing at road intersections, to ensure that no impacts to desert tortoises occurred during the project.

Desert Tortoise Survey on Onyx Ranch in Kern County, TRA Environmental Sciences, 2012. Designed and implemented a large-scale survey to sample the approximately 44.5 square-mile Onyx Ranch property for the desert tortoise. Conducted 150 miles of transects on 15 sections (parcels) of land to evaluate relative abundance, presence and distribution of the desert tortoise throughout the area. Over 60 individual sign of desert tortoise, including 13 tortoise sightings, were documented during the survey.

Desert Tortoise Monitoring for Wheaton Wash Delineation Project, Molycorp Minerals, San Bernardino County. Lilburn Corporation, 2011. Served as Authorized Biologist (by U.S. Fish and Wildlife Service and Bureau of Land Management) to conduct preconstruction surveys, clearance surveys, and monitor for desert tortoise so individuals could be moved out of harm's way during well drilling, construction, and development along Wheaton Wash. Escorted drill crews into project site through desert tortoise habitat and monitored all phases of construction for desert tortoise.

Focused Desert Tortoise Surveys for Molycorp, San Bernardino County. Lilburn Corporation, 2009. Conducted focused surveys desert tortoises along a 12-mile pipeline route. Conducted focused surveys along the alignment and zone of influence surveys at 100, 300, 600, and 1,200 feet from the alignment. Evaluated all desert tortoise sign (burrows, scat, carcasses etc.) and recorded location data using GPS technology. Navigated zone of influence surveys by uploading and following UTM coordinates on GPS.

Focused Surveys and Monitoring for Desert Tortoise along Honda Test Track, San Bernardino County. APEX Performance, 2008. Served as lead biologist to conducted focused surveys for desert tortoises along an established route in the Mecca Hills for a Honda SUV test drive. Prepared and implemented desert tortoise education program for event sponsor and all participants. Monitored the test track throughout the event to make sure that drivers remained on established route and to ensure that no impacts to desert tortoises occurred during event.

Desert Tortoise Education and Construction Monitoring, Adelanto Main Post Office, Parsons Infrastructure and Technology Group, Inc. Developed and implemented education program for the desert tortoise pursuant to the Biological Opinion issued by the U.S. Fish and Wildlife Service for the project. Performed pre-construction surveys, monitored installation of fencing around perimeter of project site and construction staging areas, and conducted clearance

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surveys in project construction area. Prepared progress and final reports to document compliance with resource agency permits. Mr. Leatherman served as authorized biologist permitted under Biological Opinion.

Desert Tortoise Surveys on Fort Irwin, Lilburn Corporation. Conducted 100% coverage and zone of influence surveys for three alternative proposed natural gas and water supply pipelines to Ft. Irwin in 2004. One alternative included survey of a fourteen mile stretch along the main access road (Fort Irwin Road) approaching and within the Fort Irwin boundary. Desert tortoise surveys, botanical surveys, and general biological surveys were conducted in 2004 in support of a biological report in preparation under contract to Lilburn Corporation.

Desert Tortoise Studies, U.S. Army, Fort Irwin. Part of a team of biologists who conducted 100% coverage surveys for desert tortoise on the north Alvord slope/Coyote Dry Lake area south of Fort Irwin, and BLM triangular strip transect surveys on approximately 300 square miles in the Silurian Valley east of Fort Irwin and as part of the NEPA and CEQA evaluation for the proposed base expansion project for Chambers Group, Inc.

Desert Tortoise Studies, U.S. Army. Part of a team of biologists who conducted BLM triangular strip transect surveys for desert tortoise on approximately 350 square miles on the north Alvord slope/Coyote Dry Lake area south of Fort Irwin and in the Silurian Valley east of Fort Irwin for the base expansion project. Mohave ground squirrels were observed in several location during the intensive study.

Focused Desert Tortoise Surveys, U. S. Marine Corps. Conducted 100% and zone of influence surveys for desert tortoise on proposed development sites and associated pipelines at 29 Palms Marine Air Ground Combat Center for the extension of existing runways. Subsequently monitored access routes and drilling pads for drilling crews.

Desert Tortoise Studies on Fort Irwin, Kiva Biological Consulting. Assisted with 100% coverage to find, radio telemeter, and eventually relocate desert tortoises from 39 square miles along the southern boundary of Ft. Irwin in the fall of 2006 and spring 2007. The project was being implemented in compliance with the Biological Opinion that would allow the U.S. Army to conduct training exercises in the southern portion of the existing base.

Desert Tortoise Studies on Fort Irwin, Lilburn Corporation. Conducted 100% coverage and zone of influence surveys for three alternative proposed natural gas and water supply pipelines to Ft. Irwin in 2004. One alternative included survey of a fourteen mile stretch along the main access road (Fort Irwin Road) approaching and within the Fort Irwin boundary. Desert tortoise surveys, botanical surveys, and general biological surveys were conducted in 2004 in support of a biological report in preparation under contract to Lilburn Corporation.

Bird Experience

Focused Western Yellow-billed Cuckoo and Southwestern Willow Flycatcher Surveys, Los Angeles Dept. of Water and Power's Devil's Gate Sediment Removal Project, Los Angeles County, ECORP, Inc. 2016, 2017. Conducted focused survey for southwestern willow flycatcher and western yellow-billed cuckoo within cottonwood-willow riparian forest along Arroyo Seco for the Devils Gate Dame Sediment Removal Project upstream of Devil's Gate Dam, where LADWP plans to remove sediment to restore flood control capacity and restore habitat.

Focused Surveys for Western Yellow-billed Cuckoo, Least Bell's Vireo, and Southwestern Willow Flycatcher, Mojave River, San Bernardino County Flood Control District, 2013. Conducted focused surveys for the western yellow-billed cuckoo, least Bell's vireo, and southwestern willow flycatcher in mature cottonwood-willow riparian forest near Mojave Narrows along the Mojave River. The proposed project involved the reconstruction of an existing levee along the east bank of the Mojave River off 6th Street in Victorville, San Bernardino County. No cuckoos or vireos were observed and one migrant flycatcher was observed.

Focused Survey for the Yellow-billed Cuckoo and Least Bell's Vireo, Santa Ana River, Riverside County, CA. Ecorp Consulting, Inc., 2016. Assisted with focused surveys for the yellow-billed cuckoo and least Bell's vireo under the supervision of a permitted biologist along the Santa Ana River for the Santa Ana River Trail Project.

Nesting Bird and Raptor Pre-Construction Surveys, City of Riverside, Riverside County, CA. Rancho Sierra Vista, 2007. Conducted a thorough survey of a small grove of large eucalyptus trees on the Tentative Tract 32476 Rancho Sierra Vista project site for active raptor nests. Other trees, such as avocado trees, Brazilian pepper trees, elderberry trees, and silk oak trees, that were mixed in the eucalyptus grove were also surveyed. The purpose of the survey was to document the presence or absence of active raptor nests prior to the removal of the trees to comply with California Fish and Game Code and Federal Migratory Bird Treaty Act.

Focused California Gnatcatcher Surveys, Tesoro del Valle Development Project, Bonterra/Psomas, 2015. Conducted focused surveys for the California gnatcatcher on over 300 acres of the 1,200-acre Tesoro del Valle development site located north of Santa Clarita in Los Angeles County. Standard protocol-level surveys were conducted in all suitable habitat. Mr. DeLuna conducted or assisted with 12 surveys and accumulated nearly 90 hours of survey time. One juvenile California gnatcatcher was observed on the final survey, documenting a significant occurrence for that region.

Focused Survey for California Gnatcatcher, Cajon Wash, San Bernardino County, CA. Lilburn Corporation, 2008. Conducted focused surveys within the San Bernardino County Flood Control District's proposed 400-acre Cajon Wash Mitigation Bank. Purpose of the survey was to evaluate potential occurrence of California gnatcatchers within mitigation bank because the area is historically known to support very low density population.

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SANDRA LEATHERMAN
PRINCIPAL BIOLOGIST

EDUCATION
California State University, Fullerton, California
Bachelor of Arts, Biological Science, 1991.

PROFESSIONAL EXPERIENCE
Leatherman BioConsulting, Inc. 2011– present; BonTerra Consulting 1998-2011; P&D Consultants 1993-1998; MBA 1992-1993; USFS Stanislaus 1991. Primarily responsible for biological surveys, report preparation, project management, and agency coordination. Specialties include habitat assessments, general vegetation documentation, vegetation mapping, focused surveys for endangered species, restoration plan development, restoration monitoring, and construction and mitigation compliance monitoring. Prepares biological technical reports to document field work and propose mitigation strategies to meet requirements of CEQA and NEPA, and to initiate formal consultation under the federal Endangered Species Act. Also prepares Habitat Mitigation Plans.

MEMBERSHIPS
- Southern California Botanists Board of Directors
- California Native Plant Society
- California Botanical Society
- Society of Ecological Restoration
- California Native Grasslands Association
- California Invasive Plant Council
- The Desert Tortoise Council

PERMITS AND CERTIFICATIONS
- CDFG Rare, Threatened and Endangered Plant Voucher Collecting Permit (No. 06022)

SEMINARS AND SPECIALIZED TRAINING
- California Native Plant Society Conservation Conference January 2015
- Southern California Botanists Symposiums Annually 1991-2018
- California Native Plant Society Conservation Conference January 2012
- 20^{th} Annual Desert Tortoise Surveying, Monitoring, and Handling Techniques Workshop. The Desert Tortoise Council. Ridgecrest, California. November 2011.
- California Native Plant Society Conservation Conference November 2009
- SERCAL's 14^{th} Annual Conference "Restoration from Sea to Shining Sea" October 2007
- SERCAL's 13^{th} Annual Conference "Shovel to Science: A Full Range of Restoration Practice in California" October 2006
- California Exotic Pest Plant Council Symposium October 1998

- California Exotic Pest Plant Council Symposium October 1995

GENERAL EXPERIENCE

Sandra Leatherman has over twenty years of experience as a professional biologist conducting general biological surveys, focused special status plant surveys, vegetation mapping, and preparing biological reports and biological resources sections for environmental documents. Ms. Leatherman's professional experience has focused on plant ecology and taxonomy. She has conducted and/or managed both general and directed surveys for biological resources, including plants listed as special status or endangered under State and federal laws and regulations. She has been responsible for developing habitat restoration programs and evaluating restoration site conditions on a quantitative and qualitative basis for public-sector and private-sector clients throughout southern California. Ms. Leatherman has developed and monitored numerous restoration projects which were approved by the resource agencies and released from further maintenance and monitoring. Ms. Leatherman has also authored the biological resources sections of numerous environmental impact reports (EIRs) and separate biological reports, including biological assessments (pursuant to Section 7 consultations with the U.S. Fish and Wildlife Service [USFWS]), Natural Environmental Studies (pursuant to California Department of Transportation [Caltrans] guidelines), and reports in accordance with NCCP guidelines (e.g. Western Riverside MSHSP). She has also authored focused survey reports for special status species, tree reports, and general biological assessments.

REPRESENTATIVE PROJECT EXPERIENCE

Interstate 10/Monterey Interchange Improvement Project, Riverside County, BonTerra Consulting. Served as the lead botanist for a freeway interchange project in Coachella Valley. Performed focused surveys for Coachella Valley milk-vetch, prepared detailed field notes and California Natural Diversity Database (CNDDB) data forms; mapped population locations; collected voucher specimens; and performed other related analyses. Responsibilities also included: preparation of a detailed special status species report, which included mitigation recommendations and a complete plant list.

Garden of Champions Biological Surveys, Riverside County, BonTerra Consulting. Served as the lead botanist for the Garden of Champions project site in Coachella Valley. Mapped vegetation and performed focused surveys for Coachella Valley milk-vetch. Prepared detailed field notes and California Natural Diversity Database (CNDDB) data forms; mapped population locations; collected voucher specimens; and performed other related analyses. Responsibilities also included: prepared a detailed special status species report (which included mitigation recommendations and a complete plant list) and a Biological Technical Report for the project site.

Special Status Plant Surveys, U.S. Gypsum Plaster City Quarry, Imperial County, CA. Aspen Environmental 2016 and 2017. Conducted special status plant surveys on the U.S. Gypsum mine with a team of botanists. Responsibilities includes: plant identification, recording GIS data and detailed field notes.

Narrow Endemic Plant Surveys, Newcastle Eastvale Site, Western Riverside County, CA. Alden Environmental Inc, 2017. Conducted focused narrow endemic plant surveys (per the MSHCP) on the approximately 16 acre project site in the City of Eastvale, western Riverside County. The surveys were conducted using 100% visual coverage surveys by walking parallel belt transects throughout the project site. Responsibilities included: documenting reference populations prior to the survey, recording all plant species present and collecting voucher specimens on the site to be submitted to the herbarium.

Special Status Plant Surveys, Thousand Palms Flood Control Project, Riverside County, CA. Aspen Environmental Group, 2016. Assisted with focused surveys for special status plant species including the Coachella Valley Milk Vetch (*Astragalus lentiginosus var. coachellae*) along four reaches of the project, two of which are adjacent to the Coachella Valley Preserve. The surveys were conducted in linear transects in a team of four biologists.

Construction Monitoring, Mojave River West Levee Phase II Project, Victorville, San Bernardino County, California. San Bernardino County, 2017. Conducts weekly biological monitoring for compliance with mitigation measures, site-specific BMPs and provides worker environmental awareness program training (WEAP training). Provides a summary of the project activities related to biological resources and jurisdictional waters. Prepares weekly monitoring memoranda using daily monitoring logs and site photographs.

Special Status Plant Surveys Valley-Ivyglen Transmission Line Project for Edison, Riverside County, CA. Kidd Biological Inc./AECOM, 2015. Served as a botanist on the 27 mile Edison Transmission Alignment in Western Riverside County. Conducted systematic surveys of the project site with a team of six biologists. Prepared detailed field notes and collected special status plant data with a hand-held Garmin GPS.

Approximate 500-Acre Adelanto Project Site, San Bernardino County, BonTerra Consulting. Served as the lead botanist for the Adelanto Project site in San Bernardino County. Conducted general plant surveys, mapped vegetation, assisted in the preparation of a technical report, and made recommendations for special status plant surveys at the site.

Dos Palmas Monitoring Wells, Riverside County, BonTerra Consulting. Served as botanist for the Monitoring Wells construction in Riverside County. Responsibilities included: vegetation mapping and a general plant survey on the site.

Cottonwood Creek, Riverside County, BonTerra Consulting. Served as the project manager and lead botanist for the proposed development in western Riverside County. Responsibilities included: mapping vegetation; a general plant survey on the site; preparation a Habitat Assessment (per the County guidelines) and a detailed plant list.

Mira-Serra, Riverside County, BonTerra Consulting. Served as the lead botanist for a 50-acre project site in Palm Springs. Performed focused surveys for Coachella Valley milk-vetch. Prepared detailed field notes and California Natural Diversity Database (CNDDB) data forms; mapped population locations; collected voucher specimens; and performed other related analyses. Responsibilities also included: preparation of a detailed special status species report, which included mitigation recommendations and a complete plant list.

20-Acre K. Hovnanian Site in Palm Springs, Riverside County, BonTerra Consulting. Served as the lead botanist for a 20-acre project site in Palm Springs. Performed focused surveys for Coachella Valley milk-vetch. Prepared detailed field notes and California Natural Diversity Database (CNDDB) data forms; mapped population locations; collected voucher specimens; and performed other related analyses. Responsibilities also included: preparation of a detailed special status species report, which included mitigation recommendations and a complete plant list.

126 Acres in Hesperia for Stonegate Development, San Bernardino County, BonTerra Consulting 2017. Served as the lead botanist for the 126-acre project site in Hesperia. Conducted general plant surveys, mapped vegetation, prepared a Constraints Analysis, and acted as Technical Editor.

15-Acre Site in Cathedral City for Burnett, Riverside County, BonTerra Consulting. Served as the lead botanist for a 15-acre project site in Cathedral City. Performed focused surveys for the Coachella Valley milk-vetch. These studies included the preparation of detailed field notes and California Natural Diversity Database (CNDDB) data forms; the mapping of population locations; the collection of voucher specimens; and the conducting of other related analyses. Responsibilities also included: the preparation of a detailed Special Status Species Report, which includes mitigation recommendations and a complete plant list.

Antelope Transit, Los Angeles County, BonTerra Consulting. Served as the lead botanist for the Antelope Valley Transit Authority project. Conducted general plant and wildlife surveys and mapped vegetation on 16 acres of open space in the City of Lancaster.

Washington Street, Riverside County, BonTerra Consulting. Served as the lead botanist for the Washington Street widening project in Coachella Valley. Mapped vegetation on the project site, conducted general plant surveys, and prepared a Biological Technical Report.

Trampas Canyon Dam and Reservoir Project, Santa Margarita Water District. 2018-Present. Project Manager and field biologist for SMWD Trampas Canyon Dam and Reservoir Project, a $123,000,000 project that is currently under construction. The project involves the reconstruction of the Trampas Canyon Dam to create a 5,000 acre-foot (ac-ft) recycled water reservoir. Responsibilities include monitoring the installation of fencing along construction limits and all clearing and grubbing activities, identifying and establishing Environmentally Sensitive Areas, and conducting pre-construction nesting bird surveys. Ms. Leatherman also submits weekly reports to RWQCB, USFWS, CDFW and USACE.

Botanical Inventory and Rare Plant Mapping, Canyon Fire, Orange County California 2018 Served as one of the lead botanists large scale botanical inventory to document plant diversity and to locate, map and estimate the population size of all special status plant species within the Canyon Fire footprints. Surveys were conducted throughout the spring and summer of 2018 throughout lands managed by the Irvine Ranch Conservancy and the NCCP Central

Reserve managed by the Natural Communities Coalition. The locations and extent of each special status plant species was mapped in the field using handheld GPS units and downloaded into mapping software to develop a GIS data base with all plant populations. Ten rare plant were detected during the surveys, including the federally endangered Braunton's milkvetch (*Astragalus brauntonii*), a very rare species that germinates and persists for short periods in areas that recently burned. Special status plant populations were recorded at 338 points and extensive populations were mapped in 96 polygons.

Vegetation Mapping South County Mobility Project Vegetation Mapping, Orange County, CA. Psomas 2017. Served as senior botanist on South County Transportation Corridor Analysis. Responsibilities include mapping over 2,000 acres of native habitats on aerial photographs for digitizing in GIS. This task also included qualitative data collection and sampling. The habitats mapped included but were not limited to: coastal sage scrub, chaparral, riparian, native grasslands, annual grassland, and oak woodlands and riparian forests. The vegetation was mapped using the OC GIS classification system and Sawyer Keeler-Wolf.

Special Status Plant Surveys, South County Mobility Project Special Status Plant Surveys, Orange County, CA. Psomas 2017. Served as the lead botanist for the special status plant surveys in southern Orange County. Responsibilities included: organizing crews of 20 people in the field, surveying over 3,000 of natural habitat, organizing all the gis data and plant data, keying plants, submitting herbarium specimens and primary author of the special status plant report. Special status plant species surveyed for included: thread-leaved brodiaea, intermediate mariposa lily, mud nama, white-rabbit tobacco, Catalina mariposa lily, many-stemmed dudleya, small-flowered morning-glory, Robinson's pepper-grass, Coulter's matilija poppy, southern tarplant, paniculate tarplant, and small-flowered microseris.

Special Status Plant Surveys, Dana Point Preserve Dana Point, Orange County, CA. Center for Natural Lands Management, 2017. Served as the lead botanist to update special status plant locations and any additional species on the 29-acre Dana Point Headlands. Responsibilities included: surveying and collecting data on special status plant locations with a GPS and Ipad (Avena Program), collecting herbarium specimens and identifying them, and author of the

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ADAM DELUNA
PROJECT BIOLOGIST

EDUCATION
California State University, Fullerton, California
Bachelor of Science, Biological Science, 2012. Focus of major on biodiversity, ecology, and conservation of biological resources in southern California.

PROFESSIONAL EXPERIENCE
Leatherman BioConsulting, Inc. March 2011 – Present. Primary responsibilities include conducting California gnatcatcher, least Bell's vireo, southwestern willow flycatcher, burrowing owl surveys, nest monitoring, desert tortoise surveys and monitoring, construction monitoring, and arundo removal monitoring on a variety of projects throughout California. Additional experience includes project management, brown-headed cowbird trapping programs, assisting with general botanical and biological surveys, wildlife trapping and control, data input, and report preparation.

PERMITS AND CERTIFICATIONS
- Authorized desert tortoise biologist
- California Department of Fish and Wildlife Scientific Collecting Permit (SC-12609).

SEMINARS AND SPECIALIZED TRAINING
- Authorized Desert Tortoise Biologist Training Course. The Desert Tortoise Council in cooperation with U.S. Fish and Wildlife Service. Primm, Nevada. September 2017.
- 20th Annual Desert Tortoise Surveying, Monitoring, and Handling Techniques Workshop. The Desert Tortoise Council. Ridgecrest, California. November 2011.
- CalFlora Training Workshop, CalFlora. Audubon Starr Ranch Sanctuary, Santa Ana Mountains, California. January 2017.

GENERAL EXPERIENCE

Adam DeLuna graduated from California State University Fullerton in 2012 with a degree in Biological Science with a focus on the ecology and conservation of vertebrates in Southern California. Since that time, Mr. DeLuna has worked extremely hard to become qualified to work with a variety rare, threatened and endangered plant and wildlife species throughout the region. Mr. DeLuna's work with the desert tortoise, coupled with his attendance to training workshops on surveying and handling desert tortoises, has recently earned him the title of Authorized Biologist, which is the highest level of qualification recognized by the resource agencies. In addition to his work with the tortoise, Mr. DeLuna is qualified and/or permitted to conduct surveys for several special status bird species, and has management experience in survey planning and leading teams of biologists on large scale bird surveys (e.g. burrowing owl, California gnatcatcher, cactus wren). Finally, Mr. DeLuna has extensive experience on a variety of construction projects on which he serves as the lead monitoring biologist, organizing and conducting nesting bird surveys, establishing buffer areas for nesting birds, conducting pre-construction sweeps and weekly (or daily) sweeps for species identified in project permits, and evaluating and documenting compliance with project related permits from various agencies.

REPRESENTATIVE PROJECT EXPERIENCE

Desert Tortoise Monitoring for Emergency Bridge Repair along National Trails Highway, Amboy, CA. San Bernardino Department of Public Works, 2013-2018. Conducted daily surveys and monitoring for emergency bridge repair work along National Trails Highway (historic Route 66). Monitoring activities included daily surveys for desert tortoise within project area, roadside surveys prior to grading, and monitoring construction crews during supplemental construction and removal of excess material. Based on his work in 2014, the county has requested his participation on emergency bridge repair projects on an annual basis following thunderstorms that result in damage to roads and bridges throughout the Mojave Desert. Accumulated over 2,100 hours of field experience surveying and monitoring for desert tortoise for the County of San Bernardino.

Burrowing Owl, Desert Kit Fox, and American Badger Surveys, Camera Monitoring, Burrow Excavation, Fence Checks, Beacon Solar Project, Kern County, CA. BonTerra Psomas, 2016-2017. Conducted focused surveys for burrowing owl, desert kit fox, and American badger on Site 2 and Site 5 of the Beacon Solar Project in the Mojave Desert. The surveys were conducted using 100% visual coverage surveys by walking parallel belt transects with a team of biologists throughout the project site searching for target species, active burrows, and potential burrows. Conducted multiple rounds of crepuscular surveys on active and potential burrows; installed camera monitoring stations on active and potential burrows; and conducted camera monitoring for target species. Constructed and installed one-way doors to passively relocate burrowing owl according to the project's Burrowing Owl Exclusion Plan and to ensure other potential burrows were inactive prior to excavation. Assisted with burrow checks using a bore scope video camera and excavated inactive burrows. Conducted weekly desert tortoise fence checks on both sites, including associated lay-down yards.

Desert Tortoise Surveys and Authorized Desert Tortoise Biologist, California City, CA. Psomas, 2017-2018. Served as an Authorized Desert Tortoise Biologist on a 35-acre prison expansion project in California City. Conducted pre-construction desert tortoise surveys and was in charge of excavating unoccupied/inactive burrows throughout the site. Surveys were conducted using 100% visual coverage surveys by walking parallel belt transects throughout the project site searching for target species, active burrows, and potential burrows.

Desert Tortoise Monitoring for Twentynine Palms Channel Grading, Twentynine Palms, CA. San Bernardino County Flood Control District, 2013 and 2017. Conducted daily monitoring along Twentynine Palms channel along Utah Road. Monitoring activities included daily surveys for desert tortoise and burrowing owl within the impact area, and monitoring for target species' as heavy equipment was used to restore the levee and channel.

Desert Tortoise Monitoring for Road Grading, Locations Throughout San Bernardino County, CA. San Bernardino County, 2013-2018. Conducted monitoring for San Bernardino County road grading crews at various locations supporting desert tortoise habitat throughout the

Mojave Desert. Surveyed shoulders and drainages prior to equipment work (graders and loaders) to ensure that no impacts to desert tortoises occurred during road maintenance. Coordinated with County workers, conducted contractor education, and was responsible in identifying and marking grading limits throughout the county maintained roads and washes.

Desert Tortoise Clearance Survey for Western Mesquite Mines, Brawley, Imperial County, CA. Hernandez Environmental Services, 2017. Conducted clearance surveys for desert tortoise on an 1800-acre site for the Western Mesquite Gold Mine. The surveys were conducted as part of a biological opinion re-initiation process by the BLM, USFWS, and CDFW and followed the current clearance survey protocol. The surveys were conducted using 100% visual coverage surveys by walking parallel belt transects with five biologists throughout the project site searching for desert tortoise and associated sign. In addition, Mr. DeLuna observed and assisted with relocation of six tortoises and excavated ten burrows.

Desert Tortoise Monitoring for Communications Tower Upgrade, Ivanpah Valley, CA. Aspen Environmental, 2013. Conducted daily monitoring along access road as well as within and around a communication tower facility during an upgrade to communication towers in an occupied desert tortoise habitat near state line (Primm, Nevada). Monitoring activities included daily sweeps for desert tortoise within project area, roadside sweeps prior to accessing the facility, escorting work crews to the facility, checking tortoise fencing around facility, and monitoring crews during construction process.

Pre-Construction Surveys and Arundo Removal Monitoring, Santa Clara River, Santa Clarita, Los Angeles County, CA. Wildscape Restoration, 2012. Conducted pre-construction survey for special status species and monitored the removal of arundo and other non-native invasive species within the Santa Clara River. Exotic species removal was conducted under the Santa Clara River Arundo and Tamarisk Removal Project (SCARP), within Area E of the Site Specific Implementation Project area near the confluence with San Francisquito Creek. Work was conducted under the auspices and conditions set forth in the California Department of Fish and Wildlife Streambed Alteration Agreement (File No. 1600-2005-0275-R5) and U. S. Fish and Wildlife Service Biological and Conference Opinions (File No. 1-8-06-F-5).

Riparian and Native Grassland Invasive Plant Removal, Dune Restoration, Camp Pendleton, San Diego County, CA. Gulf South Research Corporation, 2015-2016. Conducted surveys and mapped distribution of invasive plants in riparian habitats occupied by Least Bell's Vireo and Southwestern Willow Flycatcher, along coastal bluffs occupied by California Gnatcatcher, and in native grassland habitats with thread-leaved brodiaea populations. Assisted with special status plant surveys and monitoring for coast woolly-threads, Nuttall's lotus, Brand's phacelia and sand verbena in California least tern and snowy plover habitat. Assisted with sweet fennel removal and monitored application of herbicide treatment on sweet fennel in occupied thread-leaved brodiaea habitat. Identified weeds to be removed during the restoration of the dunes.

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GREGORY STRATTON
STAFF BIOLOGIST

EDUCATION
California Polytechnic University, Pomona, California
Bachelor of Science in Environmental Biology, 2014
Minor in Geology

PROFESSIONAL EXPERIENCE

Leatherman BioConsulting, Inc. March 2015 – present: Primary responsibilities include conducting California gnatcatcher, least Bell's vireo, burrowing owl, arroyo toad, desert tortoise surveys and monitoring, and monitoring construction sites for compliance with various project-related permits throughout California. Additional experience includes brown-headed cowbird trapping programs, monitoring restoration sites, assisting with general botanical and biological surveys, nesting bird surveys, wildlife trapping and control, data input, and report preparation.

SPECIALIZED TRAINING

- 24th Annual Desert Tortoise Surveying, Monitoring, and Handling Techniques Workshop. The Desert Tortoise Council, Ridgecrest, CA. November 2015.

GENERAL EXPERIENCE

Mr. Stratton graduated from California Polytechnic University, Pomona where he majored in Environmental Biology with an emphasis in Ecosystem Ecology and Management. He also earned a minor in Geology. His professional experience with Leatherman BioConsulting, Inc. includes construction monitoring, habitat restoration monitoring, and conducting focused surveys for special status plants and wildlife. Mr. Stratton's list of species includes arroyo toad, desert tortoise, Coachella Valley fringe-toed lizard, California gnatcatcher, least Bell's vireo, burrowing owl, and cactus wren. He has conducted surveys associated with habitat restoration projects for large-scale arundo removal projects, and worked closely with crews implementing an invasive weed control program on Camp Pendleton that involved extensive riparian habitat, coastal dunes, and grassland habitat.

REPRESENTATIVE PROJECT EXPERIENCE

Burrowing Owl, Desert Kit Fox and American Badger Pre-construction Surveys and Burrow Excavation, Beacon Solar Project, Kern County, CA. Psomas, 2016 & 2017. Conducted focused surveys for the burrowing owl, desert kit fox and American badger on two sites of the Beacon Solar Project in Kern County, CA. The surveys were conducted using 100% visual coverage surveys by walking parallel belt transects with a team of biologists throughout the project site searching for target species and potential burrows. Assisted the designated biologist with burrow checks using a borescope and excavating inactive burrows prior to construction activity. Performed weekly perimeter fence checks of tortoise fencing.

Desert Tortoise Clearance Survey for Western Mesquite Mines, Brawley, Imperial County, CA. Hernandez Environmental Services, 2017. Conducted clearance surveys for desert tortoise on an 1800-acre site for the Western Mesquite Gold Mine. The surveys were conducted as part of a biological opinion re-initiation process by the BLM, USFWS, and CDFW and followed the current clearance survey protocol. The surveys were conducted using 100% visual coverage surveys by walking parallel belt transects with teams of five biologists throughout the project site searching for desert tortoise and associated sign. In addition, Mr. Stratton observed six tortoises that were to be relocated and assisted with burrow excavation.

Desert Tortoise Monitoring, Bridge Repair Project, Amboy, San Bernardino County, CA. San Bernardino Department of Public Works, 2015 and 2017. Conducted daily monitoring for emergency bridge repair along historic Route 66 (National Trails Highway). Monitoring activities included periodic sweeps for desert tortoise within project area, roadside sweeps prior to grading, and monitoring construction crews during supplemental construction and removal of excess material.

Desert Tortoise and Burrowing Owl Pre-construction Surveys and Monitoring, Needles Flood Control Levee Project, San Bernardino County Flood Control District, CA. 2016. Conducted daily preconstruction surveys for presence of desert tortoise, burrowing owls and burrows on county storm water levees and basins in Needles, Ca. Monitoring activities included periodic sweeps for desert tortoise within project area, roadside sweeps prior to grading and spraying activity, and monitoring construction crews during supplemental construction and removal of excess material.

Desert Tortoise Monitoring for Twentynine Palms Channel Grading, Twentynine Palms, CA. San Bernardino County Flood Control District, 2017 and 2018. Conducted daily monitoring along Twentynine Palms channel along Utah Trail Road. Monitoring activities included daily surveys for desert tortoise and burrowing owl within the impact area and monitoring for desert tortoise as heavy equipment was used to restore the channel.

Desert Tortoise Monitoring for Road Grading, Locations Throughout San Bernardino County, CA. San Bernardino County, 2017-2018. Conducted monitoring for San Bernardino County road grading crews at various locations supporting desert tortoise habitat throughout the Mojave Desert. Surveyed shoulders and drainages prior to equipment work (graders and loaders) to ensure that no impacts to desert tortoises occurred during road maintenance. Coordinated with County workers, conducted contractor education, and was responsible in identifying and marking grading limits throughout the county maintained roads and washes.

Desert Tortoise Monitoring for Joshua Tree Disposal Site, Joshua Tree, San Bernardino County, CA. San Bernardino County, 2018. Conducted daily monitoring for the San Bernardino Department of Public Works during repair work at the Joshua Tree Disposal Site. The disposal site repairs included access road repair and replacement of the disposal site cover.

Monitoring activities included daily surveys for desert tortoise and burrowing owl within the impact area and monitoring for desert tortoise as heavy equipment performed the site repairs.

Pre-Construction Surveys and Arundo Removal Monitoring, Santa Clara River, Santa Paula, Ventura County, CA. Land IQ, 2016 - 2018. Conducted pre-construction surveys for special status species and monitored the removal of giant reed (*Arundo donax*) within the Santa Clara River. Conducted focused surveys for least Bell's vireo to identify nesting pairs and monitor nesting status during arundo removal activities. Monitored the removal of giant reed (*Arundo donax*) within the Santa Clara River. Flagged natives to be avoided during the removal of giant reed and marked boundaries of management blocks. Monitoring was conducted on The Nature Conservancy's Hanson Property in Santa Paula, CA. Accumulated an estimated 150.75 hours in vireo habitat and 75 hours in the presence of vireos. Work conducted under authorization from USFWS under BO 8-8-13-F-33.

Riparian and Native Grassland Invasive Plant Removal, Dune Restoration, Camp Pendleton, San Diego County, CA. Gulf South Research Corporation, 2015 & 2016. Conducted surveys and mapped distribution of invasive plants in riparian habitats occupied by Arroyo Toad, Least Bell's Vireo and Southwestern Willow Flycatcher, coastal bluffs occupied by California Gnatcatcher, and native grassland habitats with thread-leaved brodiaea populations. Assisted with special status plant surveys and flagging for coast woolly-threads, Nuttall's lotus, Brand's phacelia and sand verbena in California least tern habitat. Identified weeds to be removed by work crews during the restoration of the dunes. Assisted with sweet fennel removal and monitored application of herbicide treatment on sweet fennel in occupied thread-leaved brodiaea habitat.

Thousand Palms Flood Control Project Coachella Valley Milk Vetch and Special Status Plant Surveys, Riverside County, Aspen Environmental Group, 2016. Assisted with focused surveys for special status plant species including the Coachella Valley Milk Vetch along four reaches of the project, two of which are adjacent to the Coachella Valley Preserve.

Special Status Plant Surveys, Norco Property in the City of Norco, Riverside County, CA. Hernandez Environmental Services, 2016. Assisted in conducting field surveys for special status plants on a 430-acre site in Norco. Assisted in systematically surveying the entire project site recording all plant species observed. Also assisted in preparing the special status plant report, graphics and CNDDB forms.

Arundo Removal Monitoring, Santa Clara River, Santa Clarita, Los Angeles County, CA. Wildscape, 2019. Monitored the removal of giant reed (*Arundo donax*) within the Santa Clara River floodplain at its confluence with San Franciscito River as part of the Santa Clara River Arundo Removal Project (SCARP). Conducted contractor education meetings, flagged native plants and other biological resources to be avoided during the removal of giant reed, and marked boundaries of management blocks.

APPENDIX C-2

Jurisdictional Delineation

MESA WIND PROJECT REPOWER
Jurisdictional Waters of the State
Pursuant to California Fish and Game Code Section 1602

Prepared for:

Brookfield

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January 2021

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MESA WIND PROJECT REPOWER
Jurisdictional Waters of the State Pursuant to California Fish and Game Code Section 1602

Aspen Environmental Group
January 2021

1.0 Introduction

This report presents the methods and results of a jurisdictional delineation of Waters of the State of California at the proposed Mesa Wind Project Repower site as defined by the California Fish and Game Code and regulated by the California Department of Fish and Wildlife (CDFW). The Project Area is located on Bureau of Land Management (BLM) land in unincorporated Riverside County, California (Figure 1). The CDFW regulates waters of the state defined as the "bed and banks" of streambeds or lakebeds as well as adjacent riparian vegetation or habitat. In addition to CDFW regulation, the Colorado River Basin Regional Water Quality Control Board (RWQCB) and the US Army Corps of Engineers (USACE) may regulate waters of the State or waters of the US on the site, according to differing delineation criteria. Potential RWQCB and USACE jurisdiction on the site are addressed separately.

1.1 Project Description

Mesa Wind Power Corporation (Mesa Corp), a subsidiary of Brookfield Renewable Energy (Brookfield), as owner of the Mesa Wind Power Project (Mesa Wind), is planning to repower the existing wind project located on land administered by the Bureau of Land Management (BLM). The 401 acre project site is located approximately 11 miles northeast of Palm Springs. Mesa Corp received BLM approval of the Environmental Assessment and amendments to the existing BLM right-of-way (ROW) grants for the proposed repower in October and November 2020, respectively.

The existing wind project includes 460 36-year-old wind turbine generators (WTG) which will be removed Quarter 1 2021 under existing permits. The proposed repower includes the construction, operation, maintenance, and decommissioning up to eight new WTGs. The repower Project would produce up to 30 megawatts (MW) of wind energy, the same nameplate capacity as the existing Mesa Wind Project. The new facilities would be decommissioned at the end of their useful life. The existing WTG locations are shown on Figure 2 and the proposed locations for up to eight WTGs are shown in Figure 3. The nearest sensitive receptors to the new WTGs are rural residences in Bonnie Bell, over 3,600 feet east of the Project.

The total overall potential ground disturbance would be 97.8 acres, of which 24 acres are on areas that have been disturbed by the existing Mesa Wind Project and 73.8 acres would be new disturbance. The 97.8 acres include 18.2 permanent and 79.6 temporary acres of disturbance. Temporary impacts include 44.5 acres where ground disturbance is anticipated, including grading and vegetation removal associated with road improvements, turbine pads, laydown yard, and cut/fill. It also includes a 35.1 acre buffer area where no ground disturbance nor vegetation removal is anticipated but potential drive and crush associated with trucks backing up, or a pickup truck driving outside the graded area, could occur.

1.2 Project Location

The project site is located in the San Gorgonio Pass on public lands managed by the BLM. It is west of the Whitewater River and east of Cottonwood Creek, shown on the White Water USGS 7.5-minute topographic quad (USGS, 1955). The nearest proposed new WTG site is approximately 0.75 miles west of the active Whitewater River channel and the nearest existing legacy turbine is approximately 0.5 miles west of the active Whitewater River channel. Elevation of the project area ranges from approximately 2,250 feet at the western site boundary to approximately 2,900 feet at the northeastern corner.

2.0 Site Conditions

2.1 Topography and Surrounding Land Uses

Elevation of the project site ranges from approximately 1,800 feet to 2,800 feet. Most surrounding lands are natural open space, with the exception of an adjacent parcel to the southeast that is also in use for wind energy production. Nearby land uses include the community of Whitewater accessed from Haugen-Lehmann Way, southwest of the site; and the community of Bonnie Bell to the east.

Most surrounding lands are natural open space, with the exception of an adjacent parcel to the southeast that is also in use for wind energy production. Nearby communities include the community of Whitewater (accessed from Haugen-Lehmann Way), southwest of the site; the community of Bonnie Bell to the southeast; and the community of Snow Creek, located 3.3 miles south of the Project site.

2.2 Vegetation

Vegetation was initially mapped during the 2013 site visits. The 2013 polygons were reviewed and updated by Wood in 2019. Vegetation within the Impact Area was difficult to distinguish on aerial images due to homogeneous vegetation structure throughout much of the site. The smallest mapping unit was approximately 0.25 acre; GIS data for most mapped vegetation boundaries is accurate to within 3 feet. Any vegetation map is subject to imprecision for several reasons:

- Vegetation types tend to intergrade on the landscape so that there are no true boundaries in the vegetation itself. In these cases, a mapped boundary represents best professional judgment.
- Vegetation types as they are named and described tend to intergrade; that is, a given stand of real-world vegetation may not fit into any named type in the classification scheme used. Thus, a mapped and labeled polygon is given the best name available in the classification, but this name does not imply that the vegetation unambiguously matches its mapped name.
- Vegetation tends to be patchy. Small patches of one named type are often included within mapped polygons of another type. The size of these patches varies, depending on the minimum mapping units and scale of available aerial imagery.
- Photo interpretation of some types is difficult, such as distinguishing brittlebush scrub from California sagebrush-California buckwheat scrub.

Vegetation mapping units (see Figure 4A/B), descriptions and names are based on alliance level nomenclature in *A Manual of California Vegetation* (Sawyer et al. 2009). Each vegetation type is also defined according to Holland (1986) whenever possible. Common names of plant species are used throughout the following descriptions; Latin names for each species may be found in Attachment 2

(Species List). Representative photos of the vegetation within the Project site are provided in Figure 8 (Attachment 1).

Brittlebush Scrub. This vegetation is characterized by the dominance of brittlebush. It is the most abundant vegetation on site and is found primarily on exposed, west- and south-facing slopes. Many other species were observed within brittlebush scrub but were present in either low numbers or in small patches. Other species observed included California jointfir, cheesebush, California buckwheat, beavertail cactus, Mojave yucca, and chaparral yucca. Brittlebush is a common to dominant species in desert shrublands and in coastal scrub of the interior valleys west of the project vicinity. On the study area, brittlebush scrub is similar to descriptions of Riversidean Sage Scrub (Holland 1986).

California Juniper Woodland. This vegetation is characterized by the dominance of California juniper. Within the site it is found primarily on north-facing slopes and in the lower portions of several of the drainages. Additional species observed within juniper woodland include sugar sumac, Parry's jujube, chamise, California buckwheat, Mojave yucca, and narrow-leaved goldenbush. This vegetation matches descriptions of Semi-Desert Chaparral and Cismontane Juniper Woodland and Scrub (Holland 1986).

California Sagebrush–California Buckwheat Scrub. This vegetation is characterized by the co-dominance of California sagebrush and California buckwheat. Within the site it is most common on disturbed soils such as along road cuts and adjacent to graded areas. Additional species, similar to those listed above in brittlebush scrub, are also found in low numbers. This vegetation matches descriptions of Riversidean Sage Scrub and Upper Sonoran Subshrub Scrub (Holland 1986).

Creosote Bush–Brittlebush Scrub. This vegetation is characterized by the co-dominance of creosote bush and brittlebush. It is found primarily on the eastern portion of the site on areas with relatively flat topography. Other species present include white bursage, Parry's jujube, Mojave yucca, narrow-leaved goldenbush, silver cholla, and California buckwheat. This vegetation best matches the description of Sonoran Creosote Bush Scrub (Holland 1986).

Desert-Willow - Smoketree Wash woodland. This vegetation is characterized by the dominance of desert willow. It is not found within the limits of the Mesa Wind ROW but is found within the Impact along the access road at Cottonwood Creek on private land. Other species observed within this vegetation include California broomsage, cheesebush, brittlebush, and punctate rabbit-brush. This vegetation best matches the description of Mojave Desert Wash Scrub (Holland 1986).

Unvegetated/Ruderal. The remainder of the study area is occupied by roads, cleared areas, and building or O&M pads for the existing wind turbines. These areas are primarily unvegetated but there are some ruderal species present, including red brome, red-stemmed filaree, and schismus grass. In addition, there are several native shrubs on and adjacent to the building pads, such as California buckwheat, narrow-leaved goldenbush, and deerweed. These areas do not match published vegetation descriptions.

2.3 Climate

The site is at the western margin of the Colorado Desert and the Coachella Valley. The climate is typical of regional deserts, with extreme daily temperature changes, low annual precipitation, strong seasonal winds, and mostly clear skies. The Colorado Desert experiences more summer precipitation than the northern deserts, and although annual precipitation is low overall, a substantial portion of it falls during August and September, usually as brief and intense thunderstorms. The San Gorgonio Pass area experiences higher winds and higher annual rainfall than most of the Colorado Desert, due to its location between the San Bernardino and San Jacinto Mountains, at the boundary of the less-arid cismontane region of California.

Average annual rainfall recorded at the Palm Springs weather station, located approximately 10 miles to the southeast, is 4.85 inches (12.32 cm; U.S Climate Data 2020). Seasonal rainfall variability is extremely high in the region. The average annual high temperature is 89 degrees Fahrenheit, and the average daily winter low temperature is 60.3 (U.S Climate Data 2020).

During early 2019, the region experienced several significant storms, the first of which moved through the area on January 15, 2019. The second and more significant storm moved through the region on February 14 and 15, 2019. This larger storm inundated many streambeds throughout the region and caused significant flooding and damage in watersheds such as Mission Creek, Whitewater River, and Chino Canyon. Rainfall during 2018-2019 rainy season was more than 180 percent of average at 9.11 inches, with more than 4.32 inches falling in February alone (23.32 cm; U.S Climate Data 2020). Field work for this delineation was completed after these significant storms, and this higher than average rainfall in the region is expected to have clearly defined low flow channels within the project site.

2.4 Hydrology, Geomorphology, and Geology

The project site is located in the San Bernardino Mountain foothills, in the San Gorgonio Pass, between the San Bernardino and San Jacinto Mountains. The San Bernardino Mountains are part of the east-west trending Transverse Ranges of southern California. The mountains are primarily composed of granitic bedrock. Parent material is largely composed of partially or wholly consolidated granitic alluvium, which has been eroded by storm runoff into dissected channels draining mainly toward the south.

The project site is located within the Salton Sea Transboundary Watershed (USGS Hydrologic Unit 18100200). Runoff from the eastern part of the project site drains eastward to the Whitewater River, which is a tributary of the Salton Sea (see Figure 5). Runoff from the remainder of the site drains to the south and west into Cottonwood Creek, which enters a flood control channel and flows southward, and crosses beneath Interstate 10 (I-10) in three large box culverts. Once south of I-10 the runoff fans out over a bajada and continues to flow southeast in poorly defined low flow channels. These low flow channels do not have clearly defined surface flow connectivity with the San Gorgonio River and appear to be blocked by the Union Pacific Railroad. Part of the Whitewater River is a perennial blueline stream and Cottonwood Creek is an ephemeral blueline stream (USGS Whitewater 7.5-minute topographic quadrangle). Two major fault zones run through the San Gorgonio Pass in close proximity to the project site. The San Andreas Fault crosses from east to west through the project site and the San Gorgonio Fault crosses east to west just to the south of the project site (USGS, 2019). Fissures along these faults can allow upwelling of groundwater which can create surface ponds (sag ponds) and springs. These features were not observed within the project site but are present in Whitewater Canyon to the east of the project site.

2.5 Soils

The project site is located on the boundary of two soil survey areas. Soils of the southern portion of the project area are mapped on the Soil Survey Geographic Soil Map (SSURGO) (NRCS 2019a). The northern portion of the project site is not included in the SSURGO mapping boundaries; therefore U.S. General Soil Map data were used for this portion of the project area (NRCS 2019c). Soils data from these sources are presented in Table 1 and shown on Figure 6A/B for the project site (including access roads).

All of the mapped soil types are described as well-drained or somewhat excessively drained and are not prone to flooding. In general, the descriptions of soil types within the project site indicate that hydric soils conditions are not expected. However, several of the mapped soil types may contain hydric soil inclusions: CdC, LR, and MaD (NRCS 2019a and 2019b; see Table 1). Based on soil textures and topography, any such hydric inclusions would be located on areas where surface or subsurface ground water is regularly present, such as stream channels with seasonal or perennial flow, or in impoundments.

Table 1. Soil Types within the Project Site

Map Unit Symbol	Map Unit Name	Description
CdC[1]	Carsitas gravelly sand, 0 to 9 percent slopes	Excessively-drained; generally about 800 ft. elevation; parent material of gravelly alluvium derived from granite; depth to water table generally more than 80 in; not prone to flooding; gravelly sand (0–60 in).
CnC	Chuckawalla cobbly fine sandy loam, 2 to 9 percent slopes	Well-drained; generally 400 – 1000 ft elevation; parent material of gravelly alluvium; depth to water table more than 80 in; not prone to flooding; cobbly fine sandy loam (0–12 in), very gravelly fine sandy loam (12–60 in).
CnE	Chuckawalla cobbly fine sandy loam, 9 to 30 percent slopes	Well-drained; generally 400 – 1000 ft elevation; parent material of gravelly alluvium; depth to water table more than 80 in; not prone to flooding; cobbly fine sandy loam (0–12 in), very gravelly fine sandy loam (12–60 in).
LR[1]	Lithic Torripsamments-Rock outcrop complex	Excessively-drained; generally 650 – 9,000 ft elevation; parent material of sandy alluvium derived from sandstone; depth to water table more than 80 in; not prone to flooding; sands overlying bedrock – sand (0–4 in), bedrock (4–14 in); rock outcrop – unweathered bedrock (0–60 in).
MaD[1]	Myoma fine sand, 5 to 15 percent slopes	Somewhat excessively-drained; generally at 200 – 1,800 ft. elevation; parent material of alluvium; depth to water table generally more than 80 inches; not prone to flooding; fine sand (0 – 18 in), sand (18 – 60 in).
s1053	Springdale-Rock outcrop-Etsel family	*Springdale Series* – Somewhat excessively-drained; terrace treads and risers at 150 – 3,500 ft. elevation; moderately coarse-textured alluvium dominantly from granite; slopes of 0 – 70 percent; gravelly ashy coarse sandy loam (0 – 13 in), very gravelly loamy and coarse sand (13 – 25 in); variegated very cobbly coarse sand (25 – 61 in). *Etsel Series* – Somewhat excessively-drained; mountains at 150 – 3,500 ft. elevation; moderately coarse-textured alluvium dominantly from granite; slopes of 15 – 85 percent; gravelly loam (0 – 3 in), very gravelly loam (3 – 7 in); fractured and hard, slightly weathered, fine grained sandstone and shale (7 in).
BA	Badlands	Excessively-drained; generally in uplands; parent material of consolidated sandy alluvium; weathered bedrock (0–60 in).

3.0 Regulatory Background

Jurisdictional waters of the state or waters of the US are regulated by three agencies, listed below and summarized in the paragraphs that follow. All three agencies regulate both wetlands and non-wetland hydrologic features (e.g., dry stream channels). All three agencies use soils, hydrology, and vegetation criteria defined by the USACE (1987) to evaluate wetlands, but they may apply differing standards to determine whether a give site is a wetland. The three agencies also have differing statutory definitions of their limits of jurisdiction in both non-wetland and wetland areas.

- **California Department of Fish and Wildlife**. The CDFW regulates waters of the state under Sections 1600-1617 of the California Fish and Game Code.
- **Regional Water Quality Control Boards**. The RWQCBs regulate waters of the state under Section 401 of the federal Clean Water Act (CWA) and under the California Porter-Cologne Water Quality Control Act. In cases where a project overlaps two RWQCB boundaries, the California Water Resources Control Board (CWRCB) is the regulatory authority. In addition, the CWRCB has announced a new regulatory program addressing waters of the state to be implemented by the RWQCBs beginning in May 2020.

- **US Army Corps of Engineers**. The USACE regulates waters of the US under Section 404 of the federal CWA.

3.1 California Fish and Game Code

Section 1602 of the California Fish and Game Code requires notification to CDFW if a project would substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake. If CDFW determines that a proposed project may substantially adversely affect fish or wildlife resources, a Lake or Streambed Alteration Agreement (LSAA) is required. In practice, CDFW generally holds jurisdiction over the bed and banks of any perennial, intermittent or ephemeral streambed, lakebed, or channel where evidence of flowing or standing water (including channels formed by infrequent storm runoff). Additionally, CDFW takes jurisdiction over riparian vegetation adjacent to the bed and banks. These jurisdictional boundaries are typically broader than the ordinary high water mark (OHWM) that defines USACE and RWQCB jurisdiction. CDFW uses the soils, hydrology, and vegetation criteria to identify wetlands, but may define a wetland based on only one or two of these criteria, depending on site-specific conditions. There is no requirement for downstream connection, and CDFW holds jurisdiction over wetlands or non-wetland waters that may be isolated from other jurisdictional waters.

3.2 Porter-Cologne Water Quality Control Act

The RWQCBs regulate activities affecting waters of the state according to the Porter-Cologne Water Quality Control Act and Section 401 of the federal CWA (below). The Porter-Cologne Act defines waters of the state as all surface and subsurface waters. The RWQCBs may issue permits (called Waste Discharge Requirements or WDRs) or may issue a waiver for a given application. In addition, the California Water Resources Control Board (CWRCB) will direct RWQCBs to implement a new regulatory program for all waters of the state, taking affect in May 2020 (CWRCB 2019). For non-wetland waters of the state, CWRCB procedures and guidelines recognize the ordinary high water mark (OHWM) as defined by federal guidelines (CWRCB 2019, 2020; see also USACE 2005, 2008) as the limits of jurisdiction. However, waters of the state include isolated waters and need not have downstream surface connection to federally jurisdictional waters (compare with Federal Clean Water Act Section 404, below). The new program will use the soils, hydrology, and vegetation criteria to identify wetlands, but may define certain unvegetated sites (e.g., mud flats or playas) as wetlands based on only the soils and hydrology criteria. The Project Area is within the jurisdictional boundaries of the Colorado River RWQCB. Jurisdictional waters of the state as regulated by the Colorado River RWQCB are delineated in a separate report.

3.3 Federal Clean Water Act

Section 401. Section 401 of the CWA is administered by the RWQCBs (except in cases where a project overlaps two RWQCB boundaries, where it is administered by the CWRCB). Section 401 requires that projects involving discharge to waters of the state (defined under Porter-Cologne Water Quality Control Act) must obtain state certification that the project will comply with the federal CWA to receive federal authorization. Therefore, before the USACE may issue a CWA Section 404 permit, a permittee must apply for and receive a Section 401 Water Quality Certification or waiver from the appropriate RWQCB. The RWQCB may add conditions (i.e., WDRs, above) to their certification to remove or mitigate potential impacts to water quality standards. Such conditions must ultimately be included in the federal permit.

All waterways within the Mesa Wind project area are ephemeral washes and may not meet current or pending criteria for federal jurisdiction as waters of the US (USACE and EPA, 2020). The USACE has not issued a jurisdictional determination for the site. If no federally jurisdictional waters of the US are present, the CWA Section 401 requirement will not apply; nonetheless the RWQCB will have permitting authority for activities affecting waters of the state, including ephemeral washes, under the Porter-Cologne Water Quality Control Act (above).

Section 404. Section 404 of the CWA is administered by the USACE. Any activity that would place dredged or fill material within jurisdictional waters of the US must obtain USACE authorization. USACE jurisdiction is defined by presence of an OHWM and by a nexus to interstate commerce such as downstream surface connectivity to traditional navigable waters of the US. The USACE defines wetlands according to the soils, hydrology and vegetation criteria, generally requiring presence of all three to meet the definition. USACE jurisdiction generally extends to wetlands that are adjacent to jurisdictional waters of the US, but not to wetlands that are distant or isolated from federally jurisdictional waters. All waterways within the Mesa Wind project area are ephemeral washes and may not meet current or pending criteria for federal jurisdiction as waters of the US (USACE and EPA, 2020). The USACE has not issued a jurisdictional determination for the site. If no federally jurisdictional waters of the US are present, CWA Section 404 will not apply. Potentially jurisdictional waters of the US as regulated by the USACE are delineated in a separate report.

4.0 Delineation Methodology

All ephemeral washes within the project site are waters of the state, as defined by CDFW and RWRCB. The field methods described here focused on locations of anticipated or potential impacts (i.e., streambed alterations or dredge or fill activity, according to the relevant regulations). Aspen biologists Justin Wood, Tracy Popiel, and Scott White visited the project site for two days in April of 2013 to conduct the first jurisdictional delineation of the project site. Mr. Wood returned on September 10, 2019 and February 25, 2020 to determine the extent of potentially jurisdictional waters on the project site. Prior to conducting the 2019 field assessment, Mr. Wood reviewed current and historic aerial photographs, detailed topographic maps, available soils information, and local and state hydric soil list information to evaluate potential jurisdictional features. During the February 2020 site visit, Mr. Wood also visited the downstream portions of Cottonwood Creek to evaluate surface flow connectivity to the San Gorgonio River.

All drainages that cross through or originate within the Impact Area were visited in field and mapped on high-resolution aerial photographs (see Figure 7). GPS points were recorded using a Trimble Juno SB GPS unit where each drainage intersects the Impact AreaThe width of each jurisdictional drainage was recorded, based on the CDFW jurisdictional criteria (i.e., the top of the banks of each channel). For several of the larger drainages, Mr. Wood walked the centerline of the drainage throughout the Impact Area. Field maps were digitized using Global Information System (GIS) technology and the total area of jurisdictional features was calculated.

5.0 Results

All 28 CDFW jurisdictional streambeds within the Project site are ephemeral desert washes and erosional features. No wetlands are present in the project site. These washes and erosional features exhibited field indicators of active ephemeral flow such as water marks, linear deposits of sediment and/or plant debris, bank scour, and erosion. Using a combination of vegetation mapping, bed/bank delineation, and field observations acreages and linear feet of all features were calculated (Table 2). The locations of these features are shown on Figure 7. Representative photos of the drainages within the Project site are provided in Figure 8 (Attachment 1). These ephemeral desert washes and erosional features meet the definition of CDFW jurisdictional waters of the State or CDFW streambeds as outlined in Section 1602 of the California Fish and Game Code and regulated by the CDFW.

Table 2. Locations and Proposed Impacts to CDFW Jurisdictional Waters of the State

Drainage Number (see Figure 7)	Impact Area						
	Area (acres)	Length (linear ft)	Approx Depth	Square Feet	Cubic Yards	Cut / Fill	Work Type Category / New Construction (NC) or Replace Existing Structure (RES)
1	0.1	51	5.0	12,149	2250	Fill	RES Low water crossing, Road/trail
2	0.03	52	5.0	1,160	215	Fill	NC Culvert, Road/trail
3	0.17	635	.10	4,869	18	Fill	RES Road/trail
4	0.20	185	14.00	8,744	4534	Fill	RES Culvert, Low water crossing, Road/trail
5	0.16	778	0.50	3,949	73	Fill	RES Road/trail
6	0.41	247	1.50	17,703	984	Fill	NC Culvert, Road/trail
7	0.01	51	1.50	323	18	Fill	NC Culvert, Road/trail
8	0.03	234	(6.00)	1,483	(330)	Cut	NC Low water crossing, Road/trail
9	0.42	1365	0.50	4,675	87	Fill	NC Low water crossing, Road/trail
10	0.05	57	0.50	2,560	47	Fill	RES Road/trail
11	0.08	284	1.00	475	18	Fill	NC Low water crossing, Road/trail
12	0.01	153	14.00	467	242	Fill	NC Other (Turbine Pad)
13	0.07	460	4.00	725	107	Fill	RES Road/trail
14	0.01	39	0.50	308	6	Fill	RES Road/trail, Other (Turbine Pad)
15	0.01	137	(3.00)	551	(61)	Cut	NC Other (Turbine Pad)
16	0.02	149	(4.00)	816	(121)	Cut	NC Other (Turbine Pad)
17	0.10	177	5.00	4345	805	Fill	NC Fill
18	0.03	119	9.00	1,396	465	Fill	NC Other (Turbine Pad)
19	0.02	170	(5.00)	676	(125)	Cut	NC Other (Turbine Pad)
20	--	--	1.00	88.00	3	Fill	Temporary Stream Crossing
21	0.40	796	3.00	17,547	1950	Fill	NC Road/trail
22	0.03	115	5.00	1455	269	Fill	NC Fill
23	0.02	110	3.00	1,031	115	Fill	RES Road/trail
24	0.02	138	4.00	829	123	Fill	NC Culvert, low water crossing, Road/trail
25	0.01	183	6.00	326	72	Fill	NC Other (Turbine Pad)
26	0.06	81	6.00	2,386	530	Fill	RES Road/trail
27	0.13	379	3.00	872	97	Fill	RES/NC Road/trail, Other (Turbine Pad)
28	0.08	113	10.00	3,393	1257	Fill	NC Other (Turbine Pad)
Total	2.68	7258		95,301	14,922		

The conclusions presented above represent observations made in the field and on Aspen's knowledge and experience with the CDFW, including regulatory guidance documents and manuals. The CDFW will have final authority in determining the status and presence and extent of jurisdictional waters.

6.0 References

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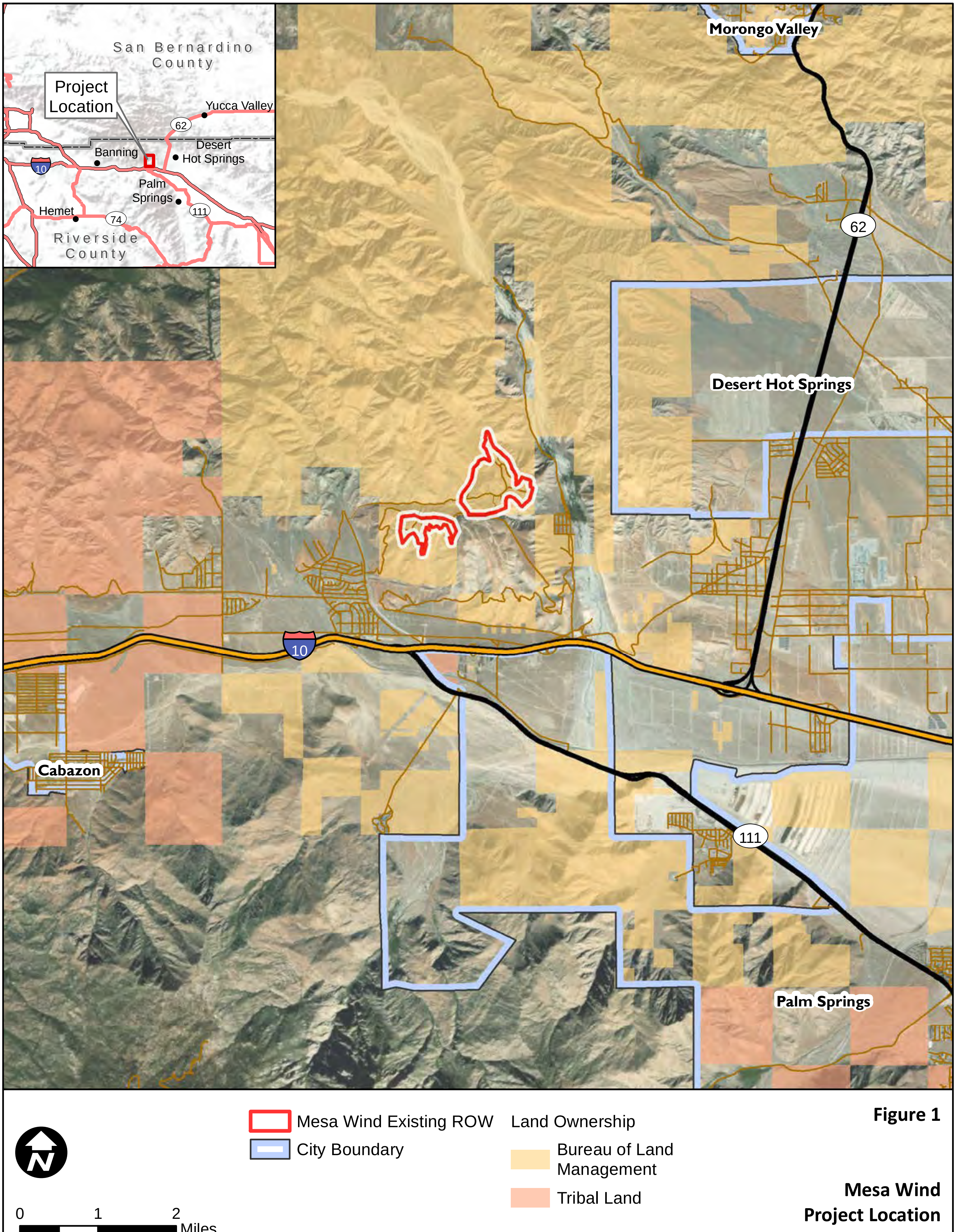
Attachment 1 – Figures



Mesa Wind Existing ROW
City Boundary
Land Ownership
Bureau of Land Management
Tribal Land

Figure 1

Mesa Wind Project Location

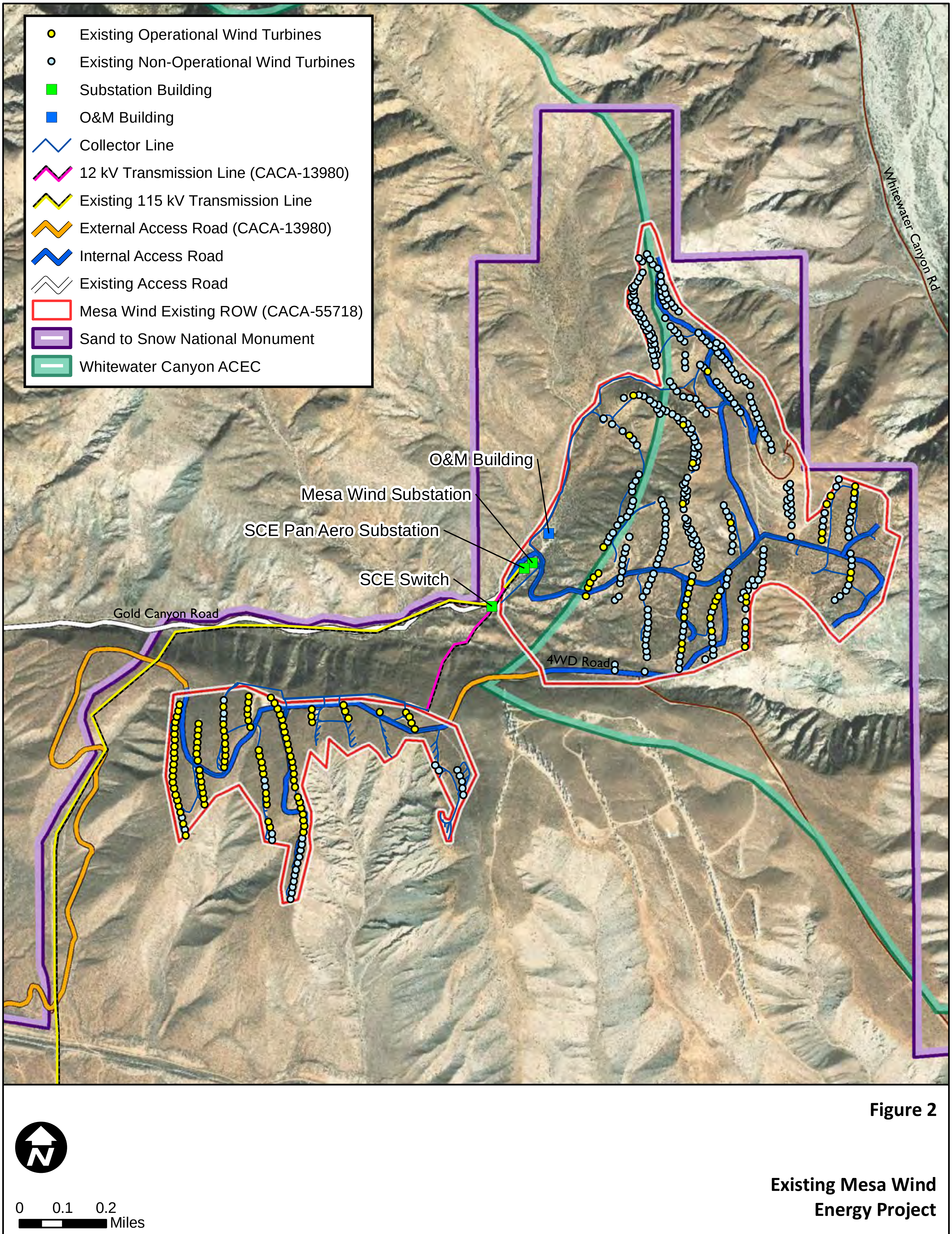


Figure 2

Existing Mesa Wind Energy Project

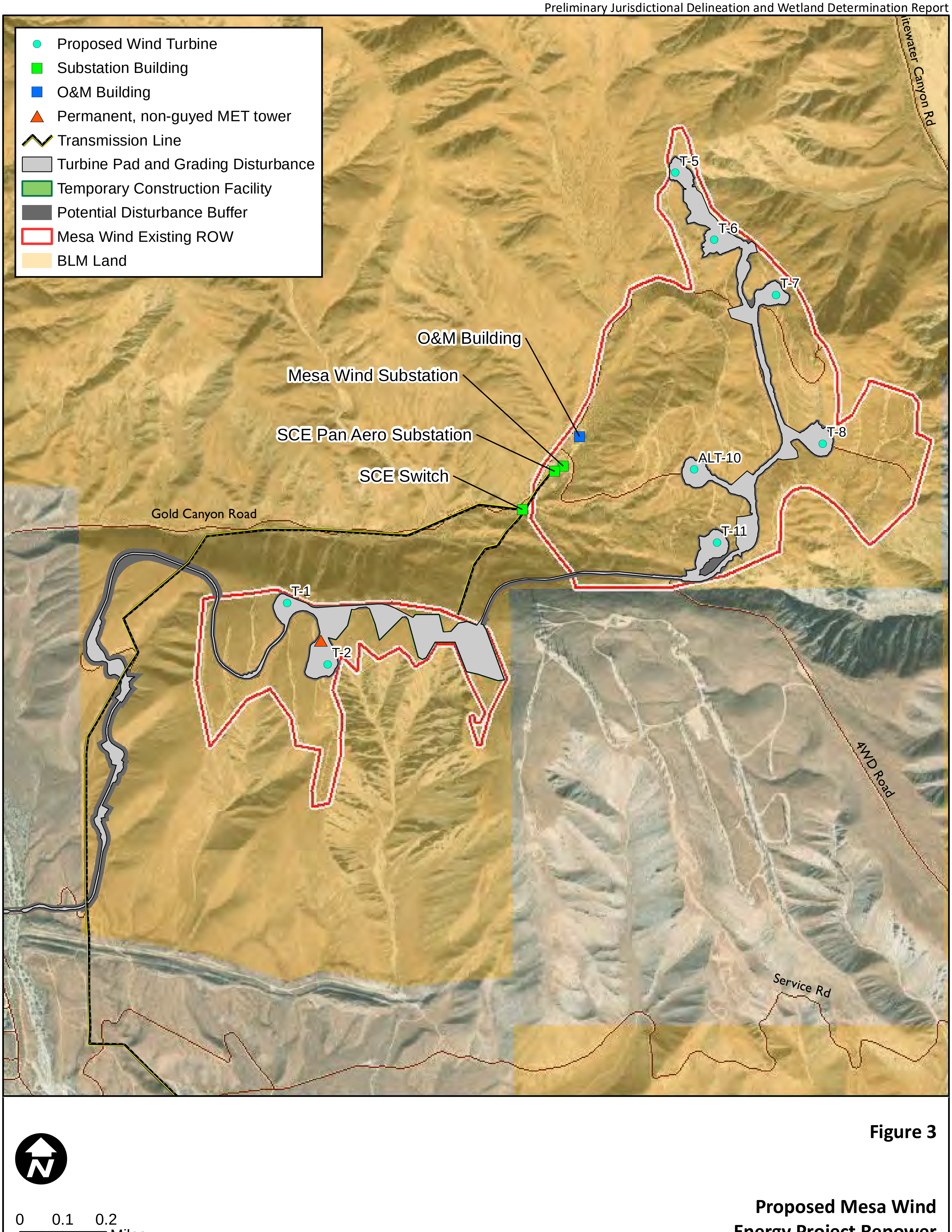


Figure 3

Proposed Mesa Wind Energy Project Repower

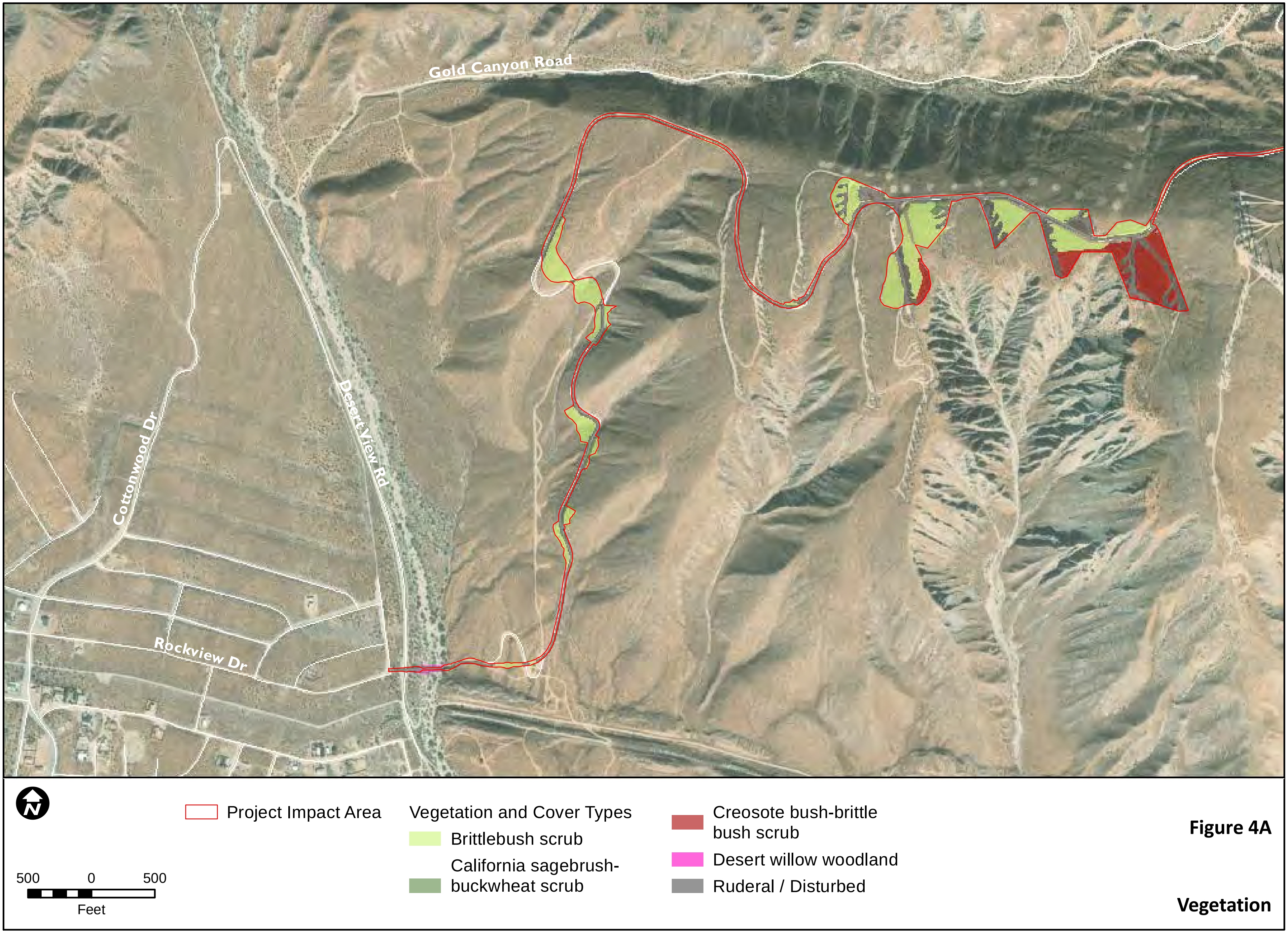


Figure 4A

Vegetation

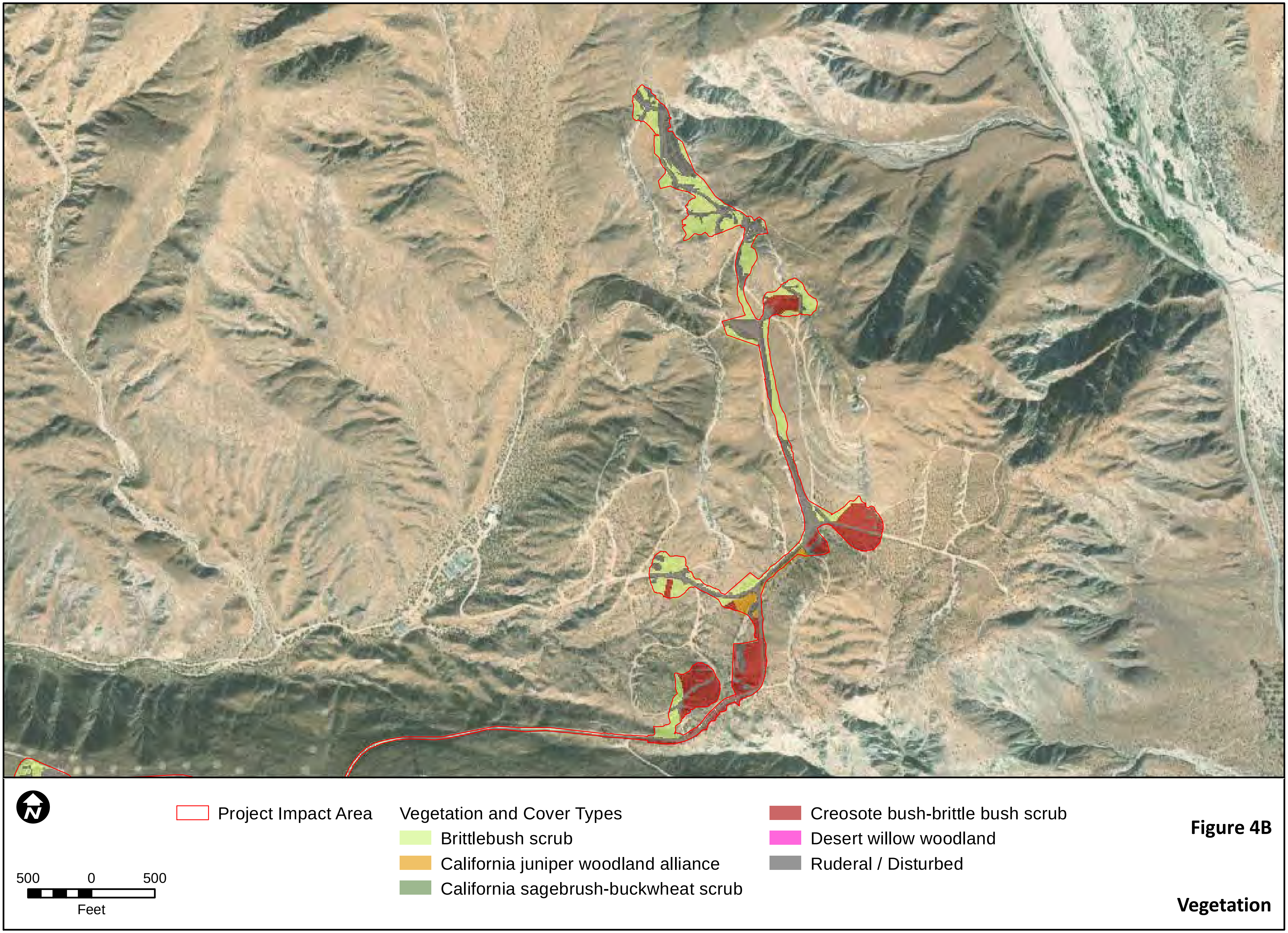


Figure 4B

Vegetation

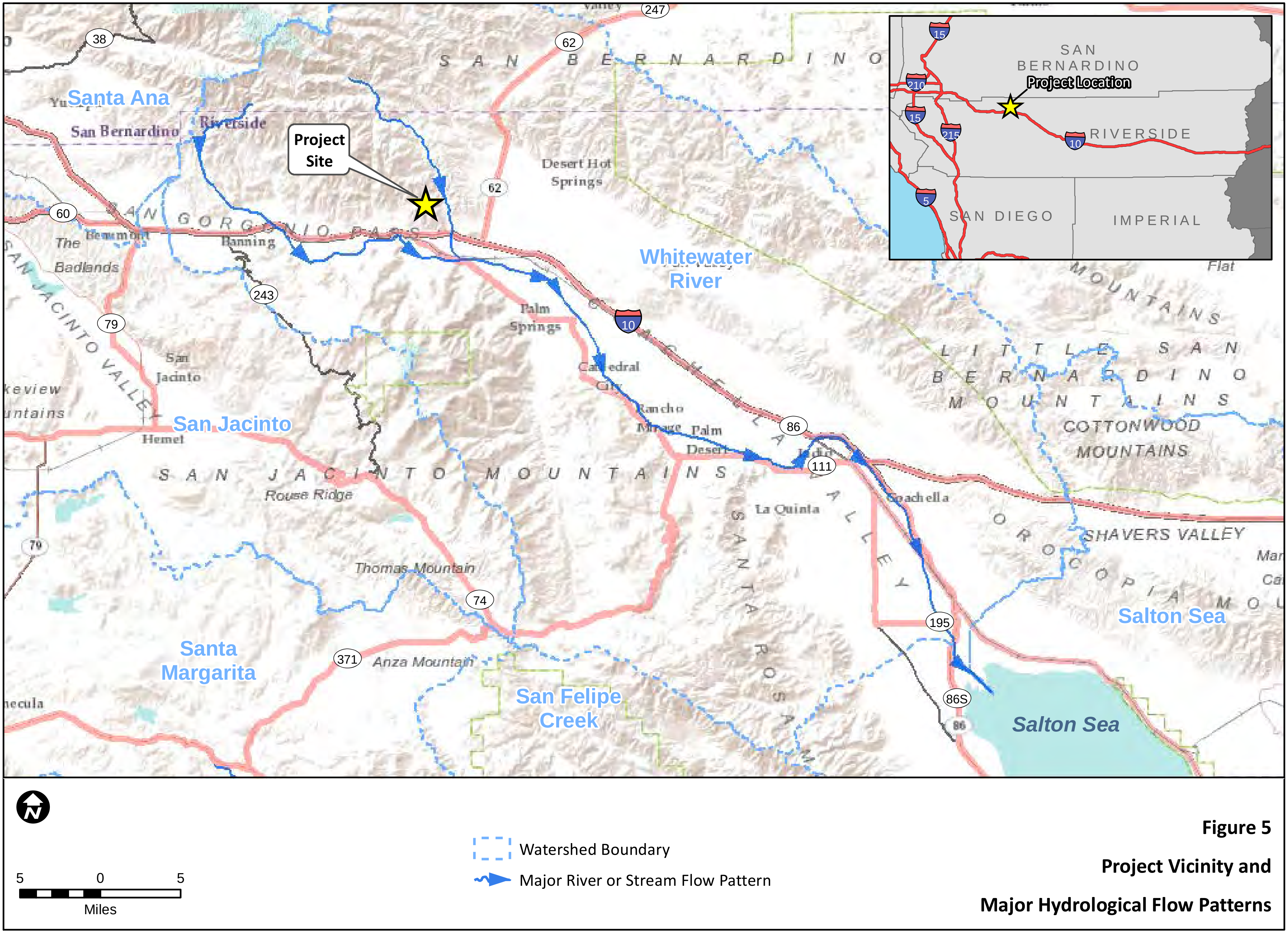


Figure 5

Project Vicinity and

Major Hydrological Flow Patterns

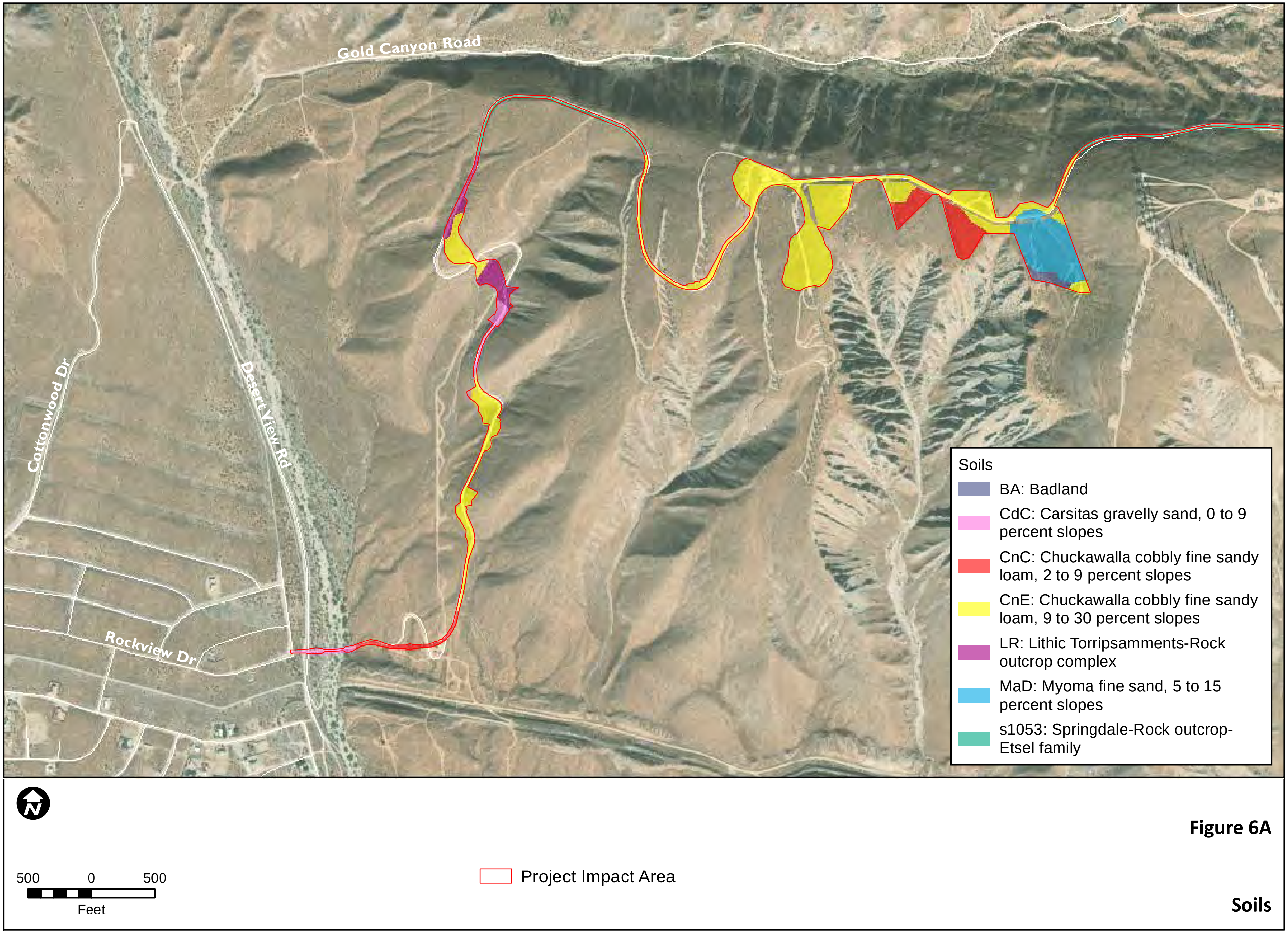


Figure 6A

Soils

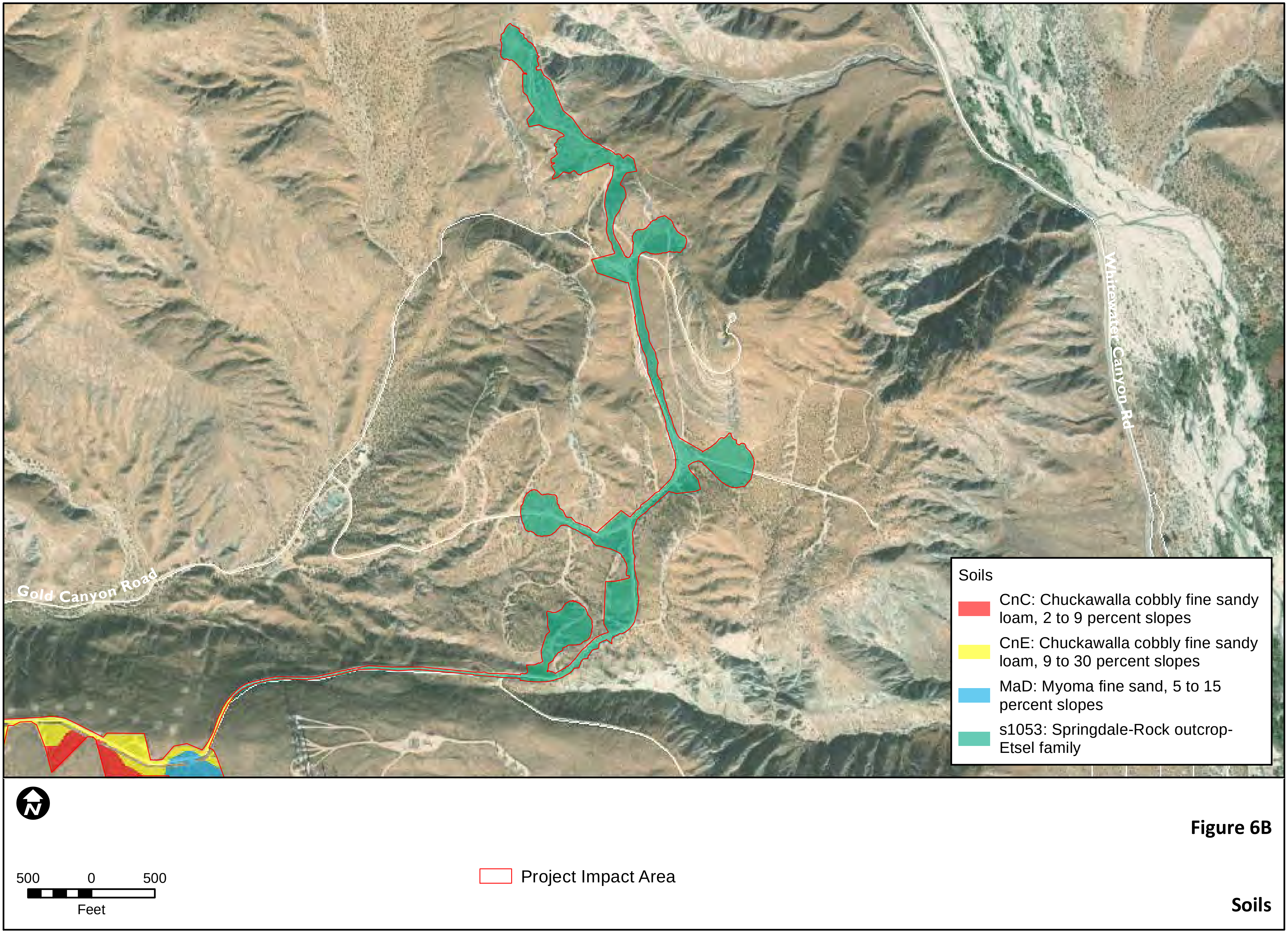


Figure 6B

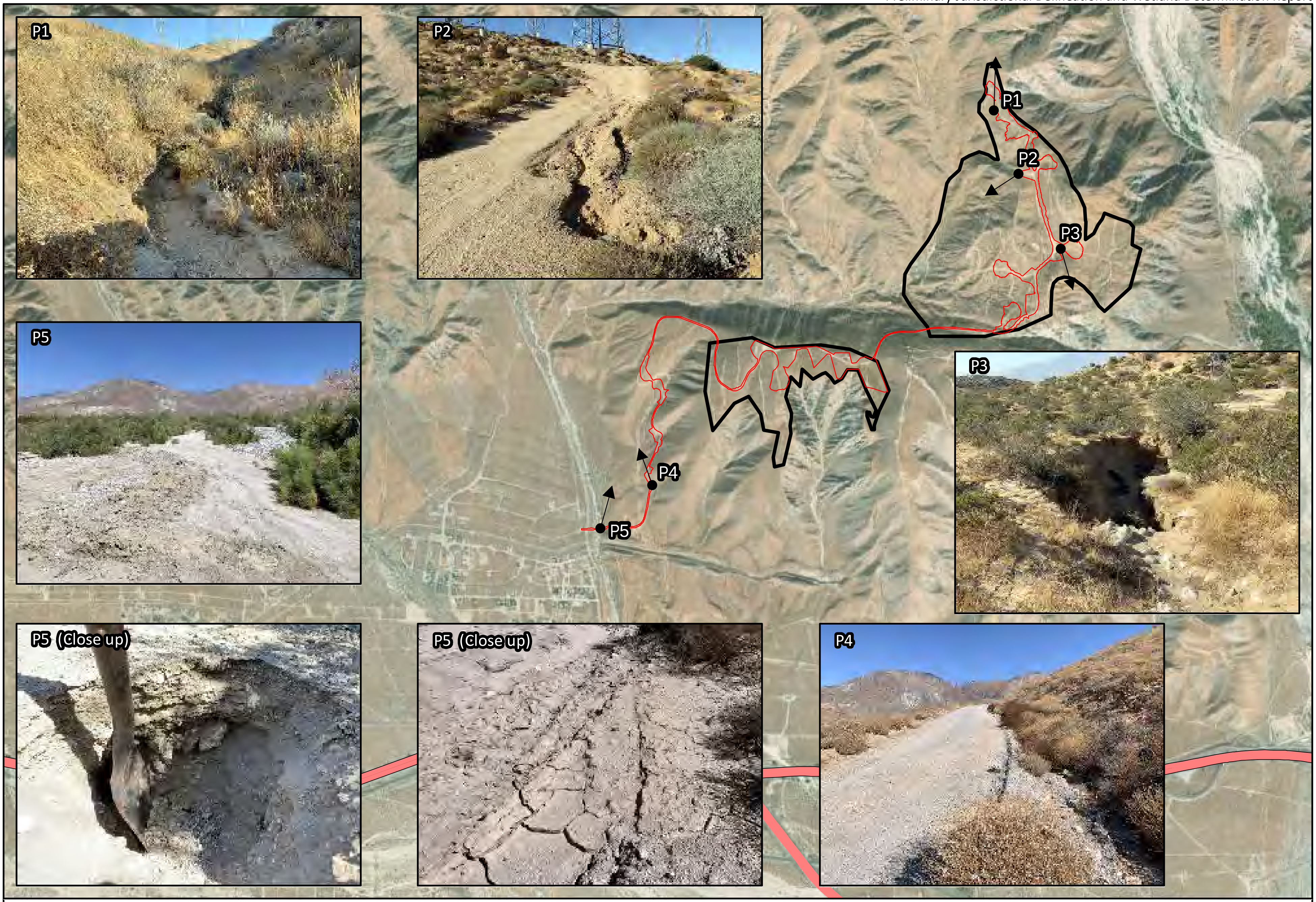
Soils

Figure 7a

CDFW Drainages

Figure 7b

CDFW Drainages



0 2,000
Feet

Mesa Wind Existing ROW
Project Impact Area
Photo Point and Direction

Figure 8
Photo Exhibit

Attachment 2 – Observed Species List

	Latin Name	Common Name
	VASCULAR PLANTS	
	Dicotyledons	
	SELAGINELLACEAE	SPIKE-MOSS FAMILY
	Selaginella bigelovii	Bigelow spike moss
	CUPRESSACEAE	CYPRESS FAMILY
	Juniperus californica	California juniper
	EPHEDRACEAE	EPHEDRA FAMILY
	Ephedra californica	Desert tea
1	*Ephedra nevadensis*	Nevada ephedra
	AMARANTHACEAE	AMARANTH FAMILY
*	*Amaranthus albus*	Tumbleweed
	ANACARDIACEAE	SUMAC or CASHEW FAMILY
	Rhus ovata	Sugar bush
	ASTERACEAE	ASTER FAMILY
	Acamptopappus sphaerocephalus	Rayless goldenhead
	Ambrosia acanthicarpa	Annual bur-sage
	Ambrosia dumosa	White bur-sage, burrobush
	Ambrosia salsols	Common burrobrush, cheesebush
	Artemisia californica	California sagebrush
	Bahiopsis parishii	Parish's goldeneye
	Bebbia juncea var. *aspera*	Sweetbush
	Brickellia californica	California brickellbush
	Chaenactis fremontii	Fremont pincushion
	Corethrogyne filaginifolia	California-aster, sand-aster
	Encelia farinosa	Brittlebush
	Encelia frutescens	Rayless encelia
	Encelia virginensis	Virgin River encelia
	Ericameria linearifolia	Interior goldenbush
	Ericameria nauseosa	Common rabbitbrush
	Ericameria paniculata	Black-banded rabbitbrush, punctate rabbitbrush
	Ericameria pinifolia	Pine-bush, pine goldenbush
	Eriophyllum wallacei	Wallace's woolly daisy
	Geraea canescens	Desert-sunflower
	Gutierrezia sarothre	Matchweed
	Isocoma acradenia	Alkali goldenbush
	Lasthenia gracilis	Goldfields
	Lasthenia californica	California goldfields
	Lepidospartum squamatum	Scale-broom
*	*Logfia gallica*	Daggerleaf cottonrose
	Malacothrix glabrata	Desert dandelion
	Rafinesquia neomexicana	Desert chicory
	Stephanomeria exigua	Wreath plant
	Stephanomeria pauciflora	Wire-lettuce, desert straw
	Tetradymia comosa	Hairy horsebrush
	Uropappus lindleyi	Silverpuffs
	BIGNONIACEAE	TRUMPET-CREEPER or JACARANDA FAMILY
	Chilopsis linearis ssp. *arcuata*	Desert-willow
	BORAGINACEAE	BORAGE OR WATERLEAF FAMILY
	Amsinckia intermedia	Large flower rancher's fiddleneck
	Amsinckia tessellata	Checker fiddleneck

	Cryptantha angustifolia	Narrow-leaved cryptantha
	Cryptantha barbigera	Bearded cryptantha
1	*Cryptantha micrantha*	Purpleroot cryptantha
	Cryptantha muricata	Prickly cryptantha
	Emmenanthe penduliflora	Whispering bells
	Eucrypta chrysanthemifolia	Spotted eucrypta
	Heliotropium curassavicum var. *oculatum*	Alkali heliotrope, salt heliotrope
	Nemophila menziesii	Baby blue eyes
	Pectocarya linearis ssp. *ferocula*	Narrow-toothed pectocarya, comb-bur
	Pectocarya platycarpa	Wide-toothed pectocarya, broad-fruited comb-bur
	Phacelia distans	Common phacelia
	Phacelia minor	Wild canterbury bells
BRASSICACEAE		MUSTARD FAMILY
*	*Brassica tournefortii*	Sahara mustard, wild turnip
*	*Hirschfeldia incana*	Shortpod mustard
	Lepidium nitidum	Shining peppergrass
*	*Sisymbrium orientale*	Hare's ear cabbage
	Streptanthella longirostris	Streptanthella
	Tropidocarpum gracile	Slender adobe-pod
CACTACEAE		CACTUS FAMILY
	Cylindropuntia echinocarpa	Silver cholla
	Cylindropuntia ramosissima	Pencil cholla
	Echinocereus engelmannii	Engelmann hedgehog cactus
	Opuntia basilaris var. *basilaris*	Beavertail cactus
CHENOPODIACEAE		GOOSEFOOT FAMILY
	Atriplex canescens	Four-wing saltbush
	Grayia spinosa	Spiny hop-sage
CLEOMACEAE		SPIDERFLOWER FAMILY
	Peritoma arborea	Bladderpod
CRASSULACEAE		STONECROP FAMILY
	Crassula connata	Pygmy-weed
	Dudleya lanceolata	Lance-leaved dudleya
	Dudleya saxosa spp. *aloides*	Desert dudleya
CROSSOSOMATACEAE		CROSSOSOMA FAMILY
	Crossosoma bigelovii	Bigelow's ragged rock flower
CUCURBITACEAE		GOURD FAMILY, CUCUMBER FAMILY
	Marah macrocarpa	Chilicothe, wild cucumber
EUPHORBIACEAE		SPURGE FAMILY
	Stillingia linearifolia	Linear-leaved stillingia
FABACEAE		LEGUME FAMILY, PEA FAMILY
	Acmispon glaber var. *glaber*	Deerweed
1	*Acmispon procumbens*	Silky deerweed
	Acmispon strigosus	Desert lotus
	Lupinus bicolor	Annual lupine
	Lupinus concinnus	Bajada lupine
	Lupinus sparsiflorus	Coulter's lupine
	Lupinus truncatus	Collar lupine
*	*Melilotus indicus*	Sourclover, India sweetclover
	Prosopis glandulosa var. *torreyana*	Honey mesquite
	Psorothamnus emoryi	Emory indigo-bush, dye-weed
	Senegalia greggii	Catclaw acacia

GERANIACEAE		GERANIUM FAMILY
*	*Erodium cicutarium*	Redstem filaree
KRAMERIACEAE		RHATANY FAMILY, KRAMERIA FAMILY
1	*Krameria bicolor*	White rhatany
LAMIACEAE		MINT FAMILY
	Salvia apiana	White sage
	Salvia columbariae	Chia
	Scutellaria mexicana	Bladder-sage, paper bag bush
LOASACEAE		LOASA FAMILY, STICK-LEAF FAMILY
	Mentzelia involucrata	Sand blazing star
MALVACEAE		MALLOW FAMILY
	Sphaeralcea ambigua var. *ambigua*	Apricot mallow, desert mallow
MONTIACEAE		MINER'S LETTUCE FAMILY, MONTIA FAMILY
	Calandrinia ciliata	Red maids
	Calyptridium monandrum	Pussypaws, common calyptridium
NYCTAGINACEAE		FOUR O'CLOCK FAMILY
	Abronia villosa var. *villosa*	Sand verbena
	Mirabilis laevis var. *villosa*	Desert wishbone bush
ONAGRACEAE		EVENING-PRIMROSE FAMILY
	Camissonia campestris	Field evening-primrose
	Camissoniopsis bistorta	California sun cup
	Camissoniopsis pallida	Pale suncup
	Eremothera boothii ssp. *condensata*	Booth's evening primrose
	Eulobus californica	California false mustard
PAPAVERACEAE		POPPY FAMILY
	Eschscholzia parishii	Parish's gold poppy
PLANTAGINACEAE		PLANTAIN FAMILY
	Plantago ovata	Desert plantain
POLEMONIACEAE		PHLOX FAMILY
	Eriastrum eremicum ssp. *eremicum*	Desert woolly-star
1	*Eriastrum sapphirinum*	Sapphire woollystar
	Gilia angelensis	Chaparral gilia, common gilia
	Gilia capitata	Blue field gilia
	Gilia ochroleuca ssp. *exilis*	Volcanic gilia
	Leptosiphon lemmonii	Lemmon's linanthus
	Leptosiphon liniflorus	Flax-flowered linanthus
POLYGONACEAE		BUCKWHEAT FAMILY
	Chorizanthe brevicornu	Brittle spine flower
	Eriogonum elongatum var. *elongatum*	Long-stem wild buckwheat, wand buckwheat
	Eriogonum fasciculatum	California buckwheat
	Eriogonum inflatum	Desert trumpet
	Lastarriaea coriacea	Leather spineflower
RANUNCULACEAE		BUTTERCUP FAMILY
	Delphinium parishii ssp. *parishii*	Parish's larkspur
RHAMNACEAE		BUCKTHORN FAMILY
	Ziziphus parryi var. *parryi*	Parry's jujube, lotebush
ROSACEAE		ROSE FAMILY
	Adenostoma fasciculatum	Chamise
	Prunus ilicifolia	Hollyleaf cherry
SOLANACEAE		NIGHTSHADE FAMILY
	Lycium andersonii	Anderson box-thorn
1	*Lycium cooperi*	Peach desert thorn

ZYGOPHYLLACEAE		CALTROP FAMILY
	Larrea tridentata	Creosote bush
Monocotyledons		
AGAVACEAE		CENTURY PLANT FAMILY, AGAVE FAMILY
	Hesperoyucca whipplei	Chaparral yucca
	Yucca schidigera	Mojave yucca
LILIACEAE		LILY FAMILY
**	*Calochortus plummerae*	Plummer's mariposa lily
POACEAE		GRASS FAMILY
*	*Avena barbata*	Slender wild oat
*	*Bromus berteroanus*	Chilean chess
*	*Bromus madritensis* ssp. *rubens*	Red brome
*	*Bromus tectorum*	Cheat grass
	Festuca microstachys	Small fescue
	Festuca octoflora	Sixweeks grass, slender fescue
	Hilaria rigida	Big galleta
*	*Hordeum murinum*	Wall barley, hare barley
	Poa secunda	Nevada blue grass, nodding blue grass
*	*Schismus barbatus*	Mediterranean schismus
	Stipa hymenoides	Sand rice grass, Indian rice grass
	Stipa speciosa	Desert needle grass
THEMIDACEAE		BRODIAEA FAMILY
	Dichelostemma capitatum	Blue dicks, wild hyacinth
VERTEBRATE ANIMALS		
REPTILIA		REPTILES
TESTUDINIDAE		LAND TORTOISES
**	*Gopherus agassizii*	Desert tortoise
IGUANIDAE		IGUANID LIZARDS
	Phrynosoma platyrhinos	Desert horned lizard
	Sceloporus magister	Desert spiny lizard
	Sceloporus occidentalis	Western fence lizard
	Uta stansburiana	Side-blotched lizard
XANTUSIIDAE		NIGHT LIZARDS
	Xantusia vigilis	Desert night lizard
TEIIDAE		WHIPTAILS
	Aspidoscelis tigris tigris	Great Basin whiptail
BOIDAE		BOAS AND PYTHONS
	Lichanura trivirgata	Rosy boa
COLUBRIDAE		COLUBRIDS
1	*Masticophis flagellum*	Coachwhip
	Pituophis catenifer	Gopher snake
VIPERIDAE		VIPERS
2	*Crotalus mitchellii*	Speckled rattlesnake
AVES		BIRDS
PELECANIDAE		PELICANS
	Pelecanus erythrorhynchos	American white pelican
PHALACROCORACIDAE		CORMORANTS
	Phalacrocorax auritus	Double-crested cormorant
THRESKIORNITHIDAE		IBISES AND SPOONBILLS
**2	*Plegadis chihi*	White-faced ibis

ANATIDAE		DUCKS, GEESE AND SWANS
	Branta canadensis	Canada goose
CATHARTIDAE		VULTURES
	Cathartes aura	Turkey vulture
ACCIPITRIDAE		HAWKS, EAGLES, HARRIERS
**[2]	*Pandion haliaetus*	Osprey
**[2]	*Elanus caeruleus*	White-tailed kite
**	*Aquila chrysaetos*	Golden eagle
**[2]	*Haliaeetus leucocephalus*	Bald eagle
**[2,3]	*Circus cyaneus*	Northern harrier
**[2]	*Accipiter striatus*	Sharp-shinned hawk
**	*Accipiter cooperii*	Cooper's hawk
**[2]	*Buteo swainsoni*	Swainson's hawk
	Buteo jamaicensis	Red-tailed hawk
**[2,3]	*Buteo regalis*	Ferruginous hawk
[2]	*Buteo lagopus*	Rough-legged hawk
FALCONIDAE		FALCONS
	Falco sparverius	American kestrel
**[2]	*Falco columbarius*	Merlin
**[2,3]	*Falco peregrinus*	Peregrine falcon
**[2,3]	*Falco mexicanus*	Prairie falcon
PHASIANIDAE		GROUSE AND QUAIL
	Alectoris chukar	Chukar
[2,3]	*Callipepla gambelii*	Gambel's quail
	Callipepla californica	California quail
COLUMBIDAE		PIGEONS AND DOVES
[2]	*Columba livia*	Rock dove
*	*Streptopelia decaocto*	Eurasian collared dove
	Zenaida macroura	Mourning dove
CUCULIDAE		CUCKOOS
	Geococcyx californianus	Greater roadrunner
STRIGIDAE		TYPICAL OWLS
**[2]	*Asio otus*	Long-eared owl
CAMPRIMULGIDAE		NIGHTJARS
	Chordeiles acutipennis	Lesser nighthawk
[2]	*Phalaenoptilus nuttallii*	Common poorwill
APODIDAE		SWIFTS
**[2,3]	*Chaetura vauxi*	Vaux's swift
	Aeronautes saxatalis	White-throated swift
TROCHILIDAE		HUMMINGBIRDS
	Calypte anna	Anna's hummingbird
**	*Calypte costae*	Costa's hummingbird
	Selasphorus sasin	Allen's hummingbird
PICIDAE		WOODPECKERS
[2]	*Picoides scalaris*	Ladder-backed woodpecker
	Picoides pubescens	Downy woodpecker
	Picoides villosus	Hairy woodpecker
	Colaptes auratus	Northern flicker
TYRANNIDAE		TYRANT FLYCATCHERS
	Empidonax wrightii	Gray flycatcher
	Sayornis nigricans	Black phoebe

	Sayornis saya	Say's phoebe
	Tyrannus vociferans	Cassin's kingbird
	Tyrannus verticalis	Western kingbird
ALAUDIDAE		LARKS
	Eremophila alpestris	Horned lark
HIRUNDINIDAE		SWALLOWS
	Tachycineta bicolor	Tree swallow
2	*Tachycineta thalassina*	Violet-green swallow
	Stelgidopteryx serripennis	Northern rough-winged swallow
	Hirundo pyrrhonota	Cliff swallow
2	*Hirundo rustica*	Barn swallow
CORVIDAE		CROWS AND JAYS
	Aphelocoma coerulescens	Scrub jay
	Corvus corax	Common raven
REMIZIDAE		VERDINS
	Auriparus flavipes	Verdin
AEGITHALIDAE		BUSHTITS
	Psaltriparus minimus	Bushtit
TROGLODYTIDAE		WRENS
	Campylorhynchus brunneicapillus	Cactus wren
	Salpinctes obsoletus	Rock wren
	Thryomanes bewickii	Bewick's wren
	Troglodytes aedon	House wren
MUSCICAPIDAE		THRUSHES AND ALLIES
	Regulus calendula	Ruby-crowned kinglet
	Polioptila caerula	Blue-gray gnatcatcher
**	*Polioptila melanura*	Black-tailed gnatcatcher
	Sialia mexicana	Western bluebird
	Catharus guttatus	Hermit thrush
	Turdus migratorius	American robin
	Chamaea fasciata	Wrentit
MIMIDAE		MOCKINGBIRDS AND THRASHERS
	Mimus polyglottos	Northern mockingbird
	Toxostoma redivivum	California thrasher
MOTACILLIDAE		WAGTAILS AND PIPITS
2	*Anthus spinoletta*	American pipit
BOMBYCILLIDAE		WAXWINGS
2	*Bombycilla cedrorum*	Cedar waxwing
PTILOGONATIDAE		SILKY FLYCATCHERS
	Phainopepla nitens	Phainopepla
LANIIDAE		SHRIKES
**	*Lanius ludovicianus*	Loggerhead shrike
STURNIDAE		STARLINGS
*	*Sturnus vulgaris*	European starling
VIREONIDAE		VIREOS
	Vireo huttoni	Hutton's vireo
EMBERIZIDAE		SPARROWS, WARBLERS, TANAGERS
	Vermivora celata	Orange-crowned warbler
	Vermivora ruficapilla	Nashville warbler
**2	*Setophaga petechia*	Yellow warbler
	Setophaga townsendi	Townsend's warbler
	Setophaga coronata	Yellow-rumped warbler

3	*Wilsonia pusilla*	Wilson's warbler
2	*Coccothraustes vespertinus*	Evening grosbeak
	Piranga ludoviciana	Western tanager
3	*Pheucticus melanocephalus*	Black-headed grosbeak
	Pipilo crissalis	California towhee
	Aimophila ruficeps	Rufous-crowned sparrow
	Spizella passerina	Chipping sparrow
	Chondestes grammacus	Lark sparrow
	Amphispiza bilineata	Black-throated sparrow
	Artemisiospiza nevadensis	Sagebrush sparrow
	Passerculus sandwichensis	Savannah sparrow
	Passerella iliaca	Fox sparrow
	Melospiza melodia	Song sparrow
	Melospiza lincolnii	Lincoln's sparrow
	Zonotrichia leucophrys	White-crowned sparrow
	Junco hyemalis	Dark-eyed junco
2	*Agelaius phoeniceus*	Red-winged blackbird
	Sturnella neglecta	Western meadowlark
	Euphagus cyanocephalus	Brewer's blackbird
FRINGILLIDAE		FINCHES
3	*Haemorhous cassinii*	Cassin's finch
	Haemorhous mexicanus	House finch
2	*Spinus pinus*	Pine siskin
	Spinus psaltria	Lesser goldfinch
	Spinus lawrencei	Lawrence's goldfinch
MAMMALIA		MAMMALS
VESPERTILIONIDAE		EVENING BATS
**3	*Antrozous pallidus*	Pallid bat
**3	*Corynorhinus townsendii*	Townsend's big-eared bat
3	*Eptesicus fuscus*	Big brown bat
**3	*Lasiurus blossevillii*	Western red bat
**3	*Lasiurus cinereus*	Hoary bat
3	*Myotis californicus*	California myotis
**3	*Myotis evotis*	Western long-eared myotis
**3	*Myotis lucifugus*	Little brown myotis
**3	*Myotis thysanodes*	Fringed myotis
**3	*Myotis volans*	Long-legged myotis
**3	*Myotis yumanensis*	Yuma myotis
3	*Pipistrellus hesperus*	Western pipistrelle
MOLOSSIDAE		FREE-TAILED BATS
3	*Tadarida brasiliensis mexicana*	Mexican free-tailed bat
LEPORIDAE		HARES AND RABBITS
	Lepus californicus deserticola	Black-tailed jackrabbit
	Sylvilagus audubonii	Desert cottontail
	Sylvilagus bachmani cinerascens	Brush rabbit
SCIURIDAE		SQUIRRELS
	Otospermophilus beecheyi	Beechey (California) ground squirrel
	Ammospermophilus leucurus	Antelope ground squirrel
GEOMYIDAE		POCKET GOPHERS
	Thomomys bottae	Botta pocket gopher
HETEROMYIDAE		POCKET MICE

	Dipodomys sp.	Kangaroo rat
	Dipodomys merriami	Merriam kangaroo rat
CRICETIDAE		RATS AND MICE
	Neotoma lepida lepida	Desert wood rat
MURIDAE		OLD WORLD RATS AND MICE
*	*Rattus rattus*	Black rat
CANIDAE		FOXES, WOLVES AND COYOTES
	Canis latrans	Coyote
MUSTELIDAE		WEASELS AND SKUNKS
**	*Taxidea taxus*	American badger
FELIDAE		CATS
	Felis concolor	Mountain lion
[2]	*Lynx rufus*	Bobcat
CERVIDAE		ELKS, MOOSE, CARIBOU, DEER
[2]	*Odocoileus hemionus*	Mule deer
BOVIDAE		SHEEP AND GOATS
[2,3]	*Ovis canadensis*	Bighorn

Non-native species are indicated by an asterisk. Special-status species are indicated by two asterisks. Species detected during surveys by NRA Inc. (2008) and not detected during recent surveys are indicated by a superscript 1, while those observed by Bloom Biological (2013) are indicated by a superscript 2, and those identified by WEST (2017) are indicated by a superscript 3. Other species may have been overlooked or inactive/absent because of the season (amphibians are active during rains, reptiles during summer, some birds (and bats) migrate out of the area for summer or winter, some mammals hibernate etc.). Taxonomy and nomenclature generally follow Stebbins (2003) for amphibians and reptiles, AOU (1998) for birds, and Jones et al. (1992) for mammals.

APPENDIX C-3

2013 Avian Survey Report

Mesa Wind Project

2012-2013 Final Avian Survey Report

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ABOUT BLOOM BIOLOGICAL, INC.

For more than 35 years, Bloom Biological, Inc. (BBI) has provided biological consulting services for large and small clients. Our resume of services includes raptor and endangered species research, biological monitoring, impact assessment, permitting, conservation planning and geospatial analysis. Our innovative approach has provided solutions to complex problems for clients and projects throughout a range of industries including alternative energy, residential development and the public sector. Collectively, the management and staff of BBI hold permits or memoranda of understanding for participating in the conservation and recovery of more than a dozen endangered or threatened species, as well as a number of other special-status species, in California and the western United States. Over the years, BBI has established an impeccable relationship with the resource agencies, project proponents, and environmental organizations by skillfully balancing the needs and objectives of land planning, resource conservation, and the public interest. In addition to our work in California and the western United States, BBI biologists have worked in Alaska, Central and South America, Europe, Southern Asia, and the western Pacific. BBI is a certified Small Business Enterprise.

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1.0 INTRODUCTION

Bloom Biological, Inc. (BBI) was retained by Brookfield Renewable Energy Group (Brookfield) to conduct field surveys to evaluate biological resources for the Mesa Wind Project (Project) located in the vicinity of Palm Springs, Riverside County, California. Survey design was based on recommendations in the U.S. Fish and Wildlife Service (USFWS) Land-Based Wind Energy Guidelines (USFWS 2012a), USFWS's Draft Eagle Conservation Plan Guidance (USFWS 2011a) and subsequent Technical Appendices (USFWS 2012b), and the California Energy Commission (CEC) Wind Energy Guidelines (CEC 2007). The final version of the Eagle Conservation Plan Guidance (Module 1; USFWS 2013) was released too late to be incorporated into the survey design, but was utilized in the analyses. These documents (hereafter "Guidelines") collectively provide a framework for determining the level of pre-permitting assessment necessary for both proposed and repowering wind energy projects. The studies described in this report are consistent with Tier 3 field studies (USFWS 2012a) or Stage 2 field studies (USFWS 2011a, 2012b, 2013) described in the Guidelines and the outcome of meetings between the project proponent, BBI and state and federal agencies.

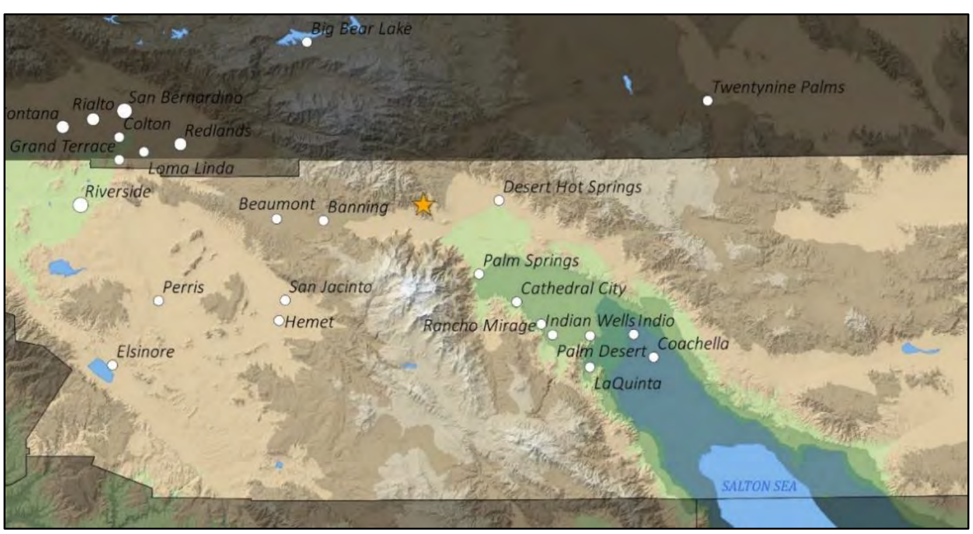
BBI conducted field surveys from September 2012 through August 2013 to evaluate the abundance, diversity, and patterns of use of birds and other vertebrates on and in proximity to the proposed Project Site across seasons. This report details the methods used and provides comprehensive results and analysis of survey results within this period, including an estimate of the predicted project-related Golden Eagle (*Aquila chrysaetos*) fatalities based on implementation of the USFWS eagle fatality prediction Bayesian model using BBI's survey data.

2.0 PROJECT SITE DESCRIPTION

The Project Site is comprised of approximately 1,185 acres (479 hectares) located in the vicinity of White Water in unincorporated Riverside County, California (see Figure 1). On the Public Land Survey System, the Project Site is located in all or portions of Sections 27, 33, 34, and 35 of Township 02S, Range 03E and Section 4 of Township 03S, Range 03E of the US Geological Survey's (USGS) 7.5-minute *White Water* quadrangle.

Topography on the site is highly varied and characterized by steep hills and sharply-defined drainages as expected within the foothills of the San Bernardino Mountains. Elevations on the site vary from approximately 1,770 feet above mean sea level near the Project Site's southwestern corner to 3,300 feet above mean sea level along the northern edge.

Figure 1. Project site location.



3.0 REASON FOR SURVEYS

The surveys described in this report are conducted to evaluate use of the Project Site by bird species, and to a lesser extent, other vertebrates that are protected under one or more of the following regulatory protections, with the intent of determining the extent of potential direct, indirect and cumulative Project impacts to these species. With regard to the Project Site, birds protected by the Endangered Species Act or Migratory Bird Treaty Act may breed, overwinter, or migrate through the area and be susceptible to Project impacts. Though some species protected by these regulations require special survey protocols to thoroughly examine their abundance and status, the surveys conducted in the present study focused primarily on detecting the presence or absence of protected species on the Project Site. If detected, further studies may be warranted. The exception, as discussed below, is the Golden Eagle, which was known prior to the onset of surveys to occur on and near the Project Site.

3.1 Endangered Species Act

Take of a federally listed threatened or endangered species is prohibited under federal law without a special permit. Section 10(a)(1)(B) of the ESA allows for take of a threatened or endangered species incidental to development activities once a Habitat Conservation Plan (HCP) has been prepared to the satisfaction of the USFWS and a Section 10(a) incidental take permit has been issued to the applicant. For federal projects (including those involving federal funding), Section 7 of the ESA allows for consultation between the affected agency and the USFWS to determine what measures may be necessary to compensate for the incidental take of a listed species. A "federal" project is any project that is proposed by a federal agency or is at least partially funded or authorized by a federal agency. Additionally, if the listed species or its habitat occurs in a portion of the project subject to federal jurisdiction (such as "Waters of the United States"), then consultation under Section 7 of the Act is usually permissible and may be required.

3.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (MBTA) is a federal law governing the taking, killing, possession, transportation, and importation of various birds, their eggs, parts and nests. The take of any number of a bird species listed as protected on any one of four treaty lists is governed by the MBTA's regulation of taking migratory birds for educational, scientific, and recreational purposes and requiring harvest to be limited to levels that prevent overutilization. The MBTA also prohibits the take, possession, import, export, transport, selling, purchase, barter, or offering for sale, purchase or barter, certain bird species, their eggs, parts, and nests, except as authorized under a valid permit (50 CFR 21.11).

The Migratory Bird Treaty Act (16 U.S.C. §§703 et seq.) makes it "unlawful at any time, by an means or in any manner, to . . . take, capture, kill, attempt to take, capture, or kill, possess, …ship, …, transport or cause to be transported …any migratory bird, any part, nest, or egg of any such bird." (16 U.S.C. §703, subd (a).) The MBTA applies to migratory bird species that occur in the United States as the result of natural biological or ecological processes. (16 U.S.C. §703, subd (b).).

3.3 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668c), enacted in 1940, and amended several times since, affords protection to both Golden Eagles and Bald Eagles (*Haliaeetus leucocephalus*). Bald Eagles are not expected to occur regularly on the Project Site given the lack of suitable foraging and breeding habitat. For this reason, further discussion of the BGEPA will focus on its relevance to Golden Eagles in the project area. Regulatory protections for Golden Eagles require thorough surveys to determine the status of Golden Eagles for projects occurring within their range and habitat. The intent is to determine the extent of potential direct, indirect and cumulative effects projects may have on eagles, avoid and or minimize these effects, assess the potential for incidental take during project operation, and monitor eagle populations in response to increased usage of desert environments for alternative energy projects. These measures are predominantly driven by the BGEPA.

The BGEPA prohibits anyone without a permit issued by the Secretary of the Interior from "taking" eagles, including their parts, nests, or eggs. The BGEPA provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The BGEPA defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

For purposes of the guidelines, "disturb" means: “to agitate or bother a Bald Eagle 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."

In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment.

In 2009 the USFWS was granted the authority to issue permits that authorize individual instances of take of Bald and Golden eagles when the take is associated with, but not the purpose of, an otherwise lawful activity, and cannot practicably be avoided. Surveys for Golden Eagles in the present study were designed according to guidelines set forth by the USFWS (USFWS 2011a, 2012b, 2013) to meet pre-permitting criteria for assessing potential impacts to eagles.

4.0 METHODS

Flight path maps were prepared for all Golden Eagle and Bald Eagle observations, regardless of whether observed during official surveys or incidentally between surveys, and regardless of how far from the observer the bird was observed. Flight paths were drawn on detailed maps of the Project Site and the surrounding area, with topographic contours showing elevation. These maps detailed the entire observable path of each eagle and indicated locations where the following occurred: a change in altitude above ground level (agl) relative to cut-off points of the Rotor Swept Zone (RSZ, see Methods, Section 4.1.2 below), perching locations, flight types exhibited, and interactions with other birds (chase, flee, etc.).

Though all Golden and Bald Eagle sightings were treated the same in all survey methodologies, only a single Bald Eagle was ultimately detected (6 kilometers from the Project Site) during the full year of surveys. For this reason, references that would otherwise be directed toward both species are generally directed toward Golden Eagles only throughout the remainder of the document. Nonetheless, details regarding the single observation of a Bald Eagle are reported in the Results section.

4.1 Bird Use Count Surveys

4.1.1 BUC Survey Design and Data Considerations

The focus of Bird Use Count (BUC) surveys was to evaluate the use of the Project Site and surrounding areas by medium to large resident and migratory birds, including Golden Eagles and other raptors. BUC surveys were designed in accordance with the USFWS Draft Eagle Conservation Plan Guidance (USFWS 2011a) and Technical Appendices (USFWS 2012b) to ensure that the data collected could be utilized to adequately characterize risk to Golden Eagles in the USFWS-developed Bayesian model for predicting eagle fatalities (Bayesian Model) described in the guidance documents. These documents (hereafter “ECP Guidelines”) recommend conducting point count surveys from the center of 0.5-mile (800-meter) radius plots, and recording detections at all distances, as well as detailed information on flight patterns and use for birds passing within the 0.5-mile (800-meter) survey area. It is recommended that the total area surveyed by 0.5-mile (800-meter) radius plots comprises at least 30% of the area within 0.6 miles (1 km) of proposed turbines (Project Footprint). To meet these criteria, three BUC observation points (O.P.s) were established across the Project Footprint (Exhibit 1). At the time this study was designed, a repowering project was under consideration by the former Project owner (Western Wind, Inc.), and the Project Footprint was generated based a 0.6-mile (1-kilometer) buffer surrounding planned turbine locations for the then-proposed repowering project. The total area of the Project Footprint is 4.36 mi^2 (11.29 km^2), and the combined area of the three 0.5-mile (800-meter) radius BUC survey plots is 2.32 mi^2 (6.01 km^2), or 53.2% of the area of the Project Footprint.

Due to the rugged terrain on the Project Site, suitable locations for observation points (O.P.s) were limited to hilltops that afforded broad views of the surrounding 0.5-mile (800-meter) buffer. Careful consideration of all potential O.P. locations within the Project Footprint resulted in two O.P.s (BUC # 2 and BUC # 3) being placed less than 1 mile (1600 meters) apart, and these O.P.s thus had partially overlapping 0.5-mile (800-meter) radius survey areas. As a result, special measures were taken during data collection and data analysis to account for the non-independence of data collected in this area of overlap, and these are discussed below in greater detail. Nonetheless, these locations were chosen because they maximized coverage of the areas proposed for turbine placement and, compared to alternative options, provided the most comprehensive coverage of the areas with the greatest potential for collision risk within the Project Footprint.

For various reasons, the 0.5-mile (800-meter) radius survey areas surrounding certain BUC O.P.s were further subdivided. BUC O.P. #3 was situated atop a flat hilltop with radio towers that obstructed the view in one direction or the other, regardless of where the surveying biologist was located. To address this issue, the survey area was subdivided into two halves, “Survey Area 3 South” (3S) and “Survey Area 3 North” (3N; Exhibit 1). Survey Area 3N is semi-circular in shape, and shares an area of overlap with the survey area surrounding BUC O.P. #2, as discussed above. This area of overlap between the two survey areas was designated as “Survey Area 4” (Exhibit 1). “Survey Area 1” was a complete 0.5-mile (800-meter) radius circle around BUC O.P. #1, as there were no obstructions or areas of overlap there, and “Survey Area 2” was comprised of all areas within 0.5 miles (800-meters) of BUC O.P. #2, *except* areas within “Survey Area 4” (Exhibit 1). Thus, at certain BUC O.P.s, multiple Survey Areas were surveyed simultaneously. The Survey Areas that were surveyed from each BUC O.P., and the percent of time at each O.P. spent surveying each are detailed below in Table 1.

Table 1. Survey Effort Allocation Among Bird Use Count Observation Points and Survey Areas

The following table lists the three BUC Observation Points (O.P.s) and the Survey Areas associated with (surveyed from) each, as well as the percent of time allocated to surveying each Survey Area across BUC O.P.s.

BUC O.P. #	Survey Area (S.A.)	% of Time Surveyed
1	1	100
2	2	100 (with S.A. 4)
2	4	100 (with S.A. 2)
3	3N	50 (with S.A. 4)
3	4	50 (with S.A. 3N)
3	3S	50

During surveys, biologists surveyed from the location of one of the three BUC O.P.s, and recorded birds detected in all directions and at all distances. However, detailed flight information, for use in the Bayesian

Model, was only collected for birds that passed within the Survey Areas they were actively surveying at the time (e.g., Survey Areas 1, 2, 3S, 3N, or 4). This approach was taken in an attempt to ensure that data collected during surveys from BUC O.P. #3 did not violate a critical assumption inherent to the Bayesian Model, namely that the detection probability of large birds (and especially Golden Eagles) within the survey area is at or very near 100%. Survey Area 4 was treated separately because it comprised a single area that was surveyed at different times from two separate O.P.s. To avoid spatial pseudoreplication of data (Hurlbert 1984), observations of birds in this area, whether observed from O.P. #2 or O.P. #3, represent a single estimate of use for one distinct area of the Project Site, and not two, in the final dataset.

4.1.2 BUC Survey Methods

During the Fall (September 15 to December 15, 2012) and Spring (February 1 to April 15, 2013) seasons, two biologists each conducted BUC surveys at separate O.P.s for 8 hours per day, 4 days per week. To ensure independence of the data collected from BUC O.P. #2 and BUC O.P. #3 (which have overlapping survey areas), the two biologists never surveyed from these two stations at the same time. Each week, BUC O.P. #1 was surveyed 4 times, and BUC O.P.s #2 and #3 were each surveyed twice. Within each week, both biologists devoted one day to surveying during the eight hours following sunrise, one day to surveying the eight hours preceding sunset, and two days to surveying the eight hours in the middle part of the day when migratory raptors are expected to be most active. The start times were rotated among O.P.s, as were the surveying biologists, to ensure that each O.P. was surveyed at roughly equal proportions at different times of day, and by different biologists within each season. All Fall and Winter BUC surveys were conducted by the same two biologists.

During the Winter (December 16, 2012 to January 31, 2013) and Summer (April 16, 2013 to August 31, 2013) seasons, one biologist conducted BUC surveys from each BUC O.P. for 4 hours, during the morning or afternoon, once every other week. Start times were rotated among O.P.s to ensure that each O.P. was surveyed at roughly equal proportions in the morning versus afternoon within each season. All winter and summer BUC surveys were conducted by the same biologist. A complete list of all BUC survey dates, times and weather conditions can be found in Appendix A.

While conducting BUC surveys, qualified BBI biologists recorded detailed flight data for focal species and summarized data for non-focal species. Focal species included all raptors, and all non-raptors larger in size than an American Crow (*Corvus brachyrhynchos*), except those belonging to the family Corvidae (i.e., crows and ravens). An emphasis was placed on detecting all focal species that passed within a Survey Area being actively surveyed (Active Survey Area), though all detections of focal species were recorded regardless of distance. Basic information was collected for focal species detected outside of an Active Survey Area, including the following: BUC O.P. #, whether the bird was a resident or migrant, date, time, species, age (if known), sex (if known), distance to bird, direction to bird, detection mode, initial height of bird, initial flight direction, final passage direction, and number of individuals (e.g., if in a flock). If the focal species passed within an Active Survey Area, the biologist recorded detailed information about the flight path and behavior. This information pertained only to flight activity within the Active Survey Area and included the following: Survey Area #, minimum height, maximum height, flight types exhibited (e.g., dive, hover, soar), the number of minutes the bird spent flying within the Active Survey Area, the number of minutes the bird spent flying in the RSZ. The definition of the RSZ was changed after the fall season to better represent recommendations in the ECP Guidelines. During the Fall 2012 season the RSZ was defined as the area between 115-450 feet (35-135 meters) agl, which represented the lower and upper limits of the rotor blade swept area on the planned turbines for the then-proposed Project. To better reflect ECP Guidelines, the RSZ was changed to all areas less than 650 feet (200 meters) agl for all subsequent BUC surveys.

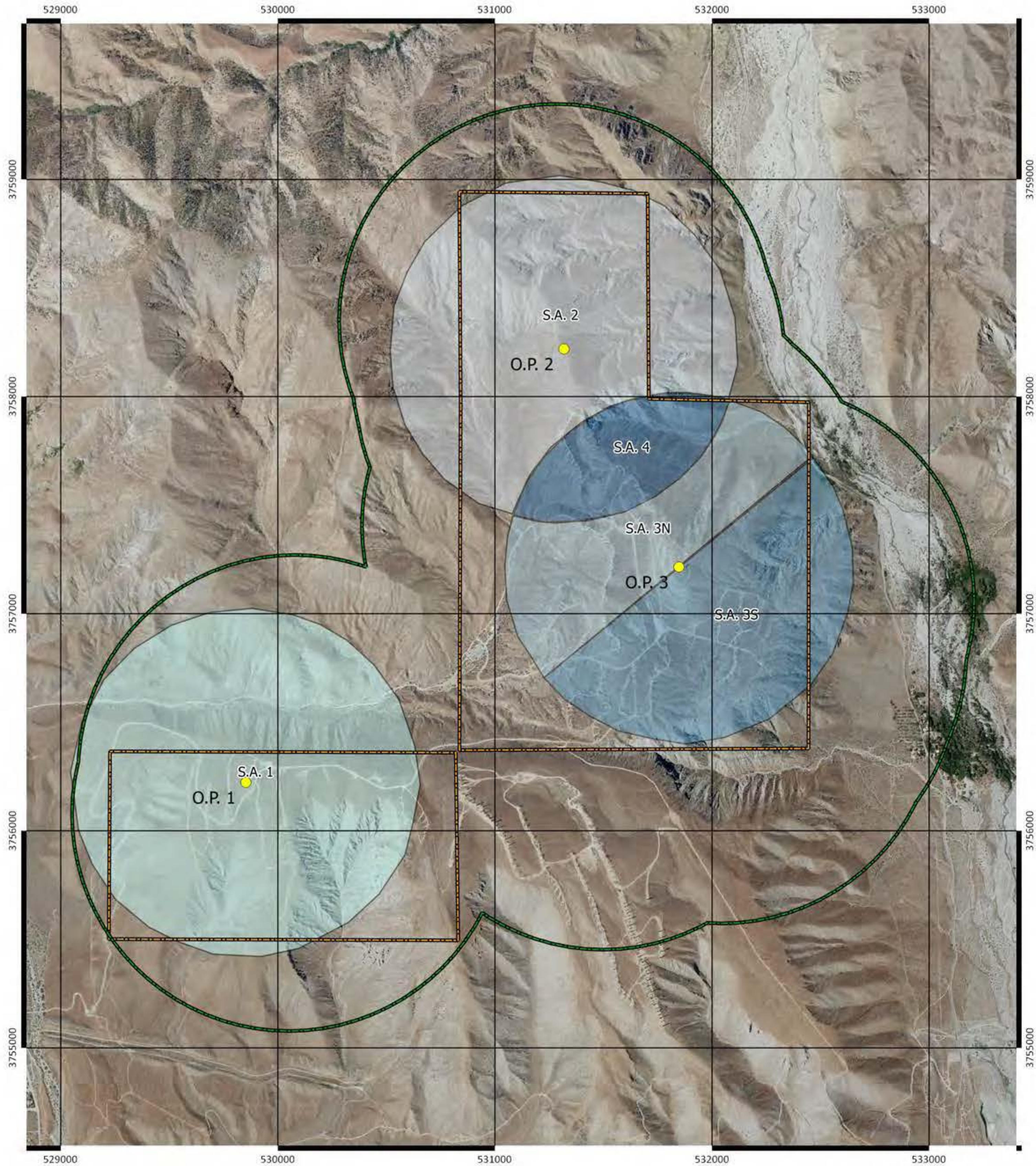
Non-focal species in BUC surveys included non-raptors equal in size to an American Crow or smaller, and Common Ravens. For these species, data were summarized hourly by species, to indicate the number of individuals observed passing through each Active Survey Area. In addition, biologists estimated the total number of minutes these birds spent flying within the RSZ within each Active Survey Area. As with focal species, the definition of the RSZ was changed after the fall season to better represent recommendations in the ECP Guidelines. During the Fall, 2012 season the RSZ was defined as the area between 115-450 feet (35-135 meters) agl, which represented the lower and upper limits of the rotor blade swept area on the proposed turbines for the Project. To better reflect ECP Guidelines, the RSZ was changed to all areas less than 650 feet (200 meters) agl for all subsequent BUC surveys.

Using rangefinders and landmarks, all surveyors were trained in estimating distances across the range expected for these surveys. Surveyors were also provided with a rangefinder and large laminated maps showing elevation contours of the survey area when conducting surveys, so they could identify the distances to various landmarks around each station and use the landmarks accordingly in distance estimates. In addition, the two biologists that conducted all BUC surveys trained together for the first three days of surveys to facilitate the calibration and consistency in distance and height estimates, as well as methodology.

4.2 Small Bird Count Surveys

4.2.1 SBC Survey Design and Data Considerations

Small Bird Count (SBC) surveys were conducted to evaluate the use of the Project Footprint and surrounding areas by resident and migrant passerine and other small and medium-sized birds, though larger birds and raptors were recorded as well. SBC surveys were designed, in part, according to recommendations in the USFWS Wind Energy Guidelines (USFWS 2012a) and the CEC Wind Energy Guidelines (CEC 2007). In establishing SBC point count station locations, a main objective was to maintain an element of randomness, while ensuring that SBC point count stations were established in areas that would provide meaningful data about the potential risks of the proposed Project to small birds. The Project Site is not large and cannot accommodate a large number of point count stations if they are to be spaced a minimum of 820 feet (250 meters) apart, as per the above-referenced guidelines. In addition, the rugged terrain of the area made a completely random allocation of survey points less than ideal, as some would invariably be placed randomly in deep canyons far below the Project Site in elevation, which would provide little relevant information about bird use in areas near turbines. To resolve this issue, a polygon was drawn which was wholly within the proposed project boundary, but which excluded areas that were deep in canyons or more than 1600 feet (500 meters) from existing or proposed turbine locations. This polygon was 0.807 mi^2 (2.090 km^2) in area, and SBC survey stations were sequentially, and randomly generated and buffered by 820 foot (250 meter) distances (per CEC 2007 recommendations) until new stations could no longer be allocated without the survey area intersecting another station's survey area. This resulted in a total of 13 SBC stations which, assuming a 300-foot (100-meter survey radius; CEC 2007), comprised an area of 0.158 mi^2 (0.408 km^2), or 19.5% of the polygon representing the area deemed suitable for the placement of SBC survey stations and 8.5% of the total area within the Project Boundary (1.85 mi^2 [4.79 km^2]). After generating random locations for the 13 SBC stations using GIS software, each specific location was visited in the field and evaluated. Final locations were chosen for each station based on the terrain in the area and may have been moved up to 25 meters in any cardinal direction from the original GIS-mapped location if a better view of the surrounding area was available. The final locations for all 13 SBC survey stations is displayed in Exhibit 2.



BUC Observation Point (O.P.)
Project Boundary
Project Footprint

BUC Survey Area (S.A.)

S.A. 1
S.A. 2
S.A. 3N
S.A. 3S
S.A. 4

1000 0 1000 2000 ft

1:24,000

UTM NAD83 Zone 11 Coordinate Grid
Map Date: 12/20/2013
Author: Michael J. Kuehn
Background Source: US Department of Agriculture

EXHIBIT 1. Bird Use Count (BUC) Survey Locations
Mesa Wind Project | Riverside County, California

BBI

4.2.2 SBC Survey Methods

During both the Fall (September 15 to October 31, 2012) and Spring (March 1 to May 9, 2013) seasons, one biologist surveyed the 13 SBC stations six times. During the Winter (December 15, 2012 to February 15, 2013) and Summer (May 10 to June 10, 2013), one biologist surveyed the 13 SBC stations 3 times. In all seasons, surveys were conducted between sunrise and 1200h, which encompasses the period when passerine birds are generally most active. The order in which SBC stations were surveyed was rotated in subsequent surveys, between surveying in the order of stations (a) 1-13, (b) 13-1 and (c) 7-13 then 1-6, to ensure that all stations were surveyed at various times of the morning hours at roughly equal proportions. All SBC surveys were conducted by the same biologist. A complete list of survey dates, times and weather conditions can be found in Appendix A.

During SBC surveys, a qualified BBI biologist began noting birds detected by sight and sound immediately after arriving at the station and for 10 minutes thereafter. Though birds of all sizes and at all distances from the observer were recorded, an emphasis was placed on detecting all birds within 110 yards (100 meters) of the observer. For each bird detected, the biologist recorded the following information: species, sex (if known), age (if known), mode of detection (visual, song, call, other), distance from station, direction from station (cardinal and inter-cardinal), number of individuals (if moving in a group), the number of minutes (rounded up to the nearest whole minute) spent flying within the 100-meter radius survey area (maximum of 10), and the number of those minutes that were spent flying within the proposed RSZ. The definition of the RSZ was changed after the Fall season to better represent recommendations in the ECP Guidelines. During the Fall, 2012 season the RSZ was defined as the area between 115-450 feet (35-135 meters) agl, which represented the lower and upper limits of the rotor blade swept area on the proposed turbines for the Project. To better reflect ECP Guidelines, the RSZ was changed to all areas less than 650 feet (200 meters) agl for all subsequent SBC surveys.

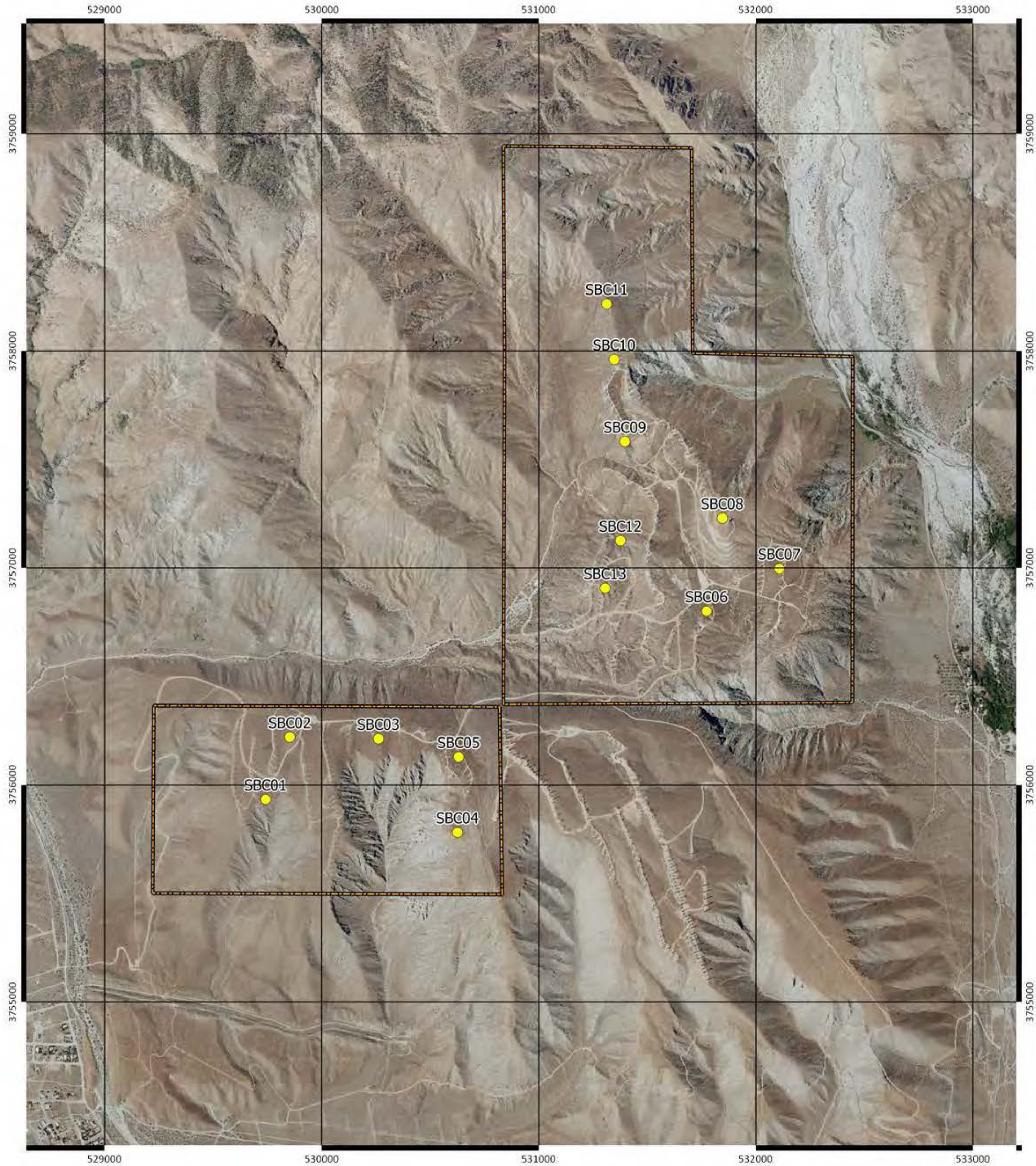
Using rangefinders and landmarks, the SBC surveying biologist was trained in estimating distances across the range expected for these surveys. The biologist was also provided with a rangefinder when conducting surveys, so they could identify the distances to various landmarks around each station or target and use the landmarks accordingly in distance estimates.

4.3 Special Status Species Surveys

4.3.1 SSS Design and Data Considerations

Special Status Species (SSS) surveys were conducted primarily to establish the presence/absence of species with sensitive status within the project area, and evaluate their use of the area in regard to risk associated with wind turbines. Sensitive status species included those designated as federally threatened (FT) or endangered (FE) under the Endangered Species Act (ESA), California threatened (CT) or endangered (CE) under the California Endangered Species Act (CESA), or listed as Species of Special Concern (SSC) or Fully Protected (FP) by the California Department of Fish & Wildlife (CDFW). These surveys were designed to provide additional survey effort within the Project Area for sensitive species that may be rare but are known to have occurred in the region of the project. Such species may be under-represented or missed altogether by stationary survey methods such as BUC and SBC surveys.

The SSS survey area was designated as all areas within 300 feet (100 meters) of all current and proposed Project-related roads and structures, including the main access road, beginning at the west gate and facilities building (Exhibit 3).



SBC Survey Station

Project Boundary

1000 0 1000 2000 ft

1:24,000

UTM NAD83 Zone 11 Coordinate Grid
Map Date: 12/20/2013
Author: Michael J. Kuehn
Background Source: US Department of Agriculture

EXHIBIT 2. Small Bird Count (SBC) Survey Locations

Mesa Wind Project | Riverside County, California

BBI

4.3.2 SSS Survey Methods

SSS Surveys were conducted once or twice per month between September 2012 and August 2013. During each SSS survey, a qualified BBI biologist walked slowly along one to five meandering transect routes, normally ranging in length from 0.5 to 2 miles (1 to 3 kilometers), within the SSS survey area and recorded all vertebrates, sign of vertebrates and special habitat features affecting vertebrate distribution (e.g., caves, water sources, burrows, etc.) encountered along the route. All such observations were recorded regardless of whether they pertained to sensitive species, although the focus of the surveys was to detect and document sensitive species or evidence of their presence. Transect routes were not pre-determined because habitat quality changes throughout the year for certain species. However, an effort was made to cover as much of the SSS survey area as possible within each season, with a particular focus on areas of suitable habitat for potential sensitive species. SSS surveys were conducted at variable hours between sunrise and sunset to encompass a variety of daylight periods during which different species might be active.

During SSS surveys, each observation was plotted on a detailed map of the SSS Survey area or recorded using a GPS unit, and labeled with a unique identification number. The identification number was then entered on a datasheet, accompanied by the following information: time, species, distance to detection, direction to detection, number of individuals and relevant notes. The exact locations of each target were computed, using the observer's location coordinates and the distance and bearing to the target, and plotted using GIS software. All SSS routes were recorded on a GPS unit during surveys. A complete list of all SSS survey dates, times and weather conditions can be found in Appendix A.

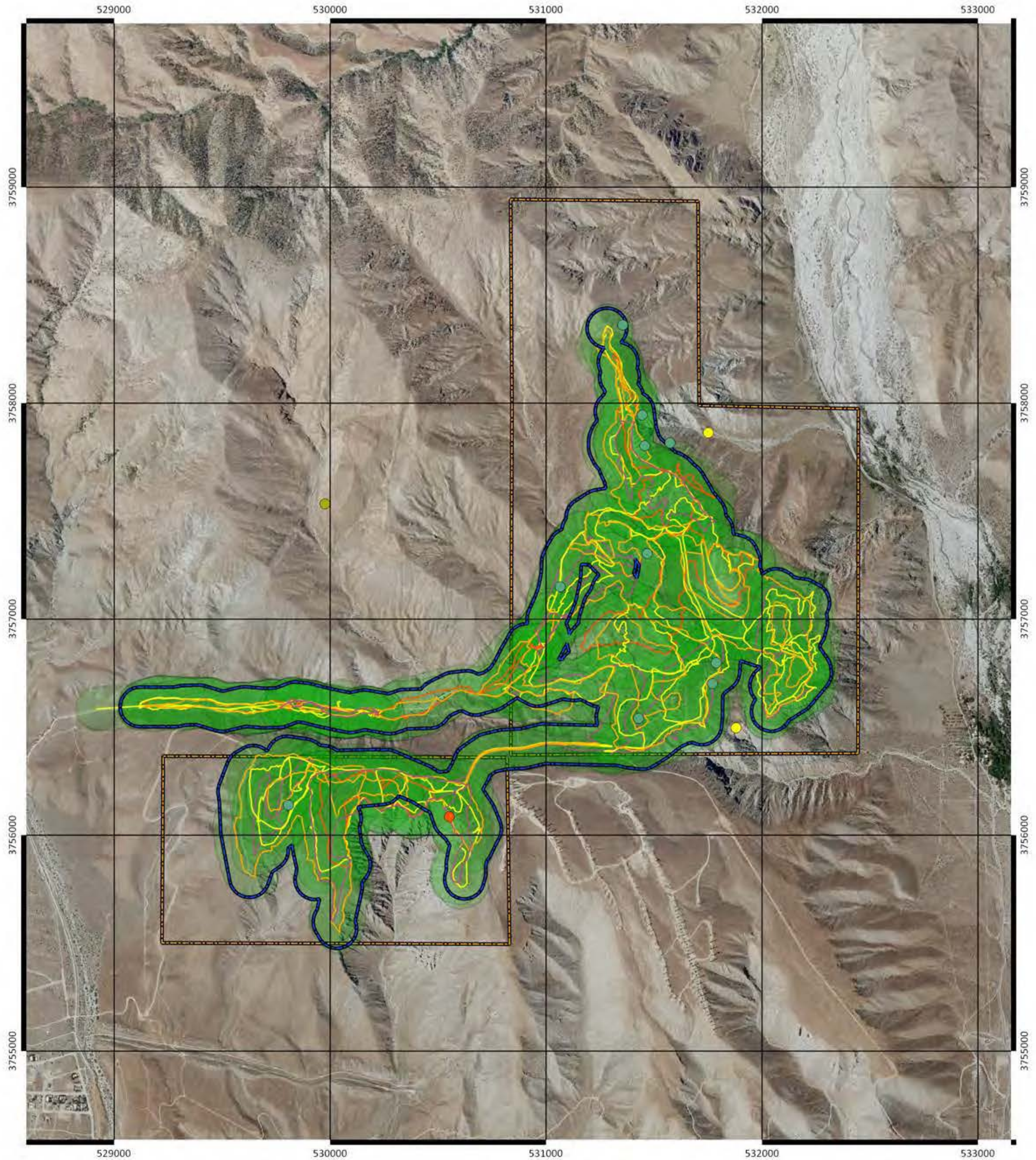
4.4 Golden Eagle Use and Fatality Prediction Analysis

4.4.1 Eagle Flight Path Analysis

All Golden Eagle observations made from the Project Site were recorded, whether they occurred during surveys or incidentally during other periods. Only a subset of these data meets the assumptions necessary for use in the Bayesian Model to estimate predicted fatality rates because this model depends on data that represent a rigorously defined *rate* of detection per unit of survey effort. Incidental observations nonetheless provide supplemental information about use of the Project Area by eagles. Flight paths of all Golden Eagles detected from the Project Site were digitized using GIS software for spatial analysis. During the digitization process, sections of each flight path were coded according to whether the bird was flying at a height within the RSZ, above the RSZ (see RSZ definitions in Methods, Section 4.1.2), or if the flight height was not determined. These paths were combined into a single map to provide a visual representation of where eagles were most frequently observed, and how flight height varied among these areas with regard to risk (distances flown within the RSZ).

4.4.2 Golden Eagle Fatality Prediction Analysis (Bayesian Model)

The USFWS developed a mathematical model for generating estimates of predicted eagle fatality rates at proposed wind energy sites using estimates of eagle use on the Project Site from pre-construction field surveys. The Bayesian Model incorporates several variables to generate an annual fatality estimate, including the following:



SSS Survey Routes
- FALL
- SPRING
- SUMMER
- WINTER

Sensitive Species Detections
- American White Pelican
- Bighorn Sheep
- Golden Eagle
- Loggerhead Shrike

Survey Effort
- High
- Low
- Medium
- Project Boundary
- SSS Survey Area Boundary

1000 0 1000 2000 ft

1:24,000

UTM NAD83 Zone 11 Coordinate Grid
Map Date: 12/20/2013
Author: Michael J. Kuehn
Background Source: US Department of Agriculture

EXHIBIT 3. Special Status Species (SSS) Survey Results

Mesa Wind Project | Riverside County, California

BBI

<u>Exposure Rate</u>: The frequency at which eagles fly at heights within the RSZ on the project footprint, calculated as the number of Eagle Minutes observed per Trial (Eagle Minutes per unit of hr*km^2), where:

- RSZ is defined as all heights between ground level and 600 feet (200 meters) above ground level
- "Eagle Minutes" are the number of minutes eagles were observed flying within the RSZ over all surveys
- A "Trial" represents the total survey time (in hours), multiplied by the area (km^2) surveyed during that time, to standardize for the probability of detecting a bird
    - E.g., 1 hour of observing 2 km^2 is equal to 2 hours of observing 1 km^2, as both equal 2 hr*km^2
- "Project Footprint" is the area encompassing all proposed turbines plus a 0.6-mile (1-kilometer) buffer surrounding them
    - Surveys are designed to estimate the frequency of eagle occurrence (Exposure Rate) within this area

<u>Collision Probability</u>: The probability that an eagle will collide with a turbine given 1 minute of flight within a hazardous area, where:

- "Hazardous Area" is the region within ½ the rotor diameter (i.e., the rotor radius) of a turbine
    - This probability has been modeled and calculated by the USFWS based on a study by Whitfield (2009) of eagle avoidance behavior at four wind energy sites
- All collisions are assumed to be fatal

<u>Collision Rate</u>: This rate is simply the product of the Exposure Rate and Collision Probability (collisions per hr*km^2 of exposure in a Hazardous Area), the terms of which are described above

<u>Expansion Factor</u>: The Collision Rate is multiplied by the Expansion Factor, which scales the Collision rate to the level of exposure to Hazardous Areas on the Project Site (in the units hr*km^2) over a one-year period. Eagles are considered exposed to risk over the Total Hazardous Area of the Project during all Daylight Hours of the year, where:

- "Total Hazardous Area" is calculated as the Hazardous Area around each turbine (see above), multiplied by the number of proposed turbines
- "Daylight Hours" are calculated as the sum of day lengths (sunrise to sunset, in hours) across the year at the Project Site

Simply multiplying the calculated values of the Exposure Rate and Collision Probability to obtain an estimate of Collision Rate could lead to misleading results because these values are *estimates* of true values generated from sampling. Because of sampling error, these estimates may not be representative of the true values for Exposure Rate and Collision Probability. To remedy this dilemma, probability distributions are generated for each variable. A probability distribution considers the level of variability associated with an estimate and uses it to generate a range of likely true values and the associated probabilities that each represents the true mean. Those nearer the calculated sample mean will be the most probable, while those lower or higher, and away from the mean will be increasingly less probable. Simulations are then run in a probabilistic fashion, multiplying one randomly selected value from the probability distribution of one variable (e.g., Exposure Rate) by another randomly selected value from the probability distribution of the second variable (e.g., Collision Probability). This process is repeated many times (often up to 100,000 times or more) in an approach referred to as bootstrapping, to generate a new probability distribution that represents the range of results obtained from multiplying the two variables using the bootstrapping technique. The Expansion Factor variable of the model does not require the calculation of a probability distribution because all of the components of the variable are constants and not based on sampling.

To generate an annual Golden Eagle fatality estimate using the Bayesian Model, a "posterior" probability distribution (Posterior Distribution) for the Project-specific Exposure Rate was first produced by combining field data from BUC surveys on the Project Footprint, including the number of Eagle Minutes observed and the total number of Trials (hr*km^2 of observation), with a "Prior" probability distribution (Prior Distribution) of Exposure Rates from other studies. The Prior Distribution was developed by the USFWS and was generated from estimates of Exposure Rates from numerous studies, though studies with ample survey effort such as this one help ensure that the shape of the resulting Posterior Distribution is unlikely to be affected strongly by the shape of the Prior Distribution. A similar process is used for the Collision Probability, except that at this point in the present study there are no site-specific collision data to contribute, and so, as per the recommendations of the ECP Guidelines, the Posterior Distribution of the Exposure Rate was multiplied in the model by the USFWS-generated Prior Distribution for Collision Probability.

The final model parameters are detailed in the Results Section (Section 5.4.2). The model was run using R Statistical software (R Core Team 2012; Package 'rv', Kerman and Gelman 2007), and was based, in part, on previously published R Code obtained from the USFWS West Butte Draft Environmental Assessment (USFWS 2011b). A complete transcript of the final R software code for the modeling of fatality is included in Appendix D. The model output is a probability distribution of the annual predicted number of Golden Eagle fatalities at the Project Site, and includes estimates of the mean annual predicted fatality rate, as well as estimates based on 80% and 95% credible intervals.

5.0 RESULTS & DISCUSSION

Tables presented within this section report only the common names for species observed. A complete list of all bird, mammal and reptile species observed on the Project Site can be found in Appendix C, with scientific names listed next to common names for reference.

5.1 Bird Use Count Survey Results

A total of 1,519 hours of BUC surveying was completed between September 2012 and August 2013 on the Project Site. During this time 26,961 birds were observed. Though all surveys were conducted from one of three observation points (O.P.s), the surrounding areas within 0.5 miles (800 meters) were divided into five distinct Survey Areas (discussed in Methods, Section 4.1.1 and visually depicted in Exhibit 1), and from some O.P.s multiple Survey Areas were surveyed simultaneously. The total amount of effort dedicated to each Survey Area is detailed in Table 2. The combined sum of Survey Hours across all seasons and Survey Areas (2,110 h) is greater than the total hours biologists spent surveying (1,519 h) because Survey Area 4 was surveyed from both Survey Areas 2 and 3A (as described in Methods, Section 4.1.1). Survey Areas also varied in size, and to generate standardized values for the levels of survey effort for each Survey Area, Survey Effort was calculated as the product of the Survey Hours (h) and the Survey Area (km^2), resulting in a measure of survey effort with the units of hr*km^2. Survey Effort is thus scaled in proportion to the time and space over which biologists had the opportunity to observe birds in a given Survey Area (discussed further in Methods, Section 4.1.1). Thus, Survey Areas that were smaller in size tended to have lower levels of Survey Effort, and those that were larger in area tended to have higher levels of Survey Effort, even if the number of Survey Hours was similar. Over the course of the entire year, the total Survey Effort for all BUC Survey Areas was 2,651.2 hours*km^2.

Table 2. BUC Survey Effort by Survey Area and Season

*The following table displays survey effort for each Survey Area on the Project Site across each season, including the total number of hours each Survey Area was observed (Survey Hours; h) and the total area of the Survey Area (Survey Area, km²). The standardized measure of Survey Effort is calculated as the product of the Survey Hours and the Survey Area to generate comparable estimates across Survey Areas that differ in size (Survey Effort, hr*km²).*

Season	Survey Area #		Survey Hours	Survey Area (km^2)	Survey Effort ($hr*km^2$)
Fall	1		361.8	2.00	724.6
Fall	2		184.0	1.65	303.5
Fall	3N		99.3	0.65	64.2
Fall	3S		90.4	1.01	91.5
Fall	4		283.3	0.36	100.7
Total					1,284.5
Winter	1		12.0	2.00	24.0
Winter	2		12.0	1.65	19.8
Winter	3N		6.0	0.65	3.9
Winter	3S		6.0	1.01	6.1
Winter	4		18.0	0.36	6.4
Total					60.2
Spring	1		322.0	2.00	644.9
Spring	2		153.1	1.65	252.6
Spring	3N		76.9	0.65	49.7
Spring	3S		76.0	1.01	77.0
Spring	4		230.0	0.36	81.8
Total					1,105.9
Summer	1		40.0	2.00	80.1
Summer	2		40.0	1.65	66.0
Summer	3N		20.0	0.65	12.9
Summer	3S		20.0	1.01	20.2
Summer	4		60.0	0.36	21.3
Total					200.6
Full Year					2,651.2

5.1.1 BUC Focal Species Results

Focal species in BUC surveys included all raptor species, and all non-raptors larger than an American Crow, except those belonging to the family Corvidae (i.e., crows and ravens). A total of 17,650 individuals of 25 focal species was observed during the full year of BUC surveys. Detailed information on the abundance and use (minutes spent flying in the survey area) for each of these species is provided below in Table 3. The species with the greatest numbers of Total Observations included Double-crested Cormorants (*Phalacrocorax auritus*), American White Pelicans (*Pelecanus erythrorhynchos*), and Turkey Vultures (*Cathartes aura*), all of which were detected primarily during the spring migratory season. Despite the large numbers of individuals detected during these periods, many of these were detected far off of the Project

Footprint and outside of the 0.5-mile (800-meter) radius survey area. The columns representing the Total Observations for each season have limited utility in understanding collision risk among seasons because these are raw numbers that do not account for differences in Survey Effort among seasons. To better understand use of the Project Site by various species, the number of observations within the designated Survey Area per unit of Survey Effort (Observations/hr*km2) is also provided in Table 3. This metric indicates the rate at which the species was observed within the Survey Area (regardless of height) and provides a more standardized means of evaluating presence of each species on the Project Site. Finally, the measure of RSZ Minutes/hr*km2 indicates the number of minutes the species spent (on average) flying lower than 200 meters above ground level (i.e., within the Rotor Swept Zone) while within the Survey Area per unit of survey effort. This metric provides a standardized measure of risk to different species by indicating the amount of time each spends flying low to the ground and on the Project Site in the vicinity of turbines. The variable RSZ Minutes/hr*km2 can be interpreted as the number of minutes one would expect to see this species flying within the RSZ if one observed a square kilometer of area within the Project Footprint for one hour. Based on values for this variable, the highest levels of use occur during the winter for a number of raptor species, including the Red-tailed Hawk (*Buteo jamaicensis*), Ferruginous Hawk (*Buteo regalis*), American Kestrel (*Falco sparverius*), Cooper's Hawk (*Accipiter cooperii*), and Prairie Falcon (*Falco mexicanus*). However, Golden Eagle use of the RSZ was highest during the Fall season (0.044 RSZ min./hr*km^2), and second highest during the Winter season (0.033 RSZ min./hr*km^2).

Table 3. BUC Survey Focal Species Abundance and Use

*The following table lists all raptors and other birds larger than an American Crow, and excluding Common Ravens, (i.e., focal species) detected by BBI biologists during each season of 2012-2013 BUC Surveys. Sensitive status for each species is indicated according to the following acronyms: Federally Threatened (FT) or Endangered (FE), California Threatened (CT) or Endangered (CE), California Fully Protected (CFP), and California Species of Special Concern (SSC). A single species may have multiple sensitive status designations. Sensitive status may pertain only to a subspecies or genetically distinct population of the species, but is included only if the sensitive population has the potential to occur on the Project Site. Measures of abundance and use are provided for each species during each Season (F=Fall, W=Winter, SP=Spring, S=Summer) and include the following: (1) total number of individual observations at all distances (i.e., inside and outside of the Survey Area; Total Observations), (2) the rate of the average number of individuals observed within the survey area per hour of observation, standardized to a 1 km^2 area (Individuals/hr*km^2), (3) the rate of the average number of minutes individuals spent flying within the Survey Area and within the Rotor-Swept Zone (RSZ, i.e., less than 200m above ground level) per hour of observation, standardized to a 1 km^2 area (RSZ Minutes/hr*km^2). The rates in the latter two columns can be interpreted as the average number of events (individuals observed, or minutes spent flying in the RSZ, respectively) expected to occur while observing a 1 km^2 area for 1 hour.*

	Sensitive	Total Observations				Observations/hr*km^2				RSZ Minutes/hr*km^2			
Common Name	**Status**	**F**	**W**	**SP**	**S**	**F**	**W**	**SP**	**S**	**F**	**W**	**SP**	**S**
Double-crested Cormorant		0	0	3,962	0	-	-	1.400	-	-	-	1.213	-
Unidentified Cormorant		0	0	1,568	0	-	-	0.445	-	-	-	0.424	-
American White Pelican	SSC	292	0	8,403	0	0.209	-	3.359	-	0.011	-	0.814	-
White-faced Ibis		196	0	0	0	0.012	-	-	-	-	-	-	-
Turkey Vulture		50	1	1,113	0	0.004	-	0.080	-	0.006	-	0.216	-
Osprey		1	0	4	0	-	-	0.004	-	-	-	0.005	-
Bald Eagle	CE CFP	1	0	0	0	-	-	-	-	-	-	-	-
Northern Harrier	SSC	17	0	1	0	0.009	-	-	-	0.005	-	-	-
Sharp-shinned Hawk		6	1	1	1	0.005	-	0.001	0.005	0.003	-	0.001	0.010
Cooper's Hawk		24	1	6	0	0.012	0.017	0.005	-	0.005	0.083	0.010	-
Unidentified Accipiter Hawk		5	0	0	0	0.002	-	-	-	-	-	-	-

Common Name	Sensitive Status	Total Observations				Observations/hr*km²				RSZ Minutes/hr*km²			
		F	W	SP	S	F	W	SP	S	F	W	SP	S
Red-shouldered Hawk		1	0	0	0	0.001	-	-	-	0.002	-	-	-
Swainson's Hawk	CT	6	0	31	2	0.002	-	0.027	0.010	-	-	0.070	-
Red-tailed Hawk		479	42	308	17	0.192	0.415	0.200	0.080	0.211	0.997	0.316	0.140
Ferruginous Hawk		6	2	3	0	0.002	0.017	0.001	-	0.001	0.083	0.002	-
Rough-legged Hawk		1	0	0	0	0.001	-	-	-	0.008	-	-	-
Unidentified Buteo Hawk		17	0	1	0	0.004	-	0.001	-	0.004	-	0.002	-
Golden Eagle	CFP	121	2	31	5	0.018	0.017	0.007	0.025	0.044	0.033	0.013	0.010
Unidentified Hawk		3	0	1	0	0.002	-	0.001	-	0.001	-	0.001	-
Whimbrel		0	0	34	0	-	-	0.031	-	-	-	0.046	-
California Gull		80	0	110	0	0.004	-	0.099	-	-	-	0.053	-
Herring Gull		0	0	2	0	-	-	0.002	-	-	-	0.001	-
Unidentified Larus Gull		0	0	145	0	-	-	0.107	-	-	-	0.025	-
Greater Roadrunner		7	0	0	0	0.005	-	-	-	-	-	-	-
Long-eared Owl	SSC	1	0	0	0	0.001	-	-	-	0.002	-	-	-
American Kestrel		141	10	345	6	0.090	0.166	0.109	0.025	0.077	0.349	0.174	0.045
Merlin		2	0	0	0	0.002	-	-	-	0.001	-	-	-
Peregrine Falcon	CE CFP	2	0	0	0	0.001	-	-	-	0.001	-	-	-
Prairie Falcon		13	1	13	1	0.009	0.017	0.011	0.005	0.012	0.050	0.011	0.005
Unidentified Falcon		1	0	1	0	0.001	-	0.001	-	0.001	-	0.001	-
Unidentified Bird		2	0	0	0	0.002	-	-	-	-	-	-	-

Focal species abundance and use varied considerably among the five BUC Survey Areas and among seasons, as detailed in Table 4. For all focal species combined, both abundance (Observations/hr*km2) and use (RSZ min./hr*km2) were highest in Survey Area 2 during the Fall and Winter seasons. However, during the Spring season focal species abundance and use were highest in Survey Areas 3N and 4 instead. The values presented in Table 4 represent the combined values for all species. Given that certain species, such as Double-crested Cormorants and American White Pelicans, were detected in very high numbers during the spring (Table 3), the variation in abundance across Survey Areas is driven largely by the variation the usage rates of these species among Survey Areas. More detailed information specific to Golden Eagle use of the Project Site both seasonally, and among different Survey Areas is provided below (See Results, Section 5.4.2).

Table 4. Variation among BUC Survey Areas in Focal Species Abundance and Use

*The following table lists the five BUC Survey Areas at which BBI biologists conducted surveys during 2012-2013. Measures of focal species abundance and use are provided for each Survey Area during each Season (F=Fall, W=Winter, SP=Spring, S=Summer), and include the following (for all focal species combined): (1) total number of individual observations at all distances (i.e., inside and outside of the Survey Area; Total Observations), (2) the rate of the average number of individuals observed within the survey area per hour of observation, standardized to a 1 km² area (Individuals/hr*km²), (3) the rate of the average number of minutes individuals spent flying within the Survey Area and within the Rotor-Swept Zone (RSZ, i.e., less than 200m above ground level) per hour of observation, standardized to a 1 km² area (RSZ Minutes/hr*km²). The rates in the latter two columns can be interpreted as the average number of events (individuals observed, or minutes spent flying in the RSZ, respectively) expected to occur while observing a 1 km² area for 1 hour.*

Survey Area #	Total Observations				Observations/hr*km²				RSZ Minutes/hr*km²			
	F	W	SP	S	F	W	SP	S	F	W	SP	S
1	893	24	8,197	8	0.435	0.583	6.923	0.087	0.272	0.916	3.325	0.137
2	415	30	2,347	14	1.025	1.061	0.994	0.212	0.718	3.436	2.431	0.394
3N	89	2	4,198	7	0.966	-	16.043	0.464	0.483	-	9.521	0.310
3S	58	2	563	3	0.503	0.329	2.923	0.148	0.459	0.494	0.844	0.049
4	20	2	778	0	0.179	0.313	9.488	-	0.169	0.469	5.612	-

5.1.2 BUC Nonfocal Species Results

Nonfocal species during BUC surveys included all non-raptors equal to or smaller in size than an American Crow, and including Common Ravens. A total of 9,311 individuals of 65 nonfocal species was observed during the full year of BUC surveys. Detailed information on the abundance and use for each of these species is provided below in Table 5. The most frequently detected nonfocal species included Common Ravens, along with various species of swallows and swifts. The swallows and swifts were primarily detected as migrants during the Fall and Spring seasons, whereas Common Ravens were relatively abundant on the Project Site year-round. All species of swallows and swifts exhibited a pattern of greater abundance and use during the Fall migratory period relative to the Spring migratory period.

As noted for data regarding focal species (Section 5.1.1), the columns in Table 5 representing the Total Observations for each season have limited utility in understanding collision risk among seasons because these are raw numbers that do not account for differences in Survey Effort among seasons. To better understand use of the Project Site by various species, the number of observations within the designated Survey Area per unit of Survey Effort (Observations/hr*km2) is also provided. This metric indicates the rate at which the species was observed within the Survey Area (regardless of height) and provides a more standardized means of evaluating presence of each species on the Project Site. Finally, the measure of RSZ Minutes/hr*km2 indicates the number of minutes the species spent (on average) flying lower than 200 meters above ground level (i.e., within the Rotor Swept Zone) while within the Survey Area per unit of survey effort. This metric provides a standardized measure of risk to different species by indicating the amount of time each spends flying low to the ground and on the Project Site in the vicinity of turbines. The variable RSZ Minutes/hr*km2 can be interpreted as the number of minutes one would expect to see this species flying within the RSZ if one observed a square kilometer of area within the Project Footprint for one hour.

Table 5. BUC Survey Non-Focal Species Abundance and Use

*The following table lists all non-raptor avian species smaller than an American Crow, and including Common Ravens, (i.e., non-focal species) detected by BBI biologists during each season of 2012-2013 BUC Surveys. Sensitive status for each species is indicated according to the following acronyms: Federally Threatened (FT) or Endangered (FE), California Threatened (CT) or Endangered (CE), California Fully Protected (CFP), and California Species of Special Concern (SSC). A single species may have multiple sensitive status designations. Sensitive status may pertain only to a subspecies or genetically distinct population of the species, but is included only if the sensitive population has the potential to occur on the Project Site. Measures of abundance and use are provided for each species during each Season (F=Fall, W=Winter, SP=Spring, S=Summer) and include the following: (1) total number of individual observations at all distances (i.e., inside and outside of the Survey Area; Total Observations), (2) the rate of the average number of individuals observed within the survey area per hour of observation, standardized to a 1 km² area (Individuals/hr*km²), (3) the rate of the average number of minutes individuals spent flying within the Survey Area and within the Rotor-Swept Zone (RSZ, i.e., less than 200m above ground level) per hour of observation, standardized to a 1 km² area (RSZ Minutes/hr*km²). The rates in the latter two columns can be interpreted as the average number of events (individuals observed, or minutes spent flying in the RSZ, respectively) expected to occur while observing a 1 km² area for 1 hour.*

Common Name	Sensitive Status	Total Observations				Observations/hr*km²				RSZ Minutes/hr*km²			
		F	W	SP	S	F	W	SP	S	F	W	SP	S
Cockatiel		0	0	1	0	-	-	0.001	-	-	-	0.001	-
California Quail		6	0	3	1	0.005	-	0.003	0.005	-	-	0.001	-
Unidentified Quail		18	0	0	0	0.014	-	-	-	-	-	-	-
Chukar		28	0	4	0	0.022	-	0.004	-	-	-	-	-
Rock Pigeon		14	0	0	0	0.011	-	-	-	0.002	-	-	-
Eurasian Collared-Dove		0	0	1	0	-	-	0.001	-	-	-	0.001	-
Mourning Dove		2	0	0	2	0.002	-	-	0.010	-	-	-	0.010
Unidentified Pigeon		9	0	0	0	0.007	-	-	-	0.001	-	-	-
Greater Roadrunner		0	0	21	0	-	-	0.019	-	-	-	0.001	-
Vaux's Swift	SSC	399	0	0	0	0.311	-	-	-	0.046	-	-	-
White-throated Swift		1,011	0	309	11	0.787	-	0.279	0.055	0.031	-	0.459	0.050
Unidentified Swift		6	0	0	0	0.005	-	-	-	-	-	-	-
Black-chinned Hummingbird		0	0	2	2	-	-	0.002	0.010	-	-	0.002	0.010
Anna's Hummingbird		1	0	7	0	0.001	-	0.006	-	-	-	0.006	-
Rufous Hummingbird		0	0	0	1	-	-	-	0.005	-	-	-	0.005
Unidentified Hummingbird		26	0	39	25	0.020	-	0.035	0.125	0.001	-	0.035	0.125
Northern Flicker		5	0	0	0	0.004	-	-	-	-	-	-	-
Western Wood-Pewee		0	0	0	1	-	-	-	0.005	-	-	-	0.005
Unidentified Empidonax Flycatcher		0	0	1	1	-	-	0.001	0.005	-	-	0.001	0.005
Say's Phoebe		6	1	1	2	0.005	0.017	0.001	0.010	-	0.033	0.001	0.010
Ash-throated Flycatcher		0	0	0	1	-	-	-	0.005	-	-	-	0.005
Western Kingbird		0	0	5	0	-	-	0.005	-	-	-	0.016	-
Unidentified Kingbird		0	0	1	0	-	-	0.001	-	-	-	0.001	-

Common Name	Sensitive Status	Total Observations				Observations/hr*km²				RSZ Minutes/hr*km²			
		F	W	SP	S	F	W	SP	S	F	W	SP	S
Loggerhead Shrike	SSC	5	1	2	1	0.004	0.017	0.002	0.005	-	0.033	0.002	-
Western Scrub-Jay		2	0	5	3	0.002	-	0.005	0.015	-	-	0.002	0.015
Common Raven		1,150	28	576	102	0.895	0.465	0.521	0.508	0.523	0.598	1.291	0.733
Horned Lark		27	0	44	5	0.021	-	0.040	0.025	0.008	-	0.036	0.025
Tree Swallow		0	0	44	0	-	-	0.040	-	-	-	0.040	-
Violet-green Swallow		2,528	0	9	0	1.968	-	0.008	-	0.086	-	0.008	-
Northern Rough-winged Swallow		11	0	9	4	0.009	-	0.008	0.020	0.001	-	0.008	0.045
Bank Swallow	CT	0	0	1	0	-	-	0.001	-	-	-	0.001	-
Cliff Swallow		179	0	41	0	0.139	-	0.037	-	0.005	-	0.037	-
Barn Swallow		19	0	51	0	0.015	-	0.046	-	0.005	-	0.046	-
Unidentified Swallow		358	0	11	0	0.279	-	0.010	-	0.016	-	0.010	-
Verdin		0	0	0	2	-	-	-	0.010	-	-	-	-
Bushtit		4	0	0	0	0.003	-	-	-	-	-	-	-
Rock Wren		137	4	210	32	0.107	0.066	0.190	0.160	-	0.100	0.007	0.015
Bewick's Wren		31	1	18	3	0.024	0.017	0.016	0.015	-	0.017	0.001	-
Cactus Wren		1	0	18	7	0.001	-	0.016	0.035	-	-	0.001	-
Blue-gray Gnatcatcher		7	0	4	3	0.005	-	0.004	0.015	-	-	0.004	0.015
Ruby-crowned Kinglet		1	0	0	0	0.001	-	-	-	-	-	-	-
Western Bluebird		0	14	1	0	-	0.233	0.001	-	-	0.017	0.001	-
Northern Mockingbird		0	0	0	9	-	-	-	0.045	-	-	-	0.020
California Thrasher		3	0	2	4	0.002	-	0.002	0.020	-	-	-	-
European Starling		22	0	7	0	0.017	-	0.006	-	0.002	-	0.006	-
American Pipit		6	0	3	0	0.005	-	0.003	-	0.004	-	0.003	-
Cedar Waxwing		63	0	0	0	0.049	-	-	-	0.002	-	-	-
Phainopepla		2	0	2	0	0.002	-	0.002	-	0.001	-	0.002	-
Orange-crowned Warbler		0	0	1	0	-	-	0.001	-	-	-	-	-
Common Yellowthroat		2	0	0	0	0.002	-	-	-	-	-	-	-
Yellow Warbler	SSC	0	0	0	1	-	-	-	0.005	-	-	-	0.005
Yellow-rumped Warbler		45	0	14	0	0.035	-	0.013	-	0.008	-	0.013	-
Unidentified Warbler		0	0	1	4	-	-	0.001	0.020	-	-	0.001	0.020
Spotted Towhee		0	0	1	0	-	-	0.001	-	-	-	-	-
Rufous-crowned Sparrow		2	0	6	0	0.002	-	0.005	-	-	-	-	-
California Towhee		22	0	82	9	0.017	-	0.074	0.045	-	-	0.005	-
Brewer's Sparrow		0	0	3	0	-	-	0.003	-	-	-	-	-
Lark Sparrow		0	0	13	4	-	-	0.012	0.020	-	-	0.006	0.010
Black-throated Sparrow		3	0	32	4	0.002	-	0.029	0.020	-	-	0.005	0.015
Sage Sparrow		0	0	1	0	-	-	0.001	-	-	-	-	-

Common Name	Sensitive Status	Total Observations				Observations/hr*km²				RSZ Minutes/hr*km²			
		F	W	SP	S	F	W	SP	S	F	W	SP	S
Savannah Sparrow		1	0	0	0	0.001	-	-	-	0.001	-	-	-
Fox Sparrow		1	0	0	0	0.001	-	-	-	-	-	-	-
Song Sparrow		1	0	0	0	0.001	-	-	-	-	-	-	-
White-crowned Sparrow		53	3	23	0	0.041	0.050	0.021	-	0.002	0.100	0.005	-
Dark-eyed Junco		8	0	47	0	0.006	-	0.042	-	-	-	0.013	-
Western Tanager		0	0	0	3	-	-	-	0.015	-	-	-	0.015
Western Meadowlark		13	0	212	13	0.010	-	0.192	0.065	0.002	-	0.039	0.005
Brewer's Blackbird		5	0	0	0	0.004	-	-	-	0.002	-	-	-
House Finch		291	5	213	55	0.227	0.083	0.193	0.274	0.041	0.083	0.179	0.244
Pine Siskin		74	0	4	2	0.058	-	0.004	0.010	0.006	-	0.004	0.010
Lesser Goldfinch		95	0	38	9	0.074	-	0.034	0.045	0.011	-	0.033	0.045
Lawrence's Goldfinch		31	0	14	1	0.024	-	0.013	0.005	0.005	-	0.013	0.005
Evening Grosbeak		1	0	0	0	0.001	-	-	-	0.001	-	-	-
Unidentified Finch		2	0	0	0	0.002	-	-	-	-	-	-	-
Unidentified Passerine		12	0	2	0	0.009	-	0.002	-	0.003	-	0.001	-
Unidentified Bird		18	0	0	0	0.014	-	-	-	0.006	-	-	-

Nonfocal species abundance and use varied widely and relatively inconsistently among the five BUC Survey Areas across seasons, as detailed in Table 6. Survey Area 2 had the most consistently high rates of abundance and use across seasons, though it was not the highest in every season. The extremely high use rate for Survey Area 2 during the Spring Season (88.551 RSZ min./hr*km²) is not explained alone by a high abundance of birds, but rather was the result of a moderate number of birds (primarily swallow species) circling and foraging on the wing near the O.P. while within the RSZ, thereby summing to a large number of flight minutes per hour of observation. Survey Area 4 had the most consistently low rates of nonfocal species usage. The values presented in Table 6 represent the combined values for all nonfocal species and given that certain species, such as swifts, swallows, and Common Ravens, were detected in greater numbers than other species (Table 5), the variation in abundance across Survey Areas is driven largely by the variation the usage rates of these species among Survey Areas. The ridgeline from which Survey Area 2 was surveyed runs south to north along Whitewater Canyon and attracted relatively large numbers of migrant swifts and swallows during both the Fall and Spring seasons.

The nonfocal data from BUC surveys are intended to supplement the more detailed Small Bird Count (SBC) Survey data presented in Section 5.2 below. Though both datasets relate to use of the site by smaller birds, the quantitative data (abundance and use rates) from the SBC surveys are more accurate for several reasons. First, the focus of BUC surveys was to detect focal species (raptors and other large birds). As such, smaller birds may have gone undetected during these surveys in an effort to ensure that no focal species were missed. Perhaps more importantly, nonfocal species in BUC surveys were recorded across the entire Survey Area, out to a 0.5-mile (800-meter) radius, and the abundance and use rates were calculated based on the Survey Area size. Because many of these birds are small and may be more difficult to detect at greater distances, estimates of nonfocal species abundance and use in Tables 5 and 6 are likely underestimates of their true abundance and use rates within each Survey Area. This may have contributed to the low nonfocal species abundance and use rates for Survey Area 4, which was surveyed from O.P.s 2 and 3N, but was situated far from both O.P.s (See Exhibit 1). Though detection may have been hampered by these distances, a greater opportunity existed during BUC surveys to document species that may not have been documented during SBC surveys, simply because of the larger survey area and the longer survey duration (including survey periods in the afternoon). In contrast, the Survey Area for all SBC surveys discussed below (Section 5.2) were 110-yards (100-meters) in radius, and the surveys were conducted in the morning hours only, when small birds are generally the most active.

Table 6. Variation among BUC Survey Areas in Non-Focal Species Abundance and Use

*The following table lists the five BUC Survey Areas at which BBI biologists conducted surveys during 2012-2013. Measures of non-focal species abundance and use are provided for each Survey Area during each Season (F=Fall, W=Winter, SP=Spring, S=Summer), and include the following (for all focal species combined): (1) total number of individual observations at all distances (i.e., inside and outside of the Survey Area; Total Observations), (2) the rate of the average number of individuals observed within the survey area per hour of observation, standardized to a 1 km² area (Individuals/hr*km²), (3) the rate of the average number of minutes individuals spent flying within the Survey Area and within the Rotor-Swept Zone (RSZ, i.e., less than 200m above ground level) per hour of observation, standardized to a 1 km² area (RSZ Minutes/hr*km²). The rates in the latter two columns can be interpreted as the average number of events (individuals observed, or minutes spent flying in the RSZ, respectively) expected to occur while observing a 1 km² area for 1 hour.*

Survey Area #	Total Observations				Observations/hr*km²				RSZ Minutes/hr*km²			
	F	W	SP	S	F	W	SP	S	F	W	SP	S
1	2,093	7	970	40	2.889	0.291	1.504	0.499	4.244	0.458	13.902	0.662
2	3,403	32	950	204	11.211	1.617	3.761	3.092	19.830	2.173	88.551	8.154
3N	290	11	106	41	4.519	2.835	2.134	3.173	2.556	3.351	7.528	4.334
3S	890	5	134	42	9.725	0.824	1.741	2.074	20.170	1.483	6.054	3.012
4	91	2	0	0	0.903	0.313	-	-	0.764	1.250	-	-

5.2 Small Bird Count Survey Results

Each of the 13 SBC stations was surveyed 18 times between September 2012 and August 2013, with six surveys per station during the Fall and Spring migratory seasons and three surveys per station during the Winter and Summer seasons. During these a total of 1,181 birds of 45 species was detected. All SBC stations had a fixed survey radius of 110-yards (100-meters) and a fixed survey duration of 10 minutes. For this reason, the standardized results presented in Tables 6 and 7 below are calculated on a per count (survey) basis, unlike the results for BUC surveys, which had variably-sized Survey Areas and durations. All species of birds, at all distances, were recorded during SBC surveys, though the focus was on detecting smaller bird species and all birds present within 110-yards (100-meters) of the SBC survey station. Thus, there are not separate tables for focal and nonfocal species.

Detailed information on the abundance and use for each species observed during SBC surveys is presented below in Table 7. Over the course of the entire year, the most commonly observed species at all distances (Total Observations column) during SBC surveys were (in order of decreasing abundance), the House Finch (*Haemorhous mexicanus*), Rock Wren (*Salpinctes obsoletus*), Double-crested Cormorant, and Common Raven. All but the Double-crested Cormorant were relatively abundant in all seasons as year-round residents at the site. Double-crested Cormorants were only observed in SBC surveys during the Spring migratory season, and although 160 individuals were observed, none flew within the SBC survey area or spent any time flying within the RSZ. Though Rock Wrens were often detected within the survey area, this species spent relatively little time flying within the RSZ, as they were often foraging on the ground, and thus have a low level of risk of collision with turbine rotors. The species that spent the greatest amount of time flying within the Rotor Swept Zone included the Common Raven, House Finch, and to a lesser extent, Vaux's Swift (*Chaetura vauxi*), White-crowned Sparrow (*Zonotrichia leucophrys*), and Violet-green Swallow (*Tachycineta thalassina*).

Table 7. SBC Survey Species Abundance and Use

The following table lists all avian species detected by BBI biologists during each season of 2012-2013 SBC Surveys. Sensitive status for each species is indicated according to the following acronyms: Federally Threatened (FT) or Endangered (FE), California Threatened (CT) or Endangered (CE), California Fully Protected (CFP), and California Species of Special Concern (SSC). A single species may have multiple sensitive status designations. Sensitive status may pertain only to a subspecies or genetically distinct population of the species, but is included only if the sensitive population has the potential to occur on the Project Site. Measures of abundance and use provided for each species include the following: (1) total number of individual observations at all distances (i.e., inside and outside of the 100m Survey Area; Total Observations), (2) the average number of individuals observed within the survey area per 10-minute count (Observations/Count), (3) the average number of minutes individuals spent flying within the Survey Area and within the Rotor-Swept Zone (RSZ, i.e., less than 200m above ground level) per 10-minute count (RSZ Minutes/Count). SBC Survey abundance and use rates are not standardized by survey area size (as BUC Survey results are), because the survey area was equal among all SBC counts (110-yard [100 meter] radius survey area).

	Sensitive	Total Observations				Observations/count				RSZ Minutes/count			
Common Name	**Status**	**F**	**W**	**SP**	**S**	**F**	**W**	**SP**	**S**	**F**	**W**	**SP**	**S**
California Quail	SSC	0	0	2	0	-	-	-	-	-	-	-	-
Unidentified Quail		7	0	0	0	-	-	-	-	-	-	-	-
Chukar		0	0	5	0	-	-	-	-	-	-	-	-
Double-crested Cormorant		0	0	160	0	-	-	-	-	-	-	-	-
Osprey		1	0	0	0	-	-	-	-	-	-	-	-
Northern Harrier	SSC	1	0	0	0	-	-	-	-	-	-	-	-
Sharp-shinned Hawk		0	0	0	1	-	-	-	-	-	-	-	-
Cooper's Hawk		0	1	0	0	-	0.026	-	-	-	0.026	-	-
Red-tailed Hawk		7	1	2	0	0.013	-	-	-	0.013	-	-	-
Golden Eagle	CFP	0	0	1	0	-	-	0.013	-	-	-	0.013	-
Mourning Dove		3	0	0	1	0.038	-	-	-	-	-	-	-
Greater Roadrunner		1	0	0	0	-	-	-	-	-	-	-	-
Vaux's Swift	SSC	14	0	0	0	0.090	-	-	-	0.308	-	-	-
White-throated Swift		1	0	16	3	-	-	0.026	-	-	-	0.026	-
Black-chinned Hummingbird		0	0	2	0	-	-	0.026	-	-	-	0.026	-
Unidentified Hummingbird		1	0	2	2	0.013	-	0.026	0.051	-	-	0.026	0.051
American Kestrel		2	0	3	0	0.013	-	0.038	-	0.026	-	0.026	-
Prairie Falcon		0	0	1	0	-	-	-	-	-	-	-	-
Say's Phoebe		1	1	1	1	-	0.026	-	0.026	-	0.256	-	0.026
Western Kingbird		0	0	5	0	-	-	0.064	-	-	-	0.064	-
Loggerhead Shrike	FE SSC	4	0	2	9	0.013	-	-	0.103	-	-	-	0.103
Common Raven		22	19	53	27	0.051	0.077	0.462	0.154	0.141	0.051	0.923	0.154
Horned Lark		3	4	5	2	-	0.026	0.051	0.026	-	0.026	0.064	0.026
Tree Swallow		0	0	3	0	-	-	-	-	-	-	-	-
Violet-green Swallow		0	0	8	0	-	-	0.103	-	-	-	0.205	-

Common Name	Sensitive Status	Total Observations				Observations/count				RSZ Minutes/count			
		F	W	SP	S	F	W	SP	S	F	W	SP	S
Verdin		3	0	0	0	0.013	-	-	-	-	-	-	-
Rock Wren		58	29	72	20	0.346	0.282	0.321	0.154	-	-	0.090	0.026
Bewick's Wren	SSC	21	11	3	0	0.205	0.256	0.013	-	-	-	-	-
Cactus Wren	SSC	4	3	11	7	-	-	-	-	-	-	-	-
Blue-gray Gnatcatcher		9	0	2	0	0.115	-	0.026	-	-	-	0.013	-
Western Bluebird		0	7	0	0	-	-	-	-	-	-	-	-
Northern Mockingbird		0	0	14	8	-	-	0.051	0.026	-	-	0.051	0.026
European Starling		2	0	0	0	-	-	-	-	-	-	-	-
Phainopepla		0	0	1	0	-	-	0.013	-	-	-	0.013	-
Yellow-rumped Warbler		13	1	22	0	0.103	0.026	0.231	-	-	0.026	0.064	-
Wilson's Warbler		0	0	1	0	-	-	0.013	-	-	-	0.013	-
Unidentified Warbler		1	0	0	0	0.013	-	-	-	-	-	-	-
California Towhee	FT CE	5	6	37	5	0.026	-	0.205	0.051	-	-	0.077	-
Lark Sparrow		0	0	18	2	-	-	0.179	0.051	-	-	0.090	-
Black-throated Sparrow		1	2	12	4	0.013	0.051	0.115	0.051	-	0.051	0.026	-
White-crowned Sparrow		15	20	15	0	0.141	0.487	0.128	-	-	0.231	0.064	-
Lazuli Bunting		0	0	0	1	-	-	-	0.026	-	-	-	-
Red-winged Blackbird	SSC	1	0	0	0	0.013	-	-	-	0.013	-	-	-
Western Meadowlark		1	6	54	7	-	0.051	0.115	-	-	-	0.038	-
House Finch		67	23	67	33	0.372	0.282	0.487	0.308	0.192	0.282	0.423	0.256
Pine Siskin		7	0	0	1	0.038	-	-	0.026	0.038	-	-	0.026
Lesser Goldfinch		21	0	6	3	0.077	-	0.064	0.026	0.026	-	0.064	0.026
Lawrence's Goldfinch		5	0	0	2	0.051	-	-	0.051	0.038	-	-	0.051

Avian abundance and use varied among the 13 SBC stations and across seasons (Table 8). Use of the RSZ by birds (RSZ min./count column) was notably higher at four stations (SBCs 7, 8, 10 and 11), which averaged more than 2 bird flight minutes within the RSZ per count in at least one of the four seasons, compared to the remaining 9 stations at which avian use of the RSZ never exceeded 2 minutes of flight per count. The peak abundance and use periods for these stations tended to be in the Spring and Fall seasons, with SBC stations 7 and 10 showing the highest levels of activity during the Winter Season. Activity at SBC stations 10 and 11 was highest during the Spring migratory season compared to other seasons. These stations are located near the northeastern end of the Project Site along a ridgeline adjacent to Whitewater Canyon, and within BUC Survey Area 2, which also had notably high levels of avian flight activity for nonfocal species during the Spring season (see Section 5.1.2). Activity tended to be lower at SBC stations 1 through 5, situated on the western section of the Project Site, compared to those on the eastern section.

Table 8. Variation among SBC Stations in Avian Abundance and Use

The following table lists the 13 SBC point count stations at which BBI biologists conducted surveys during 2012-2013. Measures of abundance and use for all species observed are provided for each station and season (F=Fall, W=Winter, SP=Spring, S=Summer), and include the following (for all species combined): (1) total number of individual observations at all distances (i.e., inside and outside of the 100m Survey Area; Total Observations), (2) the average number of individuals observed within the survey area per 10-minute count (Observations/Count), (3) the average number of minutes individuals spent flying within the Survey Area and within the Rotor-Swept Zone (RSZ, i.e., less than 200m above ground level) per 10-minute count (RSZ Minutes/Count). SBC Survey abundance and use rates are not standardized by survey area size (as BUC Survey results are), because the survey area was equal among all SBC counts (100 meter radius survey area).

	Total Observations				Observations/count				RSZ Minutes/count			
Station	F	W	SP	S	F	W	SP	S	F	W	SP	S
1	26	10	41	11	2.167	0.667	1.833	0.333	1.333	-	1.000	0.333
2	18	4	178	8	1.500	1.000	0.333	1.000	0.333	-	-	0.667
3	16	9	32	15	0.667	1.000	2.333	2.000	-	1.000	1.167	1.000
4	20	9	26	10	2.167	1.667	1.833	0.667	-	1.333	1.500	0.333
5	12	3	42	6	1.500	1.000	3.833	0.667	-	0.333	0.667	0.333
6	22	14	25	15	1.167	1.667	2.500	2.333	0.667	1.000	1.667	1.333
7	24	16	17	3	1.500	1.333	0.833	0.333	-	4.333	0.667	-
8	4	12	28	13	0.333	3.000	3.000	2.000	-	1.667	2.667	1.333
9	25	5	30	7	3.000	1.000	2.333	0.333	1.167	-	0.833	0.333
10	26	23	51	12	2.333	3.667	5.000	-	0.667	2.000	10.000	-
11	65	23	68	21	3.500	2.000	6.500	2.667	4.500	0.333	7.833	2.333
12	22	8	34	11	1.333	0.333	3.000	1.333	0.667	-	1.333	1.000
13	22	10	36	7	1.667	2.333	2.833	1.000	1.000	0.333	1.833	1.000

5.3 Special Status Species Survey Results

During Special Status Species (SSS) surveys all vertebrates, nests, and notable habitat features (e.g., caves, water sources) were noted while walking meandering transects within the SSS Survey Area (see Exhibit 3). The goal of SSS surveys was to increase the probability of detecting sensitive species on the Project Site by surveying areas not covered by standardized BUC and SBC surveys. SSS surveys are not designed to provide the level of quantitative data provided by stationary surveys with fixed survey areas (e.g., BUC, SBC surveys). The results from SSS surveys are presented below in Table 9, where separate rows are listed for vertebrate species, bird nests, and habitat features recorded. The total number of observations during each season is presented, as well as a standardized measure of the number of observations per kilometer of transect surveyed. Because detections were recorded at all distances, the number of observations per transect kilometer should be interpreted only as a coarse measure of relative abundance. These values cannot be compared directly with standardized measures of abundance from BUC or SBC surveys, but they do provide relative measures of abundance across seasons.

A total of 52 SSS survey transects were completed between September, 2012 and August, 2013, for a total of 58.7 survey hours. The mean transect length was 1.22 miles (1.97 kilometers) and ranged from 0.06 mile (0.01 kilometer) to 2.5 miles (4.1 kilometers). Survey transects were not repeated, but instead were changed among seasons to adapt to cover areas with habitat suitable for sensitive species likely to occur on the Project Site during a given season. Nonetheless, a concerted effort was made to cover as much of the SSS Survey Area during each season as possible.

During SSS surveys, 35 bird species, 5 mammal species and 6 reptile species were observed. No sensitive status bird species were detected that were not also detected during BUC or SBC surveys, and no sensitive status mammals, or reptiles were observed. Amphibians were not detected on the Project Site during any survey type, including SSS surveys. Sensitive status for all species observed during SSS Surveys is indicated in Table 9.

Among bird species detected during SSS surveys, the most frequently detected included the White-crowned Sparrow, Rock Wren and House Finch. White-crowned Sparrows, which do not breed on the Project Site, were detected in all seasons except for the Summer. The most frequently detected sensitive bird species during SSS surveys was the Loggerhead Shrike (*Lanius ludovicianus*), which was observed a total of nine times, with detections in all seasons except for the Spring. Loggerhead Shrikes were also observed least frequently during the Spring season in BUC and SBC surveys. This trough in activity may be due to the onset of the breeding season for this species in February to March, and the possibility that they are either more difficult to detect while nesting, or they nest elsewhere than on the Project Site.

Relative abundances of small mammals and reptiles among seasons may impact use of the Project Site by raptors which prey upon them. Both Black-tailed Jackrabbits (*Lepus californicus*) and Desert Cottontails (*Sylvilagus audubonii*; i.e., "lagomorphs"), as well as California Ground Squirrels (*Spermophilus beecheyi*) and White-tailed Antelope Squirrels (*Ammospermophilus leucurus*; i.e., "sciurids"), were present on the site but in relatively low abundances. Based on the limited numbers of detections, the relative abundances (Observations/km) for sciurids tended to be lowest during the Fall and higher during the other seasons, while lagomorphs did not show a strong pattern, but collectively were most frequently detected during the Fall and Summer months.

Table 9. Special Status Species Survey Detections by Season

The following table lists all species of birds, mammals, reptiles and amphibians, as well as other features such as burrows, caves, water sources and bird nests that were detected by BBI biologists conducting Special Status Species Surveys during 2012-2013. Sensitive status for each species is indicated according to the following acronyms: Federally Threatened (FT) or Endangered (FE), California Threatened (CT) or Endangered (CE), California Fully Protected (CFP), and California Species of Special Concern (SSC). A single species may have multiple sensitive status designations. Sensitive status may pertain only to a subspecies or genetically distinct population of the species, but is included only if the sensitive population has the potential to occur on the Project Site. Measures of abundance for all species and types of observations are provided for each season (F=Fall, W=Winter, SP=Spring, S=Summer), and include the following (for all species combined): (1) total number of individual observations at all distances (Total Observations) and (2) the average number of individuals observed per kilometer (0.6 mile) of transect surveyed.

Observation Type	Common Name	Sensitive Status	Total Observations				Observations/km			
			F	W	SP	S	F	W	SP	S
Bird	California Quail		4	12	1	10	0.128	0.603	0.070	0.269
Bird	Unidentified Quail		1	0	0	0	0.032	-	-	-
Bird	Cooper's Hawk		1	0	0	0	0.032	-	-	-
Bird	Red-tailed Hawk		2	3	4	5	0.064	0.151	0.282	0.134
Bird	Golden Eagle	CFP	0	1	0	0	-	0.050	-	-
Bird	Mourning Dove		1	0	0	1	0.032	-	-	0.027
Bird	Greater Roadrunner		1	2	0	2	0.032	0.100	-	0.054
Bird	White-throated Swift		0	0	0	1	-	-	-	0.027
Bird	Anna's Hummingbird		0	1	0	0	-	0.050	-	-
Bird	Costa's Hummingbird		0	1	2	2	-	0.050	0.141	0.054
Bird	Unidentified Hummingbird		0	0	1	4	-	-	0.070	0.107
Bird	Ladder-backed Woodpecker		1	2	0	0	0.032	0.100	-	-

Observation Type	Common Name	Sensitive Status	Total Observations				Observations/km			
			F	W	SP	S	F	W	SP	S
Bird	American Kestrel		0	3	0	1	-	0.151	-	0.027
Bird	Unidentified Empidonax Flycatcher		0	0	0	1	-	-	-	0.027
Bird	Say's Phoebe		0	0	2	0	-	-	0.141	-
Bird	Ash-throated Flycatcher		0	0	0	2	-	-	-	0.054
Bird	Loggerhead Shrike	SSC	4	2	0	3	0.128	0.100	-	0.081
Bird	Common Raven		17	5	5	13	0.546	0.251	0.352	0.349
Bird	Horned Lark		0	1	0	0	-	0.050	-	-
Bird	Verdin		9	6	0	0	0.289	0.301	-	-
Bird	Bushtit		18	0	0	0	0.578	-	-	-
Bird	Rock Wren		42	20	27	27	1.348	1.005	1.903	0.725
Bird	Bewick's Wren		16	9	5	4	0.514	0.452	0.352	0.107
Bird	Cactus Wren		2	4	2	6	0.064	0.201	0.141	0.161
Bird	Blue-gray Gnatcatcher		3	0	2	3	0.096	-	0.141	0.081
Bird	Ruby-crowned Kinglet		6	3	1	0	0.193	0.151	0.070	-
Bird	Northern Mockingbird		0	0	0	2	-	-	-	0.054
Bird	California Thrasher		1	2	1	2	0.032	0.100	0.070	0.054
Bird	Phainopepla		0	0	4	0	-	-	0.282	-
Bird	Rufous-crowned Sparrow		0	1	0	0	-	0.050	-	-
Bird	California Towhee		9	6	5	10	0.289	0.301	0.352	0.269
Bird	Brewer's Sparrow		0	0	2	0	-	-	0.141	-
Bird	Lark Sparrow		0	0	2	0	-	-	0.141	-
Bird	Black-throated Sparrow		2	1	2	2	0.064	0.050	0.141	0.054
Bird	White-crowned Sparrow		101	92	95	0	3.242	4.621	6.695	-
Bird	Western Meadowlark		0	7	19	0	-	0.352	1.339	-
Bird	House Finch		26	14	30	10	0.835	0.703	2.114	0.269
Bird	Lesser Goldfinch		2	1	0	3	0.064	0.050	-	0.081
Burrow	Unidentified Mammal		0	0	0	4	-	-	-	0.107
Burrow	Unidentified Species		5	0	1	0	0.161	-	0.070	-
Carcass	American White Pelican	SSC	1	0	0	0	0.032	-	-	-
Cave	Land Feature		0	0	0	1	-	-	-	0.027
Mammal	Bighorn Sheep		6	0	0	1	0.193	-	-	0.027
Mammal	Black-tailed Jackrabbit		3	0	0	6	0.096	-	-	0.161
Mammal	California Ground Squirrel		0	3	2	2	-	0.151	0.141	0.054
Mammal	Desert Cottontail		1	1	2	2	0.032	0.050	0.141	0.054
Mammal	White-tailed Antelope Squirrel		0	0	1	1	-	-	0.070	0.027
Midden	Woodrat sp.		2	0	0	20	0.064	-	-	0.537
Nest	Mourning Dove		0	0	0	1	-	-	-	0.027
Nest	Loggerhead Shrike	SSC	0	0	0	1	-	-	-	0.027
Nest	Cactus Wren		0	0	1	7	-	-	0.070	0.188
Nest	California Towhee		0	0	1	0	-	-	0.070	-
Nest	Unidentified Bird		1	0	0	1	0.032	-	-	0.027
Reptile	Desert Spiny Lizard		0	0	1	1	-	-	0.070	0.027
Reptile	Speckled Rattlesnake		1	0	0	0	0.032	-	-	-
Reptile	Western Fence Lizard		1	0	1	2	0.032	-	0.070	0.054

Observation Type	Common Name	Sensitive Status	Total Observations				Observations/km			
			F	W	SP	S	F	W	SP	S
Reptile	Western Side-blotched Lizard		1	1	2	11	0.032	0.050	0.141	0.296
Reptile	Western Whiptail		1	0	0	10	0.032	-	-	0.269
Reptile	Unidentified Lizard		20	4	8	9	0.642	0.201	0.564	0.242
Reptile	Unidentified Skink		1	0	0	0	0.032	-	-	-
Scat	Coyote		2	0	0	0	0.064	-	-	-
Water Source	Land Feature		0	1	0	0	-	0.050	-	-

5.4 Eagle Use in the Project Area

5.4.1 Eagle Flight Path Analysis

Quantitative data from BUC surveys utilize the observed flight minutes within a well-defined area (Survey Area) over a well-defined period of time to provide accurate data on the *rate* of eagle use (minutes of flight per unit of survey effort). However, during surveys many observations occurred outside of Survey Areas and were not quantified at the same level, even if they were inside of the project footprint or in a different Survey Area that was not actively being surveyed at the time the observation was made. The flight path analysis is intended to make use of all Golden Eagle observations, regardless of where they occurred, to produce an overview of relative levels of eagle use on the Project Footprint and surrounding areas. This approach produces a result similar to the method referred to as a Utilization Distribution study in the ECP Guidelines.

A total of 194 unique Golden Eagle flights were document over the course of the full year of surveys, with many detections occurring well beyond the Project Boundary and at distances of greater than 1.2 miles (2 kilometers) from the observer's location. Some individuals were observed simultaneously by both biologists surveying from separate BUC O.P.s, and in those cases the observations were combined into one flight path before analysis. Exhibit 4 displays the entire observed flight path for all Golden Eagles observed between September, 2012 and August, 2013. Each flight path is color-coded to reflect the bird's estimated height (above ground level) across the entire observed flight path, with blue representing sections of flight above the RSZ, red representing sections of flights within the RSZ, and black representing sections of flight for which height could not be determined. Note that during the Fall season the RSZ was defined differently that during the Winter, Spring and Summer seasons, as discussed in Methods, Section 4.1.2.

From Exhibit 5 it can clearly be seen that the bulk of Golden Eagle activity occurred to the north and west of the Project Site, with two main areas of concentration, approximately 1.2 miles (2 Kilometers) and 2.8 miles (4.5 Kilometers) west of BUC O.P. #2, respectively. From these locations, birds made occasional forays to the south and east over the Project Site, resulting in the majority of observations during BUC surveys, and in some cases continued on to the Coachella Valley or Whitewater Canyon.

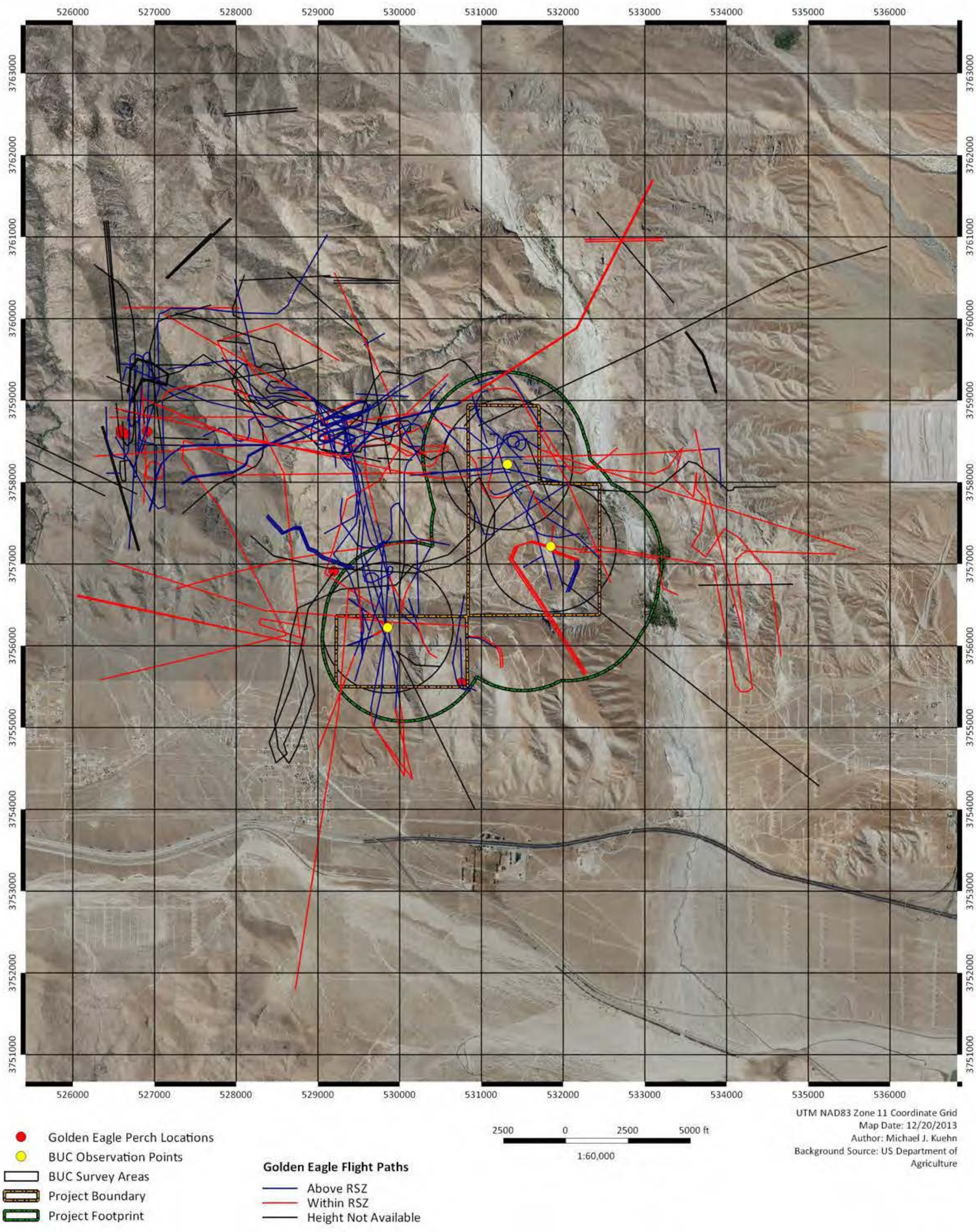


EXHIBIT 4. Golden Eagle Flight Paths Observed From the Project Site
Mesa Wind Project | Riverside County, California

BBI

5.4.2 Bayesian Model Fatality Prediction Estimates

In this section the focus is turned to the subset of Golden Eagle observations in which flight minutes were logged inside of Survey Areas that were actively being surveyed. Observations that occurred outside of these areas are omitted from this analysis because a well-defined level of survey effort, in combination with observed use levels, is required to generate accurate estimates of the *rate* at which Golden Eagles use the Project Footprint (exposure rate), which represents the number of minutes of eagle flight observed within the RSZ per unit of survey effort and is a key input variable for the Bayesian Model.

Over the course of the full year, a total of 37 Golden Eagles was detected while flying within one of the Survey Areas under active surveillance by BBI biologists, for a total of 75 minutes of flight within the RSZ. These detections are summarized below in Table 10, and totals are shown for each Survey Area and for each season. In addition, the level of survey effort for each Survey Area is shown, as well as the number of minutes eagles were observed flying within the RSZ, and these were used to generate estimates of the eagle exposure rate (Eagle Min/hr*km^2) for each Season and Survey Area, as well as for the complete year overall. The exposure rate is displayed here because it provides a standardized value, controlling for differences in the level of survey effort among Survey Areas and seasons, and thereby allows for more accurate interpretation of variation in use. A complete list of all 37 Golden Eagle flights within a Survey Area, and the details of each flight, is provided in Appendix B.

Eagle use of the Project Footprint was highest in the Fall season, with a total of 23 Golden Eagles observed to combine for 57 minutes of flight in the RSZ, and an overall exposure rate of 0.044 Eagle min/hr*km^2. Eagles were observed in all Survey Areas in the Fall season, and although the greatest number (9 eagles) was detected in Survey Area 2, the highest exposure rate occurred in Survey Area 3S, due to its smaller size. Although only one eagle was detected within an active Survey Area during winter surveys (in Survey Area 2), the level of survey effort during Winter was also lower, resulting in an overall exposure rate only marginally lower than the Fall season, at 0.033 Eagle min/hr*km^2. The exposure rate was lowest in the Spring season at 0.013 Eagle min/hr*km^2, and only slightly higher during the Summer season at 0.028 Eagle min/hr*km^2.

Table 10. Golden Eagle Flight Minutes Summary

*The following table displays eagle use data for the five Survey Areas across each season of BUC surveys conducted by BBI biologists between September, 2012 and August, 2013. Measures of eagle use are provided for each Survey Area and season (F=Fall, W=Winter, SP=Spring, S=Summer), as well as for the complete year, and include the following: (1) the number of individuals observed within an actively surveyed Survey Area (Observations), (2) total number of minutes observed flying within the Survey Area and below 600 feet (200 meters) in height (Eagle Minutes), (3) the total survey effort, calculated as the product of the total hours of observation and the size of the Survey Area (Survey Effort [hr*km^2]), (4) the eagle exposure rate, calculated by dividing the number of Eagle Minutes by the Survey Effort (Exposure Rate [Eagle min/hr*km^2]).*

Season	Survey Area #	Observations	Eagle Minutes	Survey Effort (hr*km^2)	Exposure Rate (Eagle min/hr*km^2)
Fall	1	7	24	724.6	0.033
Fall	2	9	20	303.5	0.066
Fall	3N	1	1	64.2	0.016
Fall	3S	4	10	91.5	0.109
Fall	4	2	2	100.7	0.020
Fall Avg.		23	57	1,284.5	0.044
Winter	1	0	0	24.0	0.000
Winter	2	1	2	19.8	0.101

Season	Survey Area #	Observations	Eagle Minutes	Survey Effort (hr*km^2)	Exposure Rate (Eagle min/hr*km^2)
Winter	3N	0	0	3.9	0.000
Winter	3S	0	0	6.1	0.000
Winter	4	0	0	6.4	0.000
Winter Avg.		1	2	60.2	0.033
Spring	1	8	14	644.9	0.022
Spring	2	0	0	252.6	0.000
Spring	3N	0	0	49.7	0.000
Spring	3S	0	0	77.0	0.000
Spring	4	0	0	81.8	0.000
Spring Avg.		8	14	1,105.9	0.013
Summer	1	1	1	80.1	0.012
Summer	2	1	1	66.0	0.015
Summer	3N	3	0	12.9	0.000
Summer	3S	0	0	20.2	0.000
Summer	4	0	0	21.3	0.000
Summer Avg.		5	2	200.6	0.010
Full Year		37	75	2,651.2	0.028

Data collected during BUC surveys were applied in the USFWS Bayesian fatality prediction model (USFWS 2013) to generate estimates of the predicted number of annual eagle fatalities for a possible repowering effort at the Project Site. For this analysis, it was assumed that all existing turbines would be removed and replaced with 10, 3-MW Wind Turbine Generators (WTGs), each with a rotor diameter of 300 feet (90 meters). A list of project-specific model input variables, given this hypothetical repowering effort and the data collected during surveys, is presented in Table 11. Values for the variables Eagle Minutes and Trials (i.e., Survey Effort), which are used to generate the Exposure Rate, are taken directly from the lowest row (Full Year) in Table 10 above. Values for the Number of Turbines and Turbine Hazardous Radius are based on the hypothetical repowering effort including 10 turbines with rotor radii of 45 meters, or 0.045 kilometers (consistent with model guidelines, metrics are used in all model-specific variables). The Number of Turbines and Turbine Hazardous Radius are used together to calculate the Total Hazardous Area. Daylight Hours variable was calculated for the city of Palms Springs using sunrise and sunset data made available by the U.S. Navy (http://aa.usno.navy.mil/data/docs/RS_OneYear.php), and reflects the sum of daylight hours (hours between sunrise and sunset) for the year 2013 across each day of the year. The Expansion Factor was calculated as the product of Daylight Hours and Total Hazardous Area.

Table 11. Golden Eagle Fatality Model Parameters

The following table lists input variable for the Bayesian fatality prediction model developed by the USFWS and recommended for evaluating predicted fatalities at wind energy sites in the Eagle Conservation Plan Guidance (USFWS 2013). Each variable is accompanied by a brief definition and the Project-specific value used in the model discussed below. Some values are generated in the form of probability distributions rather than as specific values and are presented in graphical form elsewhere. The Bayesian model and input variables are discussed and described in greater detail in the Methods, Section 4.4.2).

Variable	Definition	Project Value
Eagle minutes	Number of minutes that eagles were observed flying below 200 m during survey counts	75 min.
Trials	Number of trials for which Eagle minutes could have been observed (hr*km2 observed during surveys)	2651.2 hr*km^2
Exposure rate	Eagle minutes per trial (minutes/hr*km^2)	see text, *Posterior Distribution of Exposure Rate*
Collision probability	The probability of an eagle colliding with a turbine given exposure to a hazardous area	see text, *Prior Distribution of Collision Probability*
Number of turbines	Number of turbines (or proposed turbines) for the project	10
Turbine hazardous radius	one-half of the rotor diameter (i.e., length of rotor blade, in km)	0.045 km
Daylight hours	Total daylight hours per year at Palm Springs, CA (i.e. hours between sunrise and sunset)	4444 hr
Total hazardous area	Number of turbines X (π X Turbine hazardous radius^2), in km^2	0.0636 km^2
Expansion factor	Product of Daylight hours and Total hazardous area (hr*km2)	282.71 hr*km^2

The initial step in modeling the predicted number of annual eagle fatalities for the proposed Project is to generate a probability distribution for the Exposure Rate. The observed Exposure Rate of 0.028 Eagle min/hr*km^2 for the full year (Table 10) is only an estimate and is based on sampling. The true value is likely near this estimate, but could be slightly greater or slightly less, depending on the level of confidence in the estimate. The model combines this estimate with a composite of estimates from earlier studies known as the Prior Distribution of the Exposure Rate (Figure 2). The resulting output from combining these entities is the Posterior Distribution of the Exposure Rate, which is displayed in Figure 3 and is assumed to be representative of the range of Exposure Rates that might be observed on the Project Site, given sampling error and uncertainty in the estimate drawn from BUC surveys. From Figure 3, it can be seen that the Posterior Distribution of the Exposure Rate was not strongly influenced by the Prior, and that the mean Exposure Rate (0.029 Eagle min/hr*km^2, Std. Dev. = 0.057) is similar to the observed estimate of 0.028 Eagle min/hr*km^2 from survey data. The narrow width of the curve indicates that the vast majority of Exposure Rate estimates in this probability distribution occur between 0.02 and 0.04 Eagle min/hr*km^2, with the highest probability of obtaining values very near the mean.

Figure 2. Prior Distribution of the Exposure Rate

*Prior distribution of the Exposure Rate (Eagle Minutes per hour*km² of survey effort) based on USFWS data from numerous studies, with mean of 0.352 (vertical black line), and a standard deviation of 0.357. The distribution is positively skewed such that the highest-probability values are near 0.0, with an increasingly lower probability of obtaining higher values.*

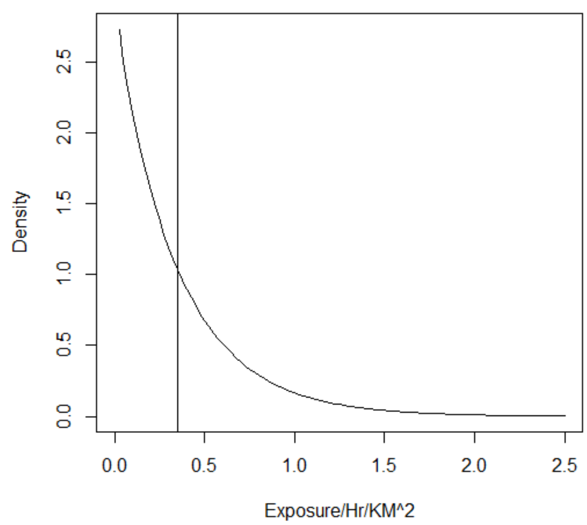
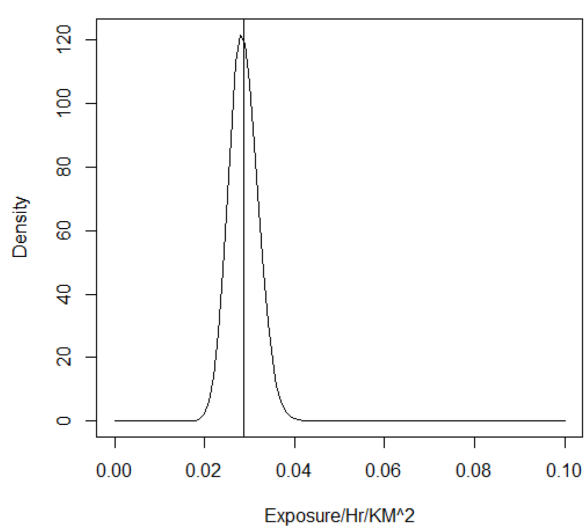


Figure 3. Posterior Distribution of the Exposure Rate

*Posterior distribution of the Exposure Rate derived after combining Project-specific data with the Prior Distribution of the Exposure Rate (Figure 2). The new distribution has a mean of 0.029 (black vertical line) and standard deviation of 0.057. The distribution is narrow, with the vast majority of values occurring at or near the Project-specific observed mean (0.028 hr*km²) based on BUC survey data.*



The next step in modeling the predicted annual eagle fatality rate for the proposed project is to apply the Posterior Distribution of the Exposure Rate (Figure 3) to the Collision Probability, generating a site-specific estimate of Collision Risk, which is a rate that represents the number of collisions per hr*km^2 of exposure in a hazardous area. The Prior Distribution of the Collision Probability (Figure 4) is taken directly from the ECP Guidance (USFWS 2013) and is based on estimates of collision rates from four studies at other wind energy projects that evaluated turbine avoidance by eagles (Whitfield 2009). Because no data were available from the Project Site to update the Prior Distribution of the Collision Probability (i.e., eagle avoidance was not assessed in BUC surveys), the Posterior Distribution of the Exposure Rate was applied to the Prior Distribution of the Collision Rate to generate an estimate of Collision Risk. In the same step, the model applies the resulting Collision Rate to the Expansion Factor, which represents the actual Project-specific amount of hazardous area (Total Hazardous Area) and hours of exposure over the course of one year (Daylight Hours), to generate the final model output; the Probability Distribution of Predicted Annual Fatalities (Figure 5).

Based on the model output, the mean estimated fatality rate for the proposed repowering project is 0.047 fatalities per year. The ECP Guidelines recommend using fatality estimates based on the 80% credible intervals from the model output. This estimate accounts for variation due to sampling error and yields a more risk-averse estimate of the fatality rate. The estimate generated by the 80% credible interval is 0.069 eagle fatalities per year, and is displayed in Figure 5 as a vertical red line. Overall, the model output suggests that one eagle fatality is likely to occur on the proposed repowered Project Site about every 14 years, or alternatively, that the probability of an eagle fatality occurring over a 5-year permit period is 34.5% (0.069 fatality/yr X 5 years).

Estimates generated from modeling analyses such as the one presented above depend heavily on the quality of data collected and used as input for the analysis. The survey effort and design used for this study and analysis were developed in consultation with the client and USFWS personnel, and met or exceeded the minimum requirements according to the ECP Guidance in nearly all regards. One source of potential error in the fatality estimate is related to the methods used during Fall surveys, when the height of the RSZ was defined differently than it was during other seasons. As described in Methods, Section 4.1.2, the height range of the RSZ was changed after the completion of Fall, 2012 BUC surveys, from being narrowly defined as between 115-450 feet (35-135 meters) to being defined as from 0-600 feet (0-200 meters), as recommended in the ECP Guidance. As a result, the actual number of Eagle Minutes, or time spent flying while in the height range recommended in the ECP Guidance-recommended RSZ (0-600 feet [0-200 meters]) may have been underestimated during Fall BUC surveys. Although biologists in the Fall did not record the number of minutes spent flying within this recommended range, they did record the minimum and maximum heights at which eagles flew while within the Survey Area, which allowed each observation to be categorized (no, possibly, definitely) according to the possibility that the number of Eagle Minutes was underestimated. All eagle detections that occurred within an actively surveyed Survey Area over the course of the full year of surveys are listed in Appendix B. For those that occurred during the Fall season, the final column lists the level of certainty that the number of Eagle Minutes was underestimated. Of the 23 eagle detections within a Survey Area during Fall, 2012, only one was classified as “definitely” having been underestimated, while eight were classified as “no” the number of minutes could not have been underestimated. This leaves 14 additional observations for which it was “possible” that the number of minutes were underestimated, though it could not be determined for certain.

An underestimation of the number of Eagle Minutes in the model would clearly result in an underestimation of the predicted fatality rate. However, because the existing information covers the most dangerous portion of the Guidance-recommended RSZ, the portion where rotors would actually be turning under the proposed repowering project, the existing estimate is believed to be reasonably accurate. Eagles that were observed generally moved laterally through Survey Areas and only rarely spent time circling within a Survey Area and then moving out of the RSZ by increasing their height above the cut-off point. Nonetheless, if the model is run in completion a second time, with the number of total eagle minutes increased from 75 to 100 (a very risk-averse increase given the available information), the resulting mean fatality estimate increases only to 0.062 fatalities per year, with the estimate from the 80% credible interval increasing to 0.092 fatalities per year, or approximately 1 eagle fatality every 10 years.

Figure 4. Prior Distribution of the Collision Rate

Prior Distribution of the Collision Probability, based on data from four studies on eagle avoidance of turbines (Whitfield 2009) and developed by the USFWS (USFWS 2012c). This distribution is skewed such that lower Collision Probabilities are more frequent than high Collision Probabilities, and has a mean of 0.0058 and a standard deviation of 0.0038. No field data were available from field studies on site to update this distribution and as such, no posterior distribution was generated.

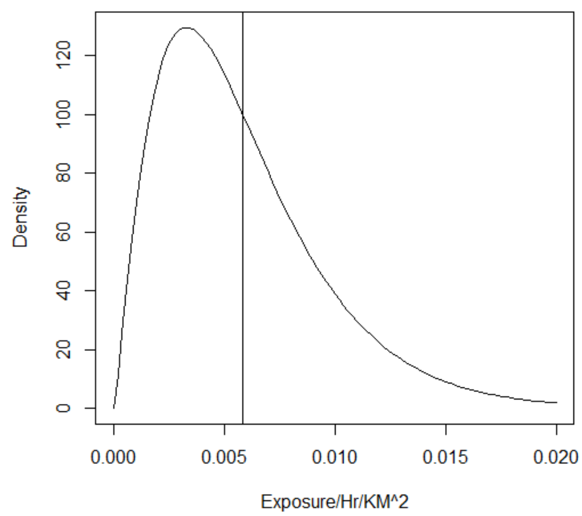
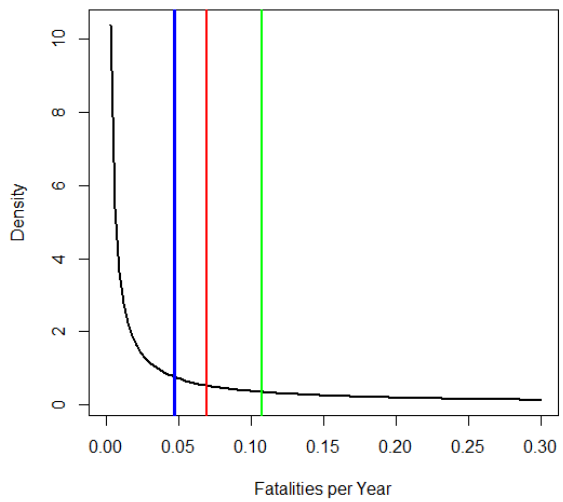


Figure 5. Probability Distribution of Predicted Annual Fatalities

This figure represents the probability distribution of the predicted annual number of fatalities at the Project Site, assuming a proposed repowering involving the replacement of all existing turbines with 10, 3-MW WTGs, each with a 300-foot (90-meter) rotor diameter. The distribution, represented by the black curve, has a mean of 0.047 fatality per year (blue vertical line), with estimates at 80% (red vertical line) and 95% (green vertical line) credible intervals of 0.069 and 0.107 fatality per year, respectively.



6.0 LITERATURE CITED

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APPENDIX A. SURVEY DATES, TIMES AND WEATHER CONDITIONS

Date	Survey Type	Time	Weather	Biologists
9/17/2012	BUC	0840-1640h	Start: 78° F, 0% cloud cover, Light Wind out of the W End: 89° F, 0% cloud cover, Light Wind out of the SW No rain; No fog; No snow	Elias Elias Karly Moore
9/18/2012	BUC	1050-1850h	Start: 89° F, 0% cloud cover, Breeze out of the SW End: 100° F, 0% cloud cover, Calm out of the W No rain; No fog; No snow	Elias Elias Karly Moore
9/19/2012	BUC	0840-1640h	Start: 80° F, 0% cloud cover, Calm out of the N End: 100° F, 0% cloud cover, Breeze out of the SE No rain; No fog; No snow	Elias Elias Karly Moore
9/20/2012	BUC	0630-1430h	Start: 83° F, 1-25% cloud cover, Calm out of the NW End: 102° F, 1-25% cloud cover, Light Wind out of the W No rain; No fog; No snow	Elias Elias
9/20/2012	BUC	0630-1430h	Start: 80° F, 1-25% cloud cover, Breeze out of the W End: 103° F, 1-25% cloud cover, Light Wind out of the W No rain; No fog; No snow	Karly Moore
9/24/2012	BUC	0840-1640h	Start: 79° F, 0% cloud cover, Strong Wind out of the W End: 86° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
9/24/2012	BUC	0840-1640h	Start: 81.3° F, 0% cloud cover, Strong Wind out of the SW End: 88.7° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
9/25/2012	BUC	0840-1640h	Start: 75° F, 0% cloud cover, Strong Wind out of the W End: 83° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
9/25/2012	BUC	0830-1630h	Start: 73° F, 0% cloud cover, Strong Wind out of the S End: 81° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
9/26/2012	BUC	1034-1834h	Start: 89° F, 0% cloud cover, Light Wind out of the E End: 82° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
9/26/2012	BUC	1030-1830h	Start: 82° F, 0% cloud cover, Breeze out of the SW End: 84° F, 0% cloud cover, Calm out of the N No rain; No fog; No snow	Karly Moore
9/27/2012	BUC	0630-1430h	Start: 77° F, 0% cloud cover, Light Wind out of the E End: 90° F, 1-25% cloud cover, Strong Wind out of the SE No rain; No fog; No snow	Elias Elias
9/27/2012	BUC	0630-1430h	Start: 78.3° F, 0% cloud cover, Breeze out of the N End: 86° F, 1-25% cloud cover, Strong Wind out of the SE No rain; No fog; No snow	Karly Moore
10/1/2012	BUC	0830-1630h	Start: 90° F, 0% cloud cover, Breeze out of the SE End: 96° F, 0% cloud cover, Breeze out of the E No rain; No fog; No snow	Elias Elias
10/1/2012	BUC	0835-1635h	Start: 86° F, 0% cloud cover, Calm out of the N End: 98° F, 0% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Karly Moore

Date	Survey Type	Time	Weather	Biologists
10/2/2012	BUC	0830-1630h	Start: 88° F, 0% cloud cover, Calm out of the W End: 99° F, 0% cloud cover, Breeze out of the W No rain; No fog; No snow	Elias Elias
10/2/2012	BUC	0835-1635h	Start: 90° F, 0% cloud cover, Calm out of the E End: 97° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
10/3/2012	BUC	1030-1830h	Start: 88° F, 1-25% cloud cover, Strong Wind out of the W End: 79° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
10/3/2012	BUC	1030-1830h	Start: 87° F, 1-25% cloud cover, Strong Wind out of the W End: 80° F, 51-75% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
10/4/2012	BUC	0645-1445h	Start: 74° F, 26-50% cloud cover, Strong Wind out of the W End: 82° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
10/4/2012	BUC	0645-1445h	Start: 70° F, 26-50% cloud cover, Strong Wind out of the W End: 81° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
10/8/2012	BUC	0830-1630h	Start: 69° F, 0% cloud cover, Strong Wind out of the W End: 77° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
10/8/2012	BUC	0830-1630h	Start: 70° F, 0% cloud cover, Strong Wind out of the W End: 79° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
10/9/2012	BUC	0830-1630h	Start: 60° F, 0% cloud cover, Breeze out of the W End: 76° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
10/9/2012	BUC	0830-1630h	Start: 60° F, 0% cloud cover, Strong Wind out of the S End: 74° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
10/10/2012	BUC	0650-1450h	Start: 55° F, 26-50% cloud cover, Strong Wind out of the W End: 69° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
10/10/2012	BUC	0650-1450h	Start: 56° F, 1-25% cloud cover, Strong Wind out of the W End: 71° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
10/11/2012	BUC	1015-1815h	Start: 58° F, 26-50% cloud cover, Strong Wind out of the W End: 57° F, 1-25% cloud cover, Strong Wind out of the W Light rain; No fog; No snow	Elias Elias
10/11/2012	BUC	1015-1815h	Start: 57° F, 26-50% cloud cover, Strong Wind out of the W End: 55° F, 0% cloud cover, Strong Wind out of the W Light rain; No fog; No snow	Karly Moore
10/15/2012	BUC	0900-1630h	Start: 80° F, 0% cloud cover, Breeze out of the E End: 85° F, 0% cloud cover, Breeze out of the SE No rain; No fog; No snow	Elias Elias
10/15/2012	BUC	0830-1630h	Start: 78° F, 0% cloud cover, Breeze out of the SE End: 86° F, 0% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Karly Moore

Date	Survey Type	Time	Weather	Biologists
10/16/2012	BUC	0830-1630h	Start: 80° F, 0% cloud cover, Breeze out of the E End: 85° F, 0% cloud cover, Breeze out of the SE No rain; No fog; No snow	Elias Elias
10/16/2012	BUC	0842-1642h	Start: 82° F, 0% cloud cover, Light Wind out of the SE End: 87° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Karly Moore
10/17/2012	BUC	1015-1815h	Start: 85° F, 0% cloud cover, Breeze out of the E End: 75° F, 1-25% cloud cover, Breeze out of the E No rain; No fog; No snow	Elias Elias
10/17/2012	BUC	1010-1810h	Start: 83° F, 0% cloud cover, Light Wind out of the E End: 78° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Karly Moore
10/18/2012	BUC	0655-1455h	Start: 72° F, 1-25% cloud cover, Breeze out of the E End: 85° F, 26-50% cloud cover, Light Wind out of the W No rain; No fog; No snow	Elias Elias
10/18/2012	BUC	0653-1453h	Start: 72° F, 0% cloud cover, Light Wind out of the NE End: 85° F, 26-50% cloud cover, Light Wind out of the W No rain; No fog; No snow	Karly Moore
10/22/2012	BUC	0830-1630h	Start: 56° F, 1-25% cloud cover, Strong Wind out of the W End: 65° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
10/22/2012	BUC	0830-1630h	Start: 57° F, 0% cloud cover, Strong Wind out of the SW End: 68° F, 1-25% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
10/23/2012	BUC	0830-1630h	Start: 62° F, 1-25% cloud cover, Strong Wind out of the W End: 63° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
10/23/2012	BUC	0830-1630h	Start: 56° F, 0% cloud cover, Strong Wind out of the SW End: 63° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
10/24/2012	BUC	1000-1800h	Start: 65° F, 0% cloud cover, Light Wind out of the W End: 61° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
10/24/2012	BUC	1001-1602h	Start: 56° F, 0% cloud cover, Strong Wind out of the SW End: 62° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
10/25/2012	BUC	0700-1500h	Start: 60° F, 1-25% cloud cover, Calm out of the N End: 75° F, 0% cloud cover, Breeze out of the E No rain; No fog; No snow	Elias Elias
10/25/2012	BUC	0659-1459h	Start: 58° F, 0% cloud cover, Breeze out of the NW End: 73° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Karly Moore
10/29/2012	BUC	0830-1630h	Start: 74° F, 0% cloud cover, Breeze out of the W End: 79° F, 0% cloud cover, Breeze out of the SE No rain; No fog; No snow	Elias Elias
10/29/2012	BUC	0830-1630h	Start: 74° F, 0% cloud cover, Calm out of the N End: 79° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Karly Moore

Date	Survey Type	Time	Weather	Biologists
10/30/2012	BUC	0830-1630h	Start: 75° F, 0% cloud cover, Calm out of the W End: 80° F, 0% cloud cover, Breeze out of the E No rain; No fog; No snow	Elias Elias
10/30/2012	BUC	0830-1630h	Start: 76° F, 0% cloud cover, Breeze out of the E End: 76° F, 0% cloud cover, Breeze out of the S No rain; No fog; No snow	Karly Moore
10/31/2012	BUC	1000-1800h	Start: 77° F, 0% cloud cover, Breeze out of the W End: 74° F, 26-50% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
10/31/2012	BUC	0954-1754h	Start: 75° F, 0% cloud cover, Breeze out of the S End: 73° F, 1-25% cloud cover, Light Wind out of the SW No rain; No fog; No snow	Karly Moore
11/1/2012	BUC	0700-1500h	Start: 65° F, 51-75% cloud cover, Light Wind out of the W End: 76° F, 26-50% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
11/1/2012	BUC	0705-1505h	Start: 64° F, 0% cloud cover, Light Wind out of the S End: 75° F, 26-50% cloud cover, Light Wind out of the SW No rain; No fog; No snow	Karly Moore
11/5/2012	BUC	0730-1530h	Start: 76° F, 0% cloud cover, Breeze out of the E End: 81° F, 0% cloud cover, Light Wind out of the NE No rain; No fog; No snow	Elias Elias
11/5/2012	BUC	0730-1430h	Start: 77° F, 0% cloud cover, Light Wind out of the E End: 84° F, 0% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Karly Moore
11/6/2012	BUC	0730-1530h	Start: 77° F, 0% cloud cover, Breeze out of the NE End: 86° F, 0% cloud cover, Breeze out of the SE No rain; No fog; No snow	Elias Elias
11/6/2012	BUC	0730-1530h	Start: 77° F, 0% cloud cover, Breeze out of the E End: 83° F, 0% cloud cover, Breeze out of the SE No rain; No fog; No snow	Karly Moore
11/7/2012	BUC	0845-1645h	Start: 76° F, 1-25% cloud cover, Strong Wind out of the W End: 73° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
11/7/2012	BUC	0845-1645h	Start: 78° F, 0% cloud cover, Light Wind out of the SW End: 72° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
11/12/2012	BUC	0730-1530h	Start: 45° F, 0% cloud cover, Light Wind out of the NE End: 60° F, 0% cloud cover, Breeze out of the NE No rain; No fog; No snow	Elias Elias
11/12/2012	BUC	0730-1530h	Start: 50° F, 0% cloud cover, Light Wind out of the NE End: 62° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Karly Moore
11/13/2012	BUC	0730-1530h	Start: 61° F, 0% cloud cover, Light Wind out of the E End: 66° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
11/13/2012	BUC	0730-1530h	Start: 58° F, 0% cloud cover, Light Wind out of the N End: 64° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Karly Moore

Date	Survey Type	Time	Weather	Biologists
11/14/2012	BUC	0845-1645h	Start: 67° F, 76-99% cloud cover, Breeze out of the E End: 64° F, 76-99% cloud cover, Breeze out of the E No rain; No fog; No snow	Elias Elias
11/14/2012	BUC	0843-1543h	Start: 68° F, 100% cloud cover, Light Wind out of the E End: 64° F, 76-99% cloud cover, Light Wind out of the E No rain; No fog; No snow	Karly Moore
11/15/2012	BUC	0620-1420h	Start: 63° F, 100% cloud cover, Calm out of the E End: 68° F, 100% cloud cover, Light Wind out of the W No rain; No fog; No snow	Elias Elias
11/15/2012	BUC	0619-1419h	Start: 61° F, 100% cloud cover, Light Wind out of the SW End: 69° F, 100% cloud cover, Light Wind out of the SW No rain; No fog; No snow	Karly Moore
11/19/2012	BUC	0730-1530h	Start: 52° F, 0% cloud cover, Breeze out of the NW End: 65° F, 0% cloud cover, Breeze out of the SE No rain; No fog; No snow	Elias Elias
11/19/2012	BUC	0730-1530h	Start: 56° F, 0% cloud cover, Light Wind out of the SW End: 72° F, 0% cloud cover, Breeze out of the SW No rain; No fog; No snow	Karly Moore
11/20/2012	BUC	0730-1530h	Start: 62° F, 0% cloud cover, Breeze out of the E End: 68° F, 0% cloud cover, Breeze out of the E No rain; No fog; No snow	Elias Elias
11/20/2012	BUC	0730-1530h	Start: 63° F, 0% cloud cover, Light Wind out of the NE End: 66° F, 0% cloud cover, Breeze out of the E No rain; No fog; No snow	Karly Moore
11/21/2012	BUC	0840-1640h	Start: 62° F, 0% cloud cover, Breeze out of the W End: 64° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Elias Elias
11/21/2012	BUC	0840-1640h	Start: 64° F, 0% cloud cover, Breeze out of the SW End: 65° F, 0% cloud cover, Light Wind out of the SW No rain; No fog; No snow	Karly Moore
11/22/2012	BUC	0630-1430h	Start: 60° F, 0% cloud cover, Calm out of the N End: 75° F, 0% cloud cover, Breeze out of the N No rain; No fog; No snow	Elias Elias
11/22/2012	BUC	0627-1427h	Start: 60° F, 0% cloud cover, Calm out of the N End: 71° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Karly Moore
11/26/2012	BUC	0730-1530h	Start: 68° F, 0% cloud cover, Calm out of the N End: 69° F, 1-25% cloud cover, Calm out of the E No rain; No fog; No snow	Elias Elias
11/26/2012	BUC	0730-1530h	Start: 67° F, 0% cloud cover, Breeze out of the W End: 70° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Karly Moore
11/27/2012	BUC	0830-1630h	Start: 67° F, 76-99% cloud cover, Breeze out of the NE End: 68° F, 76-99% cloud cover, Breeze out of the NE No rain; No fog; No snow	Elias Elias
11/27/2012	BUC	0837-1637h	Start: 66° F, 76-99% cloud cover, Light Wind out of the E End: 65° F, 76-99% cloud cover, Light Wind out of the NE No rain; No fog; No snow	Karly Moore

Date	Survey Type	Time	Weather	Biologists
11/28/2012	BUC	0730-1530h	Start: 60° F, 1-25% cloud cover, Light Wind out of the W End: 62° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
11/28/2012	BUC	0730-1530h	Start: 59° F, 0% cloud cover, Breeze out of the SW End: 66° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
11/29/2012	BUC	0630-1530h	Start: 56° F, 76-99% cloud cover, Strong Wind out of the W End: 61° F, 100% cloud cover, Strong Wind out of the W Light rain; No fog; No snow	Elias Elias
11/29/2012	BUC	0630-1524h	Start: 54° F, 100% cloud cover, Strong Wind out of the W End: 60° F, 76-99% cloud cover, Strong Wind out of the W Light rain; No fog; No snow	Karly Moore
11/30/2012	BUC	0630-1443h	Start: 59`° F, 76-99% cloud cover, Strong Wind out of the W End: 63° F, 100% cloud cover, Strong Wind out of the W Light rain; No fog; No snow	Elias Elias
11/30/2012	BUC	0630-1430h	Start: 58° F, 51-75% cloud cover, Strong Wind out of the W End: 61° F, 76-99% cloud cover, Strong Wind out of the W Light rain; No fog; No snow	Karly Moore
12/3/2012	BUC	0730-1530h	Start: 57° F, 26-50% cloud cover, Strong Wind out of the W End: 63° F, 26-50% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
12/3/2012	BUC	0730-1530h	Start: 58° F, 26-50% cloud cover, Strong Wind out of the SW End: 64° F, 76-99% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
12/4/2012	BUC	0830-1630h	Start: 68° F, 26-50% cloud cover, Light Wind out of the E End: 66° F, 100% cloud cover, Calm out of the NE No rain; No fog; No snow	Elias Elias
12/4/2012	BUC	0830-1630h	Start: 65° F, 51-75% cloud cover, Strong Wind out of the NE End: 64° F, 76-99% cloud cover, Breeze out of the NE No rain; No fog; No snow	Karly Moore
12/5/2012	BUC	0730-1530h	Start: 64° F, 1-25% cloud cover, Calm out of the NE End: 73° F, 76-99% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
12/5/2012	BUC	0730-1530h	Start: 65° F, 1-25% cloud cover, Breeze out of the N End: 74° F, 76-99% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
12/6/2012	BUC	0630-1430h	Start: 58° F, 76-99% cloud cover, Light Wind out of the SW End: 73° F, 1-25% cloud cover, Light Wind out of the SW No rain; No fog; No snow	Elias Elias
12/6/2012	BUC	0630-1430h	Start: 60° F, 51-75% cloud cover, Strong Wind out of the SW End: 69° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
12/30/2012	BUC	0800-1615h	Start: 42° F, 1-25% cloud cover, Light Wind out of the W End: 37° F, 100% cloud cover, Light Wind out of the N Light rain; No fog; Light snow	Elias Elias

Date	Survey Type	Time	Weather	Biologists
12/31/2012	BUC	1200-1600h	Start: 46° F, 0% cloud cover, Calm out of the E End: 49° F, 0% cloud cover, Calm out of the SW No rain; No fog; No snow	Elias Elias
1/16/2013	BUC	1215-1615h	Start: 54° F, 1-25% cloud cover, Strong Wind out of the E End: 57° F, 0% cloud cover, Strong Wind out of the E No rain; No fog; No snow	Elias Elias
1/17/2013	BUC	0800-1630h	Start: 53° F, 0% cloud cover, Strong Wind out of the E End: 57° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
1/30/2013	BUC	0800-1630h	Start: 51° F, 1-25% cloud cover, Light Wind out of the E End: 55° F, 0% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Elias Elias
1/31/2013	BUC	0800-1200h	Start: 57° F, 0% cloud cover, Light Wind out of the E End: 65° F, 1-25% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Elias Elias
2/4/2013	BUC	0959-1719h	Start: 65° F, 0% cloud cover, Light Wind out of the E End: 67° F, 0% cloud cover, Light Wind out of the W No rain; No fog; No snow	Elias Elias
2/4/2013	BUC	1019-1719h	Start: 68° F, 0% cloud cover, Light Wind out of the SW End: 66° F, 0% cloud cover, Light Wind out of the SW No rain; No fog; No snow	Karly Moore
2/5/2013	BUC	0800-1600h	Start: 61° F, 0% cloud cover, Light Wind out of the W End: 64° F, 0% cloud cover, Light Wind out of the W No rain; No fog; No snow	Elias Elias
2/5/2013	BUC	0800-1600h	Start: 61° F, 0% cloud cover, Light Wind out of the W End: 62° F, 51-75% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
2/6/2013	BUC	0800-1600h	Start: 47° F, 0% cloud cover, Strong Wind out of the W End: 58° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
2/6/2013	BUC	0800-1600h	Start: 46° F, 0% cloud cover, Light Wind out of the SW End: 61° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
2/7/2013	BUC	0645-1445h	Start: 52° F, 0% cloud cover, Light Wind out of the W End: 63° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
2/7/2013	BUC	0645-1445h	Start: 52° F, 0% cloud cover, Light Wind out of the SW End: 62° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
2/10/2013	BUC	0930-1730h	Start: 41° F, 1-25% cloud cover, Strong Wind out of the W End: 43° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
2/11/2013	BUC	1019-1727h	Start: 46° F, 0% cloud cover, Strong Wind out of the SW End: 45° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
2/11/2013	BUC	0000-0001h	Start: 900° F, 0% cloud cover, Calm out of the N End: 900° F, 0% cloud cover, Calm out of the N No rain; No fog; No snow	Michael Kuehn Chris Waterston

Date	Survey Type	Time	Weather	Biologists
2/12/2013	BUC	0800-1600h	Start: 50° F, 0% cloud cover, Light Wind out of the S End: 55° F, 0% cloud cover, Calm out of the S No rain; No fog; No snow	Elias Elias
2/12/2013	BUC	0800-1600h	Start: 58° F, 0% cloud cover, Light Wind out of the E End: 64° F, 0% cloud cover, Light Wind out of the W No rain; No fog; No snow	Elias Elias
2/12/2013	BUC	0800-1600h	Start: 47° F, 0% cloud cover, Light Wind out of the E End: 58° F, 0% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Karly Moore
2/13/2013	BUC	0630-1430h	Start: 57° F, 0% cloud cover, Strong Wind out of the NE End: 67° F, 0% cloud cover, Strong Wind out of the E No rain; No fog; No snow	Karly Moore
2/13/2013	BUC	0800-1600h	Start: 53° F, 0% cloud cover, Light Wind out of the E End: 63° F, 0% cloud cover, Light Wind out of the S No rain; No fog; No snow	Karly Moore
2/14/2013	BUC	0630-1430h	Start: 55° F, 0% cloud cover, Light Wind out of the NE End: 64° F, 0% cloud cover, Strong Wind out of the E No rain; No fog; No snow	Elias Elias
2/17/2013	BUC	0930-1730h	Start: 60° F, 0% cloud cover, Strong Wind out of the W End: 57° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
2/17/2013	BUC	0930-1730h	Start: 63° F, 0% cloud cover, Strong Wind out of the W End: 58° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
2/18/2013	BUC	0800-1600h	Start: 51° F, 0% cloud cover, Light Wind out of the W End: 62° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
2/18/2013	BUC	0800-1600h	Start: 52° F, 0% cloud cover, Strong Wind out of the W End: 62° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
2/21/2013	BUC	0800-1600h	Start: 41° F, 0% cloud cover, Strong Wind out of the W End: 51° F, 1-25% cloud cover, Light Wind out of the S No rain; No fog; No snow	Elias Elias
2/22/2013	BUC	0630-1430h	Start: 42° F, 1-25% cloud cover, Calm out of the E End: 63° F, 0% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Elias Elias
2/25/2013	BUC	0945-1745h	Start: 59° F, 0% cloud cover, Light Wind out of the E End: 55° F, 0% cloud cover, Light Wind out of the NE No rain; No fog; No snow	Elias Elias
2/25/2013	BUC	0940-1740h	Start: 51° F, 0% cloud cover, Light Wind out of the N End: 53° F, 1-25% cloud cover, Breeze out of the SE No rain; No fog; No snow	Karly Moore
2/26/2013	BUC	0800-1600h	Start: 56° F, 0% cloud cover, Light Wind out of the E End: 57° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
2/26/2013	BUC	0800-1600h	Start: 55° F, 0% cloud cover, Light Wind out of the E End: 62° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Karly Moore

Date	Survey Type	Time	Weather	Biologists
2/27/2013	BUC	0800-1600h	Start: 51° F, 0% cloud cover, Light Wind out of the E End: 60° F, 0% cloud cover, Strong Wind out of the S No rain; No fog; No snow	Elias Elias
2/27/2013	BUC	0804-1604h	Start: 52° F, 0% cloud cover, Strong Wind out of the NE End: 57° F, 0% cloud cover, Strong Wind out of the SE No rain; No fog; No snow	Karly Moore
2/28/2013	BUC	0615-1415h	Start: 53° F, 0% cloud cover, Strong Wind out of the E End: 66° F, 0% cloud cover, Strong Wind out of the E No rain; No fog; No snow	Elias Elias
2/28/2013	BUC	0615-1415h	Start: 50° F, 0% cloud cover, Light Wind out of the E End: 68° F, 0% cloud cover, Strong Wind out of the SE No rain; No fog; No snow	Karly Moore
3/4/2013	BUC	0945-1745h	Start: 55° F, 0% cloud cover, Strong Wind out of the W End: 59° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
3/4/2013	BUC	0945-1745h	Start: 57° F, 0% cloud cover, Light Wind out of the SW End: 61° F, 0% cloud cover, Light Wind out of the W No rain; No fog; No snow	Karly Moore
3/5/2013	BUC	0800-1600h	Start: 64° F, 1-25% cloud cover, Light Wind out of the S End: 65° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
3/5/2013	BUC	0757-1557h	Start: 62° F, 26-50% cloud cover, Breeze out of the E End: 64° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
3/6/2013	BUC	0800-1600h	Start: 44° F, 1-25% cloud cover, Strong Wind out of the W End: 56° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
3/6/2013	BUC	0800-1600h	Start: 47° F, 1-25% cloud cover, Strong Wind out of the W End: 59° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
3/7/2013	BUC	0615-1415h	Start: 47° F, 26-50% cloud cover, Strong Wind out of the W End: 52° F, 100% cloud cover, Strong Wind out of the W Light rain; No fog; No snow	Elias Elias
3/7/2013	BUC	0610-1410h	Start: 47° F, 0% cloud cover, Strong Wind out of the SW End: 51° F, 100% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
3/11/2013	BUC	1100-1900h	Start: 70° F, 0% cloud cover, Light Wind out of the E End: 69° F, 0% cloud cover, Light Wind out of the W No rain; No fog; No snow	Elias Elias
3/11/2013	BUC	1050-1850h	Start: 70° F, 0% cloud cover, Strong Wind out of the NE End: 67° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
3/12/2013	BUC	0900-1700h	Start: 70° F, 0% cloud cover, Light Wind out of the E End: 76° F, 0% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Elias Elias
3/12/2013	BUC	0857-1657h	Start: 69° F, 0% cloud cover, Strong Wind out of the E End: 79° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Karly Moore

Date	Survey Type	Time	Weather	Biologists
3/13/2013	BUC	0900-1700h	Start: 73° F, 0% cloud cover, Strong Wind out of the E End: 83° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
3/13/2013	BUC	0900-1700h	Start: 73° F, 0% cloud cover, Strong Wind out of the NE End: 85° F, 0% cloud cover, Strong Wind out of the N No rain; No fog; No snow	Karly Moore
3/14/2013	BUC	0700-1500h	Start: 75° F, 0% cloud cover, Light Wind out of the NE End: 84° F, 1-25% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
3/14/2013	BUC	0657-1457h	Start: 71° F, 0% cloud cover, Light Wind out of the NE End: 86° F, 0% cloud cover, Strong Wind out of the NE No rain; No fog; No snow	Karly Moore
3/18/2013	BUC	1100-1900h	Start: 64° F, 26-50% cloud cover, Strong Wind out of the W End: 61° F, 100% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
3/18/2013	BUC	1057-1857h	Start: 64° F, 51-75% cloud cover, Strong Wind out of the W End: 62° F, 100% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
3/19/2013	BUC	0900-1700h	Start: 61° F, 1-25% cloud cover, Strong Wind out of the W End: 69° F, 76-99% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
3/19/2013	BUC	0900-1700h	Start: 61° F, 1-25% cloud cover, Strong Wind out of the SW End: 66° F, 76-99% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
3/20/2013	BUC	0900-1700h	Start: 66° F, 51-75% cloud cover, Strong Wind out of the W End: 66° F, 76-99% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
3/20/2013	BUC	0900-1700h	Start: 67° F, 76-99% cloud cover, Strong Wind out of the W End: 68° F, 76-99% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
3/21/2013	BUC	0645-1445h	Start: 57° F, 100% cloud cover, Strong Wind out of the NW End: 73° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
3/21/2013	BUC	0645-1445h	Start: 55° F, 100% cloud cover, Strong Wind out of the W End: 72° F, 100% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
3/25/2013	BUC	1100-1900h	Start: 80° F, 1-25% cloud cover, Light Wind out of the SE End: 70° F, 51-75% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
3/25/2013	BUC	1100-1900h	Start: 72° F, 76-99% cloud cover, Light Wind out of the NE End: 68° F, 51-75% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Karly Moore
3/26/2013	BUC	0900-1700h	Start: 65° F, 1-25% cloud cover, Strong Wind out of the W End: 68° F, 76-99% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
3/26/2013	BUC	0855-1655h	Start: 67° F, 1-25% cloud cover, Strong Wind out of the W End: 72° F, 76-99% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore

Date	Survey Type	Time	Weather	Biologists
3/27/2013	BUC	0900-1700h	Start: 59° F, 76-99% cloud cover, Strong Wind out of the W End: 69° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
3/27/2013	BUC	0850-1650h	Start: 60° F, 76-99% cloud cover, Strong Wind out of the SW End: 68° F, 1-25% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
3/28/2013	BUC	0645-1445h	Start: 1445° F, 1-25% cloud cover, Strong Wind out of the W End: 71° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
3/28/2013	BUC	0640-1440h	Start: 60° F, 76-99% cloud cover, Strong Wind out of the W End: 77° F, 1-25% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
4/1/2013	BUC	1100-1900h	Start: 53° F, 26-50% cloud cover, Strong Wind out of the NW End: 55° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
4/1/2013	BUC	1105-1905h	Start: 57° F, 51-75% cloud cover, Strong Wind out of the SW End: 56° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
4/2/2013	BUC	0845-1645h	Start: 56° F, 0% cloud cover, Light Wind out of the W End: 71° F, 76-99% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
4/2/2013	BUC	0855-1655h	Start: 53° F, 0% cloud cover, Strong Wind out of the SW End: 68° F, 76-99% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
4/3/2013	BUC	0845-1645h	Start: 68° F, 0% cloud cover, Calm out of the W End: 78° F, 0% cloud cover, Light Wind out of the W No rain; No fog; No snow	Elias Elias
4/3/2013	BUC	0850-1650h	Start: 70° F, 0% cloud cover, Light Wind out of the W End: 85° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
4/4/2013	BUC	0630-1430h	Start: 62° F, 1-25% cloud cover, Calm out of the W End: 76° F, 1-25% cloud cover, Strong Wind out of the N No rain; No fog; No snow	Elias Elias
4/4/2013	BUC	0630-1430h	Start: 62° F, 1-25% cloud cover, Strong Wind out of the SW End: 74° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
4/5/2013	BUC	0630-1430h	Start: 56° F, 1-25% cloud cover, Strong Wind out of the W End: 66° F, 76-99% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
4/7/2013	BUC	1115-1915h	Start: 65° F, 100% cloud cover, Light Wind out of the W End: 66° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
4/7/2013	BUC	0840-1640h	Start: 58° F, 76-99% cloud cover, Strong Wind out of the SW End: 71° F, 1-25% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore

Date	Survey Type	Time	Weather	Biologists
4/8/2013	BUC	1100-1300h	Start: 45° F, 100% cloud cover, Strong Wind out of the SW End: 43° F, 51-75% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
4/9/2013	BUC	0845-1645h	Start: 50° F, 0% cloud cover, Strong Wind out of the W End: 68° F, 0% cloud cover, Strong Wind out of the S No rain; No fog; No snow	Karly Moore
4/10/2013	BUC	0845-1645h	Start: 68° F, 0% cloud cover, Light Wind out of the S End: 78° F, 0% cloud cover, Light Wind out of the SW No rain; No fog; No snow	Elias Elias
4/10/2013	BUC	0845-1645h	Start: 64° F, 0% cloud cover, Light Wind out of the SE End: 75° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Karly Moore
4/11/2013	BUC	0615-1415h	Start: 1415° F, 1-25% cloud cover, Strong Wind out of the W End: 72° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
4/11/2013	BUC	0620-1420h	Start: 65° F, 0% cloud cover, Strong Wind out of the W End: 76° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Karly Moore
4/14/2013	BUC	1200-1645h	Start: 54° F, 0% cloud cover, Strong Wind out of the W End: 57° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
4/14/2013	BUC	0845-1130h	Start: 52° F, 0% cloud cover, Strong Wind out of the W End: 51° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
4/26/2013	BUC	1130-1530h	Start: 79° F, 0% cloud cover, Light Wind out of the E End: 80° F, 1-25% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Elias Elias
4/27/2013	BUC	1330-1730h	Start: 88° F, 0% cloud cover, Light Wind out of the E End: 90° F, 0% cloud cover, Strong Wind out of the SW No rain; No fog; No snow	Elias Elias
4/27/2013	BUC	0855-1255h	Start: 79° F, 0% cloud cover, Light Wind out of the W End: 92° F, 0% cloud cover, Light Wind out of the NE No rain; No fog; No snow	Elias Elias
5/12/2013	BUC	1040-1440h	Start: 90° F, 1-25% cloud cover, Light Wind out of the E End: 94° F, 1-25% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Elias Elias
5/13/2013	BUC	0845-1245h	Start: 87° F, 0% cloud cover, Light Wind out of the W End: 86° F, 1-25% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
5/13/2013	BUC	1315-1715h	Start: 97° F, 1-25% cloud cover, Light Wind out of the SE End: 92° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
5/23/2013	BUC	0843-1243h	Start: 59° F, 0% cloud cover, Strong Wind out of the W End: 65° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
5/23/2013	BUC	1305-1705h	Start: 68° F, 0% cloud cover, Strong Wind out of the W End: 74° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias

Date	Survey Type	Time	Weather	Biologists
5/24/2013	BUC	0843-1243h	Start: 59° F, 0% cloud cover, Strong Wind out of the W End: 69° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
6/3/2013	BUC	1315-1715h	Start: 83° F, 0% cloud cover, Strong Wind out of the W End: 81° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
6/3/2013	BUC	0845-1245h	Start: 66° F, 0% cloud cover, Light Wind out of the W End: 86° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
6/4/2013	BUC	1030-1430h	Start: 78° F, 0% cloud cover, Strong Wind out of the W End: 83° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
6/17/2013	BUC	0835-1235h	Start: 76° F, 0% cloud cover, Strong Wind out of the W End: 87° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
6/17/2013	BUC	1300-1700h	Start: 88° F, 0% cloud cover, Strong Wind out of the W End: 87° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
6/21/2013	BUC	0845-1245h	Start: 74° F, 1-25% cloud cover, Strong Wind out of the W End: 83° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
6/30/2013	BUC	1250-1650h	Start: 105° F, 1-25% cloud cover, Light Wind out of the SE End: 102° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
7/1/2013	BUC	0850-1250h	Start: 84° F, 100% cloud cover, Strong Wind out of the W End: 91° F, 51-75% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
7/1/2013	BUC	1315-1715h	Start: 94° F, 1-25% cloud cover, Strong Wind out of the W End: 97° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
7/17/2013	BUC	1305-1705h	Start: 94° F, 76-99% cloud cover, Light Wind out of the S End: 92° F, 51-75% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
7/18/2013	BUC	0855-1255h	Start: 82° F, 26-50% cloud cover, Strong Wind out of the W End: 91° F, 76-99% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
7/18/2013	BUC	1315-1715h	Start: 95° F, 51-75% cloud cover, Light Wind out of the W End: 94° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
8/2/2013	BUC	1327-1727h	Start: 89° F, 1-25% cloud cover, Strong Wind out of the W End: 86° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
8/2/2013	BUC	0915-1315h	Start: 78° F, 26-50% cloud cover, Strong Wind out of the W End: 85° F, 26-50% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
8/3/2013	BUC	0949-1249h	Start: 78° F, 1-25% cloud cover, Strong Wind out of the W End: 86° F, 26-50% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias

Date	Survey Type	Time	Weather	Biologists
8/13/2013	BUC	1315-1715h	Start: 88° F, 0% cloud cover, Light Wind out of the E End: 93° F, 0% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Elias Elias
8/13/2013	BUC	0851-1251h	Start: 90° F, 0% cloud cover, Light Wind out of the E End: 89° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
8/14/2013	BUC	0850-1250h	Start: 87° F, 0% cloud cover, Light Wind out of the E End: 92° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
8/29/2013	BUC	0858-1258h	Start: 79° F, 26-50% cloud cover, Light Wind out of the NE End: 85° F, 51-75% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
8/29/2013	BUC	1335-1735h	Start: 82° F, 51-75% cloud cover, Light Wind out of the E End: 83° F, 51-75% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
8/30/2013	BUC	1020-1420h	Start: 77° F, 100% cloud cover, Light Wind out of the E End: 81° F, 51-75% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Elias Elias
9/16/2012	SBC	0630-1140h	Start: 78° F, 0% cloud cover, Light Wind out of the N End: 88° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
9/21/2012	SBC	0638-1123h	Start: 82° F, 0% cloud cover, Light Wind out of the W End: 98° F, 26-50% cloud cover, Light Wind out of the S No rain; No fog; No snow	Elias Elias
9/28/2012	SBC	0630-1200h	Start: 78° F, 1-25% cloud cover, Light Wind out of the W End: 91° F, 1-25% cloud cover, Breeze out of the W No rain; No fog; No snow	Elias Elias
10/5/2012	SBC	0645-1145h	Start: 64° F, 26-50% cloud cover, Calm out of the N End: 81° F, 51-75% cloud cover, Breeze out of the W No rain; No fog; No snow	Elias Elias
10/14/2012	SBC	0700-1200h	Start: 70° F, 0% cloud cover, Calm out of the E End: 82° F, 0% cloud cover, Breeze out of the E No rain; No fog; No snow	Elias Elias
10/19/2012	SBC	0650-1140h	Start: 65° F, 0% cloud cover, Breeze out of the E End: 84° F, 0% cloud cover, Breeze out of the W No rain; No fog; No snow	Elias Elias
12/31/2012	SBC	0650-1115h	Start: 38° F, 0% cloud cover, Calm out of the N End: 47° F, 0% cloud cover, Calm out of the W No rain; No fog; No snow	Elias Elias
1/16/2013	SBC	0615-1200h	Start: 45° F, 76-99% cloud cover, Light Wind out of the NE End: 56° F, 1-25% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
2/11/2013	SBC	0636-1114h	Start: 39° F, 1-25% cloud cover, Calm out of the N End: 54° F, 1-25% cloud cover, Strong Wind out of the S No rain; No fog; No snow	Elias Elias
3/1/2013	SBC	0620-1041h	Start: 61° F, 0% cloud cover, Light Wind out of the E End: 71° F, 0% cloud cover, Strong Wind out of the E No rain; No fog; No snow	Elias Elias

Date	Survey Type	Time	Weather	Biologists
3/15/2013	SBC	0703-1157h	Start: 74° F, 26-50% cloud cover, Light Wind out of the W End: 78° F, 76-99% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
3/29/2013	SBC	0645-1133h	Start: 61° F, 0% cloud cover, Calm out of the W End: 76° F, 0% cloud cover, Light Wind out of the S No rain; No fog; No snow	Elias Elias
4/12/2013	SBC	0615-1043h	Start: 56° F, 76-99% cloud cover, Light Wind out of the N End: 77° F, 1-25% cloud cover, Light Wind out of the E No rain; No fog; No snow	Elias Elias
4/26/2013	SBC	0606-1040h	Start: 56° F, 0% cloud cover, Light Wind out of the SW End: 72° F, 0% cloud cover, Light Wind out of the W No rain; No fog; No snow	Elias Elias
5/3/2013	SBC	0554-1016h	Start: 69° F, 26-50% cloud cover, Light Wind out of the N End: 78° F, 26-50% cloud cover, Strong Wind out of the E No rain; No fog; No snow	Elias Elias
5/12/2013	SBC	0550-1009h	Start: 77° F, 0% cloud cover, Light Wind out of the N End: 91° F, 1-25% cloud cover, Light Wind out of the S No rain; No fog; No snow	Elias Elias
5/31/2013	SBC	0536-1014h	Start: 61° F, 0% cloud cover, Light Wind out of the W End: 80° F, 0% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Elias Elias
6/4/2013	SBC	0535-0945h	Start: 59° F, 1-25% cloud cover, Strong Wind out of the W End: 72° F, 0% cloud cover, Strong Wind out of the S No rain; No fog; No snow	Elias Elias
8/23/2012	Site Visit	0700-1200h	Start: 80° F, 0% cloud cover, Calm out of the S End: 85° F, 0% cloud cover, Calm out of the S No rain; No fog; No snow	Pete Bloom Marcus C. England Michael Kuehn Scott Thomas
8/27/2012	Site Visit	0800-1000h	Start: 80° F, 0% cloud cover, Strong Wind out of the W End: 85° F, 0% cloud cover, Calm out of the W No rain; No fog; No snow	Michael Kuehn Scott Thomas
9/15/2012	Site Visit	1330-1800h	Start: 9999° F, 0% cloud cover, Breeze out of the W End: 9999° F, 0% cloud cover, Breeze out of the W No rain; No fog; No snow	Elias Elias Michael Kuehn
9/16/2012	Site Visit	1100-1600h	Start: 103° F, 0% cloud cover, Breeze out of the NW End: 103° F, 0% cloud cover, Breeze out of the NW No rain; No fog; No snow	Elias Elias Michael Kuehn Karly Moore Cheryl Thomas Scott Thomas
9/27/2012	SSS	0910-1528h	Start: 85° F, 0% cloud cover, Light Wind out of the E End: 90° F, 0% cloud cover, Strong Wind out of the NE No rain; No fog; No snow	Michael Kuehn
9/27/2012	SSS	0630-0948h	Start: 75° F, 0% cloud cover, Light Wind out of the W End: 78° F, 0% cloud cover, Light Wind out of the W No rain; No fog; No snow	Michael Kuehn
10/31/2012	SSS	0820-1519h	Start: 63° F, 0% cloud cover, Breeze out of the W End: 90° F, 0% cloud cover, Light Wind out of the W No rain; No fog; No snow	Michael Kuehn

Date	Survey Type	Time	Weather	Biologists
11/30/2012	SSS	0710-1320h	Start: 65° F, 51-75% cloud cover, Light Wind out of the W End: 66° F, 76-99% cloud cover, Light Wind out of the W Light rain; No fog; No snow	Michael Kuehn
12/21/2012	SSS	0756-1331h	Start: 47° F, 0% cloud cover, Breeze out of the NE End: 69° F, 0% cloud cover, Breeze out of the SE No rain; No fog; No snow	Michael Kuehn
2/4/2013	SSS	1010-1458h	Start: 71° F, 0% cloud cover, Calm out of the N End: 81° F, 0% cloud cover, Light Wind out of the SE No rain; No fog; No snow	Michael Kuehn
2/5/2013	SSS	0748-1348h	Start: 56° F, 0% cloud cover, Calm out of the N End: 77° F, 0% cloud cover, Breeze out of the E No rain; No fog; No snow	Michael Kuehn
3/1/2013	SSS	0842-1430h	Start: 69° F, 0% cloud cover, Breeze out of the SW End: 83° F, 0% cloud cover, Breeze out of the SE No rain; No fog; No snow	Michael Kuehn
4/12/2013	SSS	1304-1857h	Start: 88° F, 0% cloud cover, Light Wind out of the SE End: 84° F, 0% cloud cover, Light Wind out of the E No rain; No fog; No snow	Michael Kuehn
5/21/2013	SSS	1345-1448h	Start: 95° F, 1-25% cloud cover, Light Wind out of the N End: 96° F, 1-25% cloud cover, Light Wind out of the N No rain; No fog; No snow	Michael Kuehn
5/31/2013	SSS	0755-1408h	Start: 71° F, 0% cloud cover, Breeze out of the W End: 95° F, 0% cloud cover, Breeze out of the W No rain; No fog; No snow	Michael Kuehn
6/27/2013	SSS	0835-1340h	Start: 83° F, 0% cloud cover, Light Wind out of the W End: 99° F, 0% cloud cover, Breeze out of the SE No rain; No fog; No snow	Michael Kuehn
6/28/2013	SSS	1305-1451h	Start: 100° F, 0% cloud cover, Light Wind out of the NW End: 104° F, 0% cloud cover, Light Wind out of the W No rain; No fog; No snow	Michael Kuehn
8/1/2013	SSS	1154-1946h	Start: 92° F, 1-25% cloud cover, Light Wind out of the W End: 78° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
8/29/2013	SSS	1217-1635h	Start: 91° F, 51-75% cloud cover, Light Wind out of the NE End: 98° F, 51-75% cloud cover, Breeze out of the E No rain; No fog; No snow	Michael Kuehn

APPENDIX B. DETAILS OF GOLDEN EAGLE FLIGHTS IN BUC SURVEY AREAS

The following table lists all instances of Golden Eagle observations occurring within actively surveyed Survey Areas during BUC Surveys on the Project Site between September 15, 2012 and August 31, 2013. Each observation is accompanied by details of the observed flight within the Survey Area, including: (1) the survey season in which the observation occurred (Season), (2) the Survey Area (#1,2,3N,3S, or 4) the bird was observed in (Survey Area), (3) date of observation (Date), (4) time of initial detection (Time), (5) Age of eagle (Adult [A], Subadult [S], or Juvenile [J]), if known (Age), (6) the minimum height (agl, in meters) the eagle was observed flying within the Survey Area (Min. Height), (7) the maximum height (agl, in meters) the bird was observed flying within the survey area (Max. Height), (8) the total number of minutes the bird was observed flying within the RSZ (defined differently for Fall than for other seasons; see Methods, Section 4.1.2), and within the Survey Area (RSZ Minutes), and (9) an indication of whether the minutes recorded during the Fall season may be an underestimation of the minutes the bird flew in the RSZ, based on the definition used during other seasons (Min. Underest.?). The last column is relevant to estimates of predicted annual Golden Eagle fatalities on the Project Site based on the Bayesian Model (see discussion in Results, Section 5.4.2).

Season	Survey Area #	Date	Time	Age	Min. Height	Max Height	RSZ Minutes	Min. Underest.?
Fall	3B	9/20/2012	13:32	A	1,500	1,500	0	No
Fall	1	9/24/2012	12:08	J	100	100	2	No
Fall	2	9/25/2012	11:13	J	135	200	1	Poss.
Fall	3B	9/27/2012	13:38	A	75	250	5	Poss.
Fall	3B	9/27/2012	13:38	A	75	250	5	Poss.
Fall	3A	10/15/2012	13:28	S	60	80	1	No
Fall	4	10/15/2012	13:28	S	80	120	1	No
Fall	2	10/23/2012	10:50	A	1	40	1	Poss.
Fall	1	10/29/2012	9:29	J	10	150	1	Poss.
Fall	1	11/1/2012	10:50	A	0	300	10	Poss.
Fall	1	11/1/2012	10:50	A	0	300	10	Poss.
Fall	4	11/13/2012	12:41	A	80	120	1	No
Fall	2	11/13/2012	12:41	A	30	60	4	Poss.
Fall	2	11/14/2012	13:51	A	50	150	2	Poss.
Fall	3B	11/15/2012	12:56	J	600	600	0	No
Fall	2	11/20/2012	9:49	A	25	250	5	Poss.
Fall	1	11/22/2012	13:04	A	140	360	0	Def.
Fall	2	11/27/2012	9:42	A	70	400	3	Poss.
Fall	2	11/27/2012	11:37	A	300	300	0	No
Fall	2	11/28/2012	13:29	A	122	380	1	Poss.
Fall	1	12/4/2012	11:20	S	250	400	0	No
Fall	2	12/4/2012	12:11	S	70	150	3	Poss.
Fall	1	12/6/2012	13:00	A	3	75	1	Poss.
Spring	1	2/5/2013	10:35	S	50	85	1	
Spring	1	2/17/2013	11:48	A	150	300	1	
Spring	1	2/18/2013	14:36	NA	80	250	1	
Spring	1	2/18/2013	14:36	NA	130	234	1	
Spring	1	3/7/2013	14:18	NA	120	300	4	
Spring	1	3/7/2013	14:18	S	100	300	4	
Spring	1	4/2/2013	14:15	S	300	500	0	
Spring	1	4/7/2013	12:06	S	170	210	2	

Summer	1	8/2/2013	17:12	S	120	360	1	
Summer	2	8/29/2013	15:58	A	50	300	1	
Summer	3A	8/30/2013	11:02	J	400	500	0	
Summer	3A	8/30/2013	11:02	A	400	500	0	
Summer	3A	8/30/2013	11:02	A	400	500	0	
Winter	2	1/17/2013	15:03	A	10	65	2	

APPENDIX C. SPECIES LIST

The following list of 122 bird, 11 mammal, and 7 reptile species represents a complete compendium of vertebrate species detected from the Project Site during surveys and incidentally (outside of regular survey periods) by BBI biologists between August 23, 2012 and August 30, 2013. Sensitive status designations are derived directly from the California Department of Fish and Wildlife's California Wildlife Habitats Relationship Database. Sensitive statuses in this database may pertain only to a subspecies or genetically distinct population of the species, and are included here only if the sensitive population has the potential to occur on the Project Site.

Birds

Common Name	Scientific Name	FESA End.	FESA Thr.	CESA End.	CESA Thr.	CA Fully Prot.	CA Protected	CA SSC	Introduced
Anatidae - Ducks, Geese, and Swans									
Greater White-fronted Goose	Anser albifrons							X	NATIVE
Mallard	Anas platyrhynchos								NATIVE
Ring-necked Duck	Aythya collaris								NATIVE
Odontophoridae - New World Quail									
California Quail	Callipepla californica								NATIVE
Gambel's Quail	Callipepla gambelii								NATIVE
Phasianidae - Partridges, Grouse, Turkeys, and Old World Quail									
Chukar	Alectoris chukar								INTROD
Phalacrocoracidae - Cormorants									
Double-crested Cormorant	Phalacrocorax auritus								NATIVE
Pelecanidae - Pelicans									
American White Pelican	Pelecanus erythrorhynchos							X	NATIVE
Ardeidae - Herons, Bitterns, and Allies									
Great Blue Heron	Ardea herodias								NATIVE
Snowy Egret	Egretta thula								NATIVE
Threskiornithidae – Ibises and Spoonbills									
White-faced Ibis	Plegadis chihi								NATIVE
Cathartidae - New World Vultures									
Turkey Vulture	Cathartes aura								NATIVE
Pandionidae - Ospreys									
Osprey	Pandion haliaetus								NATIVE
Accipitridae - Hawks, Kites, Eagles, and Allies									
Bald Eagle	Haliaeetus leucocephalus			X		X			NATIVE
Northern Harrier	Circus cyaneus							X	NATIVE
Sharp-shinned Hawk	Accipiter striatus								NATIVE
Cooper's Hawk	Accipiter cooperii								NATIVE
Red-shouldered Hawk	Buteo lineatus								NATIVE
Swainson's Hawk	Buteo swainsoni				X				NATIVE
Red-tailed Hawk	Buteo jamaicensis								NATIVE

Common Name	Scientific Name	FESA End.	FESA Thr.	CESA End.	CESA Thr.	CA Fully Prot.	CA Protected	CA SSC	Introduced
Ferruginous Hawk	Buteo regalis								NATIVE
Rough-legged Hawk	Buteo lagopus								NATIVE
Golden Eagle	Aquila chrysaetos					X			NATIVE
Rallidae - Rails, Gallinules, and Coots									
American Coot	Fulica americana								NATIVE
Scolopacidae - Sandpipers, Phalaropes, and Allies									
Whimbrel	Numenius phaeopus								NATIVE
Laridae - Gulls, Terns, and Skimmers									
California Gull	Larus californicus								NATIVE
Herring Gull	Larus argentatus								NATIVE
Columbidae - Pigeons and Doves									
Rock Pigeon	Columba livia								INTROD
Band-tailed Pigeon	Patagioenas fasciata								NATIVE
Eurasian Collared-Dove	Streptopelia decaocto								INTROD
Mourning Dove	Zenaida macroura								NATIVE
Cuculidae - Cuckoos, Roadrunners, and Anis									
Greater Roadrunner	Geococcyx californianus								NATIVE
Tytonidae - Barn Owls									
Barn Owl	Tyto alba								NATIVE
Strigidae - Typical Owls									
Long-eared Owl	Asio otus							X	NATIVE
Caprimulgidae - Goatsuckers									
Common Poorwill	Phalaenoptilus nuttallii								NATIVE
Apodidae - Swifts									
Vaux's Swift	Chaetura vauxi							X	NATIVE
White-throated Swift	Aeronautes saxatalis								NATIVE
Trochilidae - Hummingbirds									
Black-chinned Hummingbird	Archilochus alexandri								NATIVE
Anna's Hummingbird	Calypte anna								NATIVE
Costa's Hummingbird	Calypte costae								NATIVE
Rufous Hummingbird	Selasphorus rufus								NATIVE
Alcedinidae - Kingfishers									
Belted Kingfisher	Megaceryle alcyon								NATIVE
Picidae - Woodpeckers and Allies									
Ladder-backed Woodpecker	Picoides scalaris								NATIVE
Nuttall's Woodpecker	Picoides nuttallii								NATIVE
Northern Flicker	Colaptes auratus								NATIVE
Falconidae - Caracaras and Falcons									
American Kestrel	Falco sparverius								NATIVE
Merlin	Falco columbarius								NATIVE

Common Name	Scientific Name	FESA End.	FESA Thr.	CESA End.	CESA Thr.	CA Fully Prot.	CA Protected	CA SSC	Introduced
Peregrine Falcon	Falco peregrinus			X		X			NATIVE
Prairie Falcon	Falco mexicanus								NATIVE
Tyrannidae - Tyrant Flycatchers									
Western Wood-Pewee	Contopus sordidulus								NATIVE
Black Phoebe	Sayornis nigricans								NATIVE
Say's Phoebe	Sayornis saya								NATIVE
Ash-throated Flycatcher	Myiarchus cinerascens								NATIVE
Western Kingbird	Tyrannus verticalis								NATIVE
Laniidae - Shrikes									
Loggerhead Shrike	Lanius ludovicianus							X	NATIVE
Vireonidae - Vireos									
Bell's Vireo	Vireo bellii	X		X					NATIVE
Corvidae - Crows and Jays									
Western Scrub-Jay	Aphelocoma californica								NATIVE
American Crow	Corvus brachyrhynchos								NATIVE
Common Raven	Corvus corax								NATIVE
Alaudidae - Larks									
Horned Lark	Eremophila alpestris								NATIVE
Hirundinidae - Swallows									
Tree Swallow	Tachycineta bicolor								NATIVE
Violet-green Swallow	Tachycineta thalassina								NATIVE
Northern Rough-winged Swallow	Stelgidopteryx serripennis								NATIVE
Bank Swallow	Riparia riparia				X				NATIVE
Cliff Swallow	Petrochelidon pyrrhonota								NATIVE
Barn Swallow	Hirundo rustica								NATIVE
Paridae - Chickadees and Titmice									
Mountain Chickadee	Poecile gambeli								NATIVE
Remizidae - Penduline Tits and Verdins									
Verdin	Auriparus flaviceps								NATIVE
Aegithalidae - Long-tailed Tits and Bushtits									
Bushtit	Psaltriparus minimus								NATIVE
Troglodytidae - Wrens									
Rock Wren	Salpinctes obsoletus								NATIVE
Canyon Wren	Catherpes mexicanus								NATIVE
House Wren	Troglodytes aedon								NATIVE
Bewick's Wren	Thryomanes bewickii								NATIVE
Cactus Wren	Campylorhynchus brunneicapillus								NATIVE
Polioptilidae - Gnatcatchers and Gnatwrens									
Blue-gray Gnatcatcher	Polioptila caerulea								NATIVE
Regulidae - Kinglets									

Common Name	Scientific Name	FESA End.	FESA Thr.	CESA End.	CESA Thr.	CA Fully Prot.	CA Protected	CA SSC	Introduced
Ruby-crowned Kinglet	Regulus calendula								NATIVE
Turdidae - Thrushes									
Western Bluebird	Sialia mexicana								NATIVE
Hermit Thrush	Catharus guttatus								NATIVE
American Robin	Turdus migratorius								NATIVE
Mimidae - Mockingbirds and Thrashers									
Northern Mockingbird	Mimus polyglottos								NATIVE
California Thrasher	Toxostoma redivivum								NATIVE
Sturnidae - Starlings									
European Starling	Sturnus vulgaris								INTROD
Motacillidae - Wagtails and Pipits									
American Pipit	Anthus rubescens								NATIVE
Bombycillidae – Waxwings									
Cedar Waxwing	Bombycilla cedrorum								NATIVE
Ptilogonatidae - Silky-flycatchers									
Phainopepla	Phainopepla nitens								NATIVE
Parulidae - Wood-Warblers									
Orange-crowned Warbler	Oreothlypis celata								NATIVE
Common Yellowthroat	Geothlypis trichas								NATIVE
Yellow Warbler	Setophaga petechia							X	NATIVE
Yellow-rumped Warbler	Setophaga coronata								NATIVE
Black-throated Gray Warbler	Setophaga nigrescens								NATIVE
Townsend's Warbler	Setophaga townsendi								NATIVE
Wilson's Warbler	Cardellina pusilla								NATIVE
Emberizidae – Emberizids									
Green-tailed Towhee	Pipilo chlorurus								NATIVE
Spotted Towhee	Pipilo maculatus								NATIVE
Rufous-crowned Sparrow	Aimophila ruficeps								NATIVE
California Towhee	Melozone crissalis								NATIVE
Chipping Sparrow	Spizella passerina								NATIVE
Brewer's Sparrow	Spizella breweri								NATIVE
Lark Sparrow	Chondestes grammacus								NATIVE
Black-throated Sparrow	Amphispiza bilineata								NATIVE
Sage Sparrow	Artemisiospiza belli								NATIVE
Savannah Sparrow	Passerculus sandwichensis								NATIVE
Fox Sparrow	Passerella iliaca								NATIVE
Song Sparrow	Melospiza melodia								NATIVE
Lincoln's Sparrow	Melospiza lincolnii								NATIVE
White-throated Sparrow	Zonotrichia albicollis								NATIVE
White-crowned Sparrow	Zonotrichia leucophrys								NATIVE

Common Name	Scientific Name	FESA End.	FESA Thr.	CESA End.	CESA Thr.	CA Fully Prot.	CA Protected	CA SSC	Introduced
Dark-eyed Junco	Junco hyemalis								NATIVE
Cardinalidae - Cardinals and Allies									
Western Tanager	Piranga ludoviciana								NATIVE
Black-headed Grosbeak	Pheucticus melanocephalus								NATIVE
Blue Grosbeak	Passerina caerulea								NATIVE
Lazuli Bunting	Passerina amoena								NATIVE
Icteridae – Blackbirds									
Red-winged Blackbird	Agelaius phoeniceus							X	NATIVE
Western Meadowlark	Sturnella neglecta								NATIVE
Brewer's Blackbird	Euphagus cyanocephalus								NATIVE
Hooded Oriole	Icterus cucullatus								NATIVE
Bullock's Oriole	Icterus bullockii								NATIVE
Fringillidae - Fringilline and Cardueline Finches and Allies									
House Finch	Haemorhous mexicanus								NATIVE
Pine Siskin	Spinus pinus								NATIVE
Lesser Goldfinch	Spinus psaltria								NATIVE
Lawrence's Goldfinch	Spinus lawrencei								NATIVE
Evening Grosbeak	Coccothraustes vespertinus								NATIVE

Mammals

Common Name	Scientific Name	FESA End.	FESA Thr.	CESA End.	CESA Thr.	CA Fully Prot.	CA Protected	CA SSC	Introduced
Leporidae									
Desert Cottontail	Sylvilagus audubonii								NATIVE
Black-tailed Jackrabbit	Lepus californicus								NATIVE
Sciuridae									
White-tailed Antelope Squirrel	Ammospermophilus leucurus								NATIVE
California Ground Squirrel	Spermophilus beecheyi								NATIVE
Geomyidae									
Botta's Pocket Gopher	Thomomys bottae								NATIVE
Muridae									
Desert Woodrat	Neotoma lepida								NATIVE
Canidae									
Coyote	Canis latrans								NATIVE
Felidae									
Bobcat	Lynx rufus								NATIVE
Cervidae									

Common Name	Scientific Name	FESA End.	FESA Thr.	CESA End.	CESA Thr.	CA Fully Prot.	CA Protected	CA SSC	Introduced
Mule Deer	Odocoileus hemionus								NATIVE
Bovidae									
Bighorn Sheep	Ovis canadensis					X			NATIVE
Feral Cattle	Bos taurus								INTROD

Reptiles

Common Name	Scientific Name	FESA End.	FESA Thr.	CESA End.	CESA Thr.	CA Fully Prot.	CA Protected	CA SSC	Introduced
Phrynosomatidae									
Desert Spiny Lizard	Sceloporus magister								NATIVE
Western Fence Lizard	Sceloporus occidentalis								NATIVE
Side-blotched Lizard	Uta stansburiana								NATIVE
Teiidae									
Western Whiptail	Aspidoscelis tigris								NATIVE
Boidae									
Rosy Boa	Charina trivirgata								NATIVE
Colubridae									
Gopher Snake	Pituophis catenifer							X	NATIVE
Viperidae									
Speckled Rattlesnake	Crotalus mitchellii								NATIVE

APPENDIX D. R CODE (R CORE DEVELOPMENT TEAM 2010) USED TO GENERATE GOLDEN EAGLE FATALITY ESTIMATES AND CREDIBLE INTERVALS FOR THE MESA WIND ENERGY PROJECT.

```
require(rv)

nSim<-100000

setnsims(nSim)

getnsims()

### Example Eagle Collision Fatality Model - Long Version###

# Hazardous Area

nTurbine<-10 #the number of proposed turbines for the project

HazRadKm<-45/1000 #radius of hazardous area around turbine (i.e., the rotor radius)

HzKM2<-nTurbine*pi*HazRadKm^2 #this is the total hazardous area for the project

HzKM2

#Exposure Survey Data

ExpSvy<-data.frame(row.names=c("Total"),nTrials=c(2651.2),EMin=c(75),DaylightHr=c(4444))

# nTrials is calculated elsewhere for each season (Table 10 in report), the number of trials is the total km2-
hours per

# ...season that we could have observed an eagle min

# EMin are the total number of eagle minutes (in flight in RSZ, among the 5 survey areas) observed within
each season

# DaylightHr are the number of daylight hours (hours of exposure) in each season (calculated from

# ...Palm Springs, CA sunrise/sunset times at http://aa.usno.navy.mil/cgi-bin/aa_rstablew.pl)

ExpFactor<-ExpSvy$DaylightHr*HzKM2 #expansion factor; the daylight hours-km squared that we are
expanding

#...the exposure/collision to in the model

# Exposure rate (Eagle min per hr per km^2)

## Exposure rate prior (based on exposure rates from a range of other projects)

## is a gamma distribution with the following mean, SD:
```

```
PriExp  <-0.352

PriExpSD<-0.357

# From the mean and sd, we get the shape and rate of the gamma distributed prior

aPriExp<-(PriExp/PriExpSD)^2

bPriExp<-PriExp/PriExpSD^2

## Graph of the exposure prior:

curve(dgamma(x,aPriExp,rate=bPriExp),0,2.5,

    main="Exposure Prior",xlab="Exposure/Hr/KM^2",ylab="Density")

abline(v=aPriExp/bPriExp)

# update the exposure prior to get the posterior

aPostExp<-aPriExp+ExpSvy$EMin #previous alpha + eagle mins observed

bPostExp<-bPriExp+ExpSvy$nTrials #previous beta + number of trials

ExpPost<-rvgamma(n=1,aPostExp,bPostExp)

# simulates the posterior exposure for each of the strata

# (samples a point from the proir adds the EMin and trials

# to get the posterior value for each simulation)

ExpPost # display the mean and sd for Exposure Posterior

## Graph of the exposure Posterior:

curve(dgamma(x,aPostExp,rate=bPostExp),0,.1,

main="Exposure Posterior",xlab="Exposure/Hr/KM^2",ylab="Density")

abline(v=aPostExp/bPostExp)

# Collision Probability (probability of collision per minute of flight in hazardous area)

# Collision Probability Prior (based on the info in Whitfield 2009; 1-Avoidance):

PriCPr<-0.0058

PriCPrSD<-0.0038
```

```
# Convert to the beta distribution a and b (nu and nu prime in the Guidance Appendix)

Fac<-PriCPr*(1-PriCPr)/PriCPrSD^2-1 #formula for converting the mean and SD into a and b

aPriCPr<-PriCPr*Fac

bPriCPr<-(1-PriCPr)*Fac

# simulate the prior based on aPriCPr,bPriCPr

CPr<-rvbeta(n=1,aPriCPr,bPriCPr)

## for now, we do not have data to update Collision Probability,

#  so we use the prior in our model

# Estimating fatalities

 Fatalities<-ExpPost*CPr*ExpFactor

Rvmean (Fatalities)

rvquantile(Fatalities,probs=0.20)

rvquantile(Fatalities,probs=0.80)

rvquantile(Fatalities,probs=0.95)

curve(dgamma(x,rvmean(Fatalities),rvsd(Fatalities)),0,0.05,main="Estimated Annual Fatalities and Credible
Intervals",

xlab="Fatalities per Year" ,ylab="Density", lwd =2)

abline(v=rvquantile(Fatalities,probs=0.80), col="red", lwd = 2)

abline(v=rvquantile(Fatalities,probs=0.95), col="green", lwd = 2)

abline(v=rvmean(Fatalities), col="blue", lwd = 3)
```

APPENDIX C-4

2013 Golden Eagle Nesting Survey Report

Mesa Wind Project
2013 Golden Eagle Nesting Survey Results

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December 2013

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ABOUT BLOOM BIOLOGICAL, INC.

For over 35 years, Bloom Biological, Inc. (BBI) has provided biological consulting services to large and small clients. Our resume of services includes raptor and endangered species research, biological monitoring, impact assessment and permitting, conservation planning and geospatial analysis. Our innovative approach to our work has provided solutions to complex problems for clients and projects throughout a range of industries including alternative energy, residential development and the public sector. Collectively, the management and staff of BBI hold permits or memoranda of understanding for participating in the conservation and recovery of more than a dozen endangered or threatened species, as well as numerous other special-status species, in California and the western United States. Over the years, BBI has established an impeccable relationship with the resource agencies, project proponents, and environmental organizations by skillfully balancing the needs and objectives of land planning, resource conservation, and the public interest. In addition to our work in southern California, BBI biologists have worked throughout the western United States, and in Alaska, Peru, Ecuador, Belize, Costa Rica, India, Southeast Asia, Sweden and the western Pacific. BBI is a certified Small Business Enterprise.

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1.0 INTRODUCTION

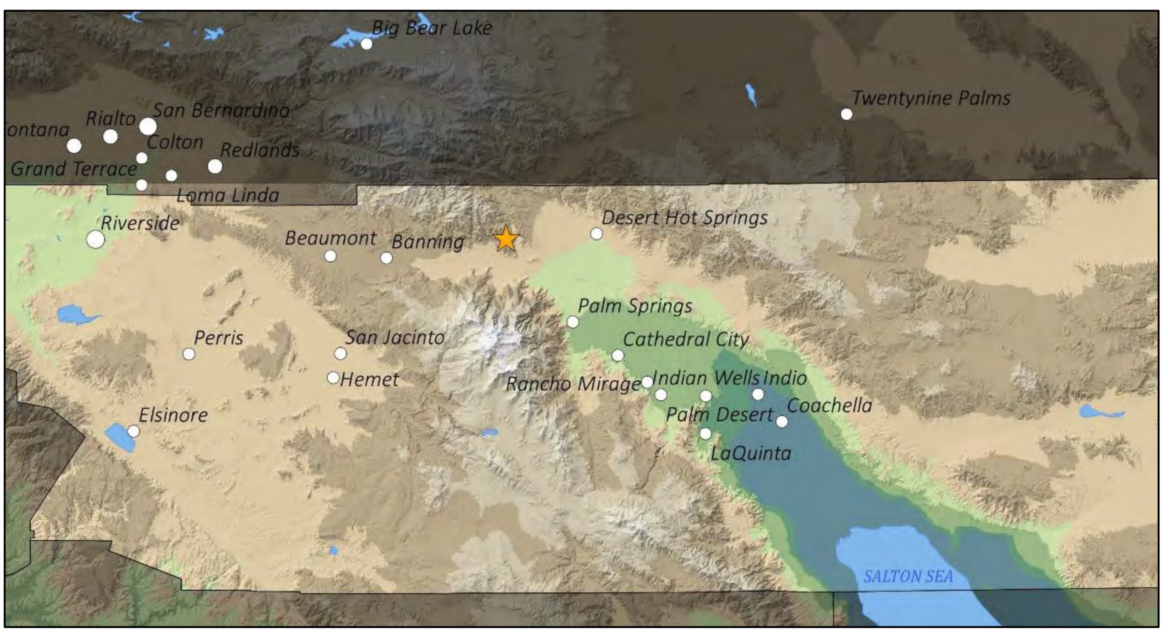
Bloom Biological, Inc. (BBI) was retained by Brookfield Renewable Energy Group to conduct nesting surveys for Golden Eagle (*Aquila chrysaetos*) for the Mesa Wind Project located in the vicinity of White Water in unincorporated Riverside County, California. BBI's survey effort consisted of a combination of aerial surveys by helicopter and ground surveys on foot in the northern portion of the Study Area. Restrictions on flying prevented a thorough survey of the Study Area, however, a total of five (5) Golden Eagle nests were documented. This report describes the methods used by BBI and all survey results. Hopefully, the provided data can assist on more thorough surveys of the Study Area in future years.

2.0 STUDY AREA DESCRIPTION

The Mesa Wind Project Site is comprised of approximately 1,185 acres (479 hectares) located in the vicinity of White Water in unincorporated Riverside County, California (see Figure 1, Exhibit 1). On the Public Land Survey System, the Project Site is located in all or portions of sections 27, 33, 34, and 35 of Township 02S, Range 03E and Section 4 of Township 03S, Range 03E of the US Geological Survey's (USGS) 7.5-minute White Water quadrangle.

Topography on the site is highly varied and characterized by steep hills and sharply-defined drainages as expected within the foothills of the San Bernardino Mountains. Elevations on the site vary from approximately 1,770 feet above mean sea level near the Project Site's southwestern corner to 3,300 feet above mean sea level along the northern edge.

Figure 1. Study area location.



Pagel et al. (2010) describes Golden Eagle survey methodologies recommended for alternative energy projects. BBI used the recommended ten mile buffer from the Project Site in Pagel et al. (2010) as the Study Area for this report. As shown on Exhibit 1, the Study Area includes the San Bernardino Mountains (and the southern slope of Mt. San Gorgonio) in much of the northwest, the Morongo Valley and Little San Bernardino Mountains to the northeast, and the San Jacinto Mountains, including Mt. San Jacinto proper, in the south.

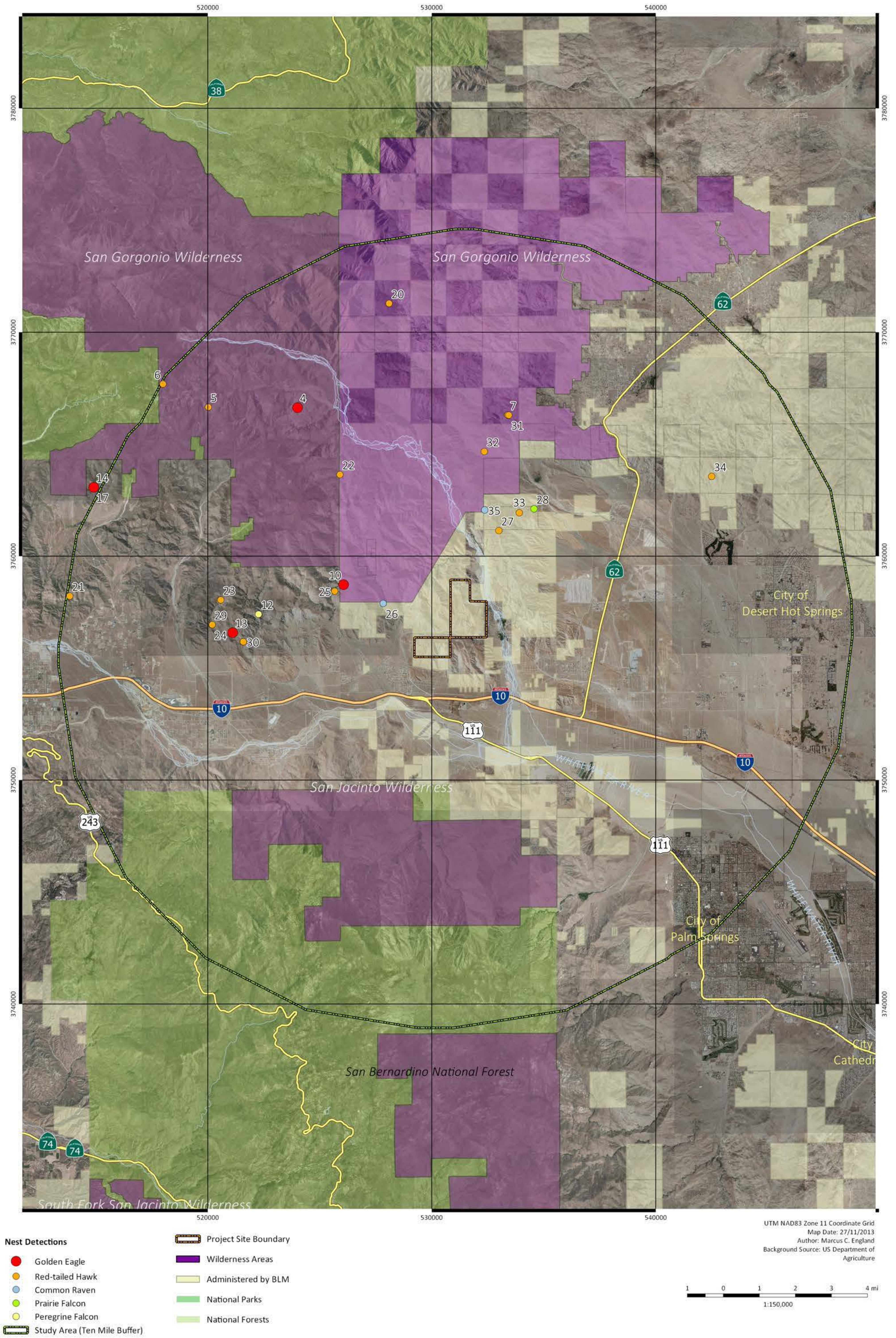


EXHIBIT 1. 2013 Golden Eagle Nest Survey Results

Mesa Wind Project | Riverside County, California

BBI

The presence of all or part of Southern California's two tallest peaks provides a high degree of terrain and habitat variability, with elevations ranging from 500 to nearly 11,000 feet above mean sea level, and vegetation associations representing desert, Mediterranean coastal, and high elevation pine, spruce and fir forests. Significant portions of the Study Area are located on federal lands, including the San Bernardino National Forest as well as the San Gorgonio Wilderness and San Jacinto Wilderness.

3.0 REASON FOR SURVEYS

3.1 Golden Eagle Natural History

Kochert et al. (2002) provided a thorough description of the natural history of the Golden Eagle, noting that the species is found in a variety of habitats located in a wide range of latitudes throughout the Northern Hemisphere. In North America, Golden Eagles are most common in the western half of the continent near open spaces that provide hunting habitat, and generally with cliffs or large trees present for nesting sites. While northern populations are migratory, often making trips of thousands of miles to the wintering grounds; southern breeding populations (including those in southern California) tend to be resident year-round. The movements of locally fledged sub-adults are largely unknown, although early unpublished reports of PTT-equipped young suggest considerable wandering over western North America. Other than the endeavors of early egg collectors who provided valuable data (WFVZ unpub. data) on then extant Golden Eagle nest sites, the Mojave Desert breeding population is poorly known or reported on.

While Golden Eagles are capable of killing large prey such as cranes, wild ungulates, and domestic livestock, they primarily subsist on rabbits, hares, ground squirrels, and prairie dogs (Bloom and Hawks 1982, Olendorff 1976). Golden Eagles typically reach sexual maturity, form territories and begin nesting, probably well after four years. Two eagles banded in southwestern California have both survived into their early twenties (Bloom unpub. data) Adult breeding pairs are generally thought to stay within the limits of their territory, which can measure well over 20 square kilometers and may contain as many as 14 nests (Kochert et al. 2002, Bloom pers. obs.). The pair annually maintains and repairs one or more of these nests as part of its courtship. Over the course of a decade several of these nests will be used and will produce young while others ("alternate nests") may only be added to with fresh sticks, not added to at all, or be used by other species. In the Mojave Desert, other species known to use Golden Eagle nests include Red-tailed Hawk (*Buteo jamaicensis*), Prairie Falcon (*Falco mexicanus*), and Great Horned Owl (*Bubo virginianus*). Most alternate nests are important in the successful reproduction of a pair of eagles. Kochert et al. (2002) also noted that the nesting season is prolonged, extending more than 6 months from the time the 1-3 eggs are laid until the young reach independence. A typical Golden Eagle raises an average of only 1 young per year and up to 15 young over its lifetime. Pairs often refrain from laying eggs in some years, particularly when prey is scarce. The number of young that Golden Eagles produce each year depends on a combination of weather and prey conditions. Probably due mainly to the predictably severe weather conditions of this region, many of the nests and breeding territories located in the Mojave Desert may have been inactive for decades. Some pairs have likely been extirpated due to ORV use, camping, shooting, and other recreational activities (Bloom unpub. data).

3.2 Regulatory Protections

Regulatory protections for Golden Eagles require thorough surveys to determine the status of Golden Eagles for projects occurring within their range and habitat. The intent is to determine the extent of potential direct, indirect and cumulative effects projects may have on eagles, avoid and or minimize these effects, assess the potential for incidental take during project operation, and monitor eagle populations in response to increased usage of desert environments for alternative energy projects. These measures are predominantly driven by the Bald and Golden Eagle Protection Act.

The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), enacted in 1940, and amended several times since, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

For purposes of the guidelines, "disturb" means: “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."

In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment.

4.0 METHODS

4.1 Flight Restrictions

Bighorn Sheep (*Ovis canadensis*) are susceptible to potentially fatal falls when helicopters fly in close proximity, particularly during the lambing season. As such, the California Department of Fish and Wildlife places restrictions on flight locations and heights in some areas during some seasons. For BBI’s initial flight, surveyors were restricted from flying in the San Jacinto Mountains (southern half of the Study Area) because of lambing season. In the San Bernardino and Little San Bernardino Mountains in the northern portion of the Study Area survey personnel were given flight height restrictions of 500 to 1,500 feet.

After the first flight, BBI was notified that permission must be obtained from the appropriate federal agencies to fly helicopters over areas designated as Wilderness. As shown in Exhibit 1, the San Gorgonio Wilderness and San Jacinto Wilderness areas encompass much of the Study Area with appropriate nesting habitat for Golden Eagles. While BBI was able to quickly obtain flight permission from the Bureau of Land Management, BBI has not yet obtained permission from the US Forest Service. For this reason, a full survey was not completed.

4.2 Aerial Surveys

Helicopter surveys were performed on April 1 and 2 and May 26, 2013 by BBI biologist Peter H. Bloom, Ph.D. (lead observer), who was accompanied by either Scott Thomas or Chris A. Niemela (assistant observers). The helicopter (Bell Jet Ranger) was owned and operated by a pilot experienced in conducting aerial Golden Eagle nesting surveys who followed the survey methodology described in Section VII.b of Aerial Surveys of Pagel et al. (2010) to the extent possible. The biologists conducted an aerial examination of all appropriate nesting habitat at in areas accessible by helicopter at the time the survey was conducted. Certain areas could not be surveyed by helicopter at all because of aircraft restrictions, and in other areas helicopters were required to maintain a minimum height above ground level (agl) as described previously. During aerial surveys, BBI biologists searched for large stick nests of Golden Eagles and other raptors on cliff faces and transmission towers, while adhering to the flight restrictions that applied at the time of the survey.

GPS units (one primary and one backup) were used to mark locations of nest sites. The following information was recorded for each raptor or Common Raven (*Corvus corax*) nest found during surveys:

- Name of observer(s)
- Date/Time/Weather conditions
- Raptor species
- Location (GPS coordinates)
- Nest status (occupied, unoccupied, or unknown)
- Nest contents
- Nest condition
- Nest substrate
- Nest description (or other indications of breeding behavior)
- Other pertinent descriptive information

Photographs of nests were taken when feasible. These data were subsequently entered into BBI's proprietary biological resources database. Survey dates, times, and weather conditions are summarized in Table 1.

4.3 Ground Surveys

Ground surveys were conducted by BBI biologist Elias Elias in Whitewater Preserve on April 15 and 16, 2013, as this area could not be flown closer than 1,500 feet agl because of Bighorn Sheep flight restrictions. Elias spent a total of 12 hours looking for nests on 2 linear kilometers of cliff face north and south of the Whitewater Preserve Visitor Center. Adjacent cliffs were also surveyed by eye and ear for evidence of nests or raptor occupation. Survey dates, times, and weather conditions are summarized in Table 1.

Table 1. Field Survey Dates, Times, and Weather Conditions

Date	Type	Time	Weather	Biologists
05/26/2013	Aerial	0715-1230h	Start: 52° F, 0% cloud cover, Strong Wind out of the W End: 75° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Pete Bloom Chris Niemela
04/16/2013	Ground	0535-1145h	Start: 47° F, 26-50% cloud cover, Strong Wind out of the N End: 55° F, 0% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Elias Elias
04/15/2013	Ground	0545-1145h	Start: 54° F, 26-50% cloud cover, Strong Wind out of the W End: 60° F, 1-25% cloud cover, Strong Wind out of the NW No rain; No fog; No snow	Elias Elias
04/02/2013	Aerial	0630-1530h	Start: 60° F, 1-25% cloud cover, Calm End: 68° F, 0% cloud cover, Light Wind out of the W No rain; No fog; No snow	Pete Bloom Scott Thomas
04/01/2013	Aerial	0600-1100h	Start: 65° F, 1-25% cloud cover, Light Wind out of the W End: 68° F, 1-25% cloud cover, Strong Wind out of the W No rain; No fog; No snow	Pete Bloom Scott Thomas

4.4 Nest Determination

4.4.1 Species Identification

Biologists determined the species that built or occupied all large stick nests discovered during surveys by observing one or more of the following: defending or incubating adults, the size of the nest, stick size, eggs and chicks, volume and height of excrement, and anthropogenic material, if present. These distinctions were based upon the experience of the principal investigator (Dr. Bloom), which includes the entry and inspection of thousands of California raptor nests of 22 raptorial species including Golden Eagle, and the three raptor species most likely to usurp Golden Eagle nests in this region; Red-tailed Hawk, Prairie Falcon and Great Horned Owl.

In the southern California deserts, Red-tailed Hawks and Golden Eagles are the only raptors that build large nests constructed of sticks in cliffs. Common Ravens are non-raptors that also construct reasonably large stick nests in this region. Of these three species, Red-tailed Hawk and Common Raven nests are the most abundant by a large factor. Swainson's Hawks (*B. swainsoni*) nest infrequently in Joshua Trees or non-native tree species in the region. Fortunately, there are often predictable cues that can be used to differentiate among the nests of these species beyond the direct observation of adults, young or eggs in the nest:

- Ravens tend to have the smallest nests of the three species, followed by Red-tailed Hawks and finally, Golden Eagles.

- Although Red-tailed Hawk and Common Raven nests are sometimes difficult to distinguish from one another, Common Ravens are unique in that they often bring trash to nest sites near civilization, and their nests tend to be very tightly structured.

- Golden Eagle and Red-tailed Hawk nests can also be difficult to differentiate without ample experience. The two species often use each other’s nests for reproduction, though Red-tailed Hawks more commonly occupy inactive Golden Eagle nests than the other way around. This may be because Golden Eagles often have more alternate nests than do Red-tailed Hawks and because the larger Golden Eagle nests tend to survive longer. Newly created, first year Golden Eagle nests are typically 6-10 inches thick and as small as 4 feet wide and may overlap in size with Red-tailed Hawk nests. At the other end of the size spectrum, Golden Eagles may build large tower nests 15 feet in deep and 4 - 6 feet wide.

We considered nests greater than 5 feet wide and 3 feet thick to be in a size range definitive of eagle nests. The size of the sticks, both in diameter and length, also provides clues as to what species carried them and added them to the nest, with eagle nests containing much larger sticks than Red-tailed Hawks would generally bring to their nests.

4.4.2 Nest Status

An active nest was one that, at a minimum, had fresh sticks added to it during the current nesting season, or was found to contain eggs or young (dead or alive). A failed nest was one that at least had fresh sticks added to it in 2013, and may have had eggs or young that perished. The newness (fresh sticks) of nest sticks can often be determined by their color and condition if they were recently collected from live plants and trees, however bleaching by the desert sun can sometimes make new sticks appear old quickly. The placement, compaction or lack of compaction of sticks can be a more accurate determinant of newness, such as the fresh sticks seen on the top of a recently active Golden Eagle nest (Figure 2) compared with the compacted old sticks in the inactive nest. A successful nest was one that fledged at least one young (typically assumed if young were greater than eight weeks old during an observation). Active nests found at the end of the nesting cycle with considerable excrement in and around the nest, surrounding boulders or alternate nests were considered to have fledged. Nests without any of these signs were considered inactive.

Determining the activity status of nests during the breeding season is often unequivocal because in some instances an adult eagle will be incubating eggs or brooding nestlings and/or visible nestlings. For survey visits outside the actual nesting period (e.g., prior to egg laying or after fledging) more emphasis is placed on the condition of the nest and presence or absence of sign. Prior to egg laying, an active nest will be relatively level on top, will have visibly newer sticks several inches thick arranged on the top of the nest, may have fresh greenery (Figure 2), and may have fresh feathers. Following fledging, the biologists primarily consider the condition of the nest and the amount and relative age of whitewash, which in the case of

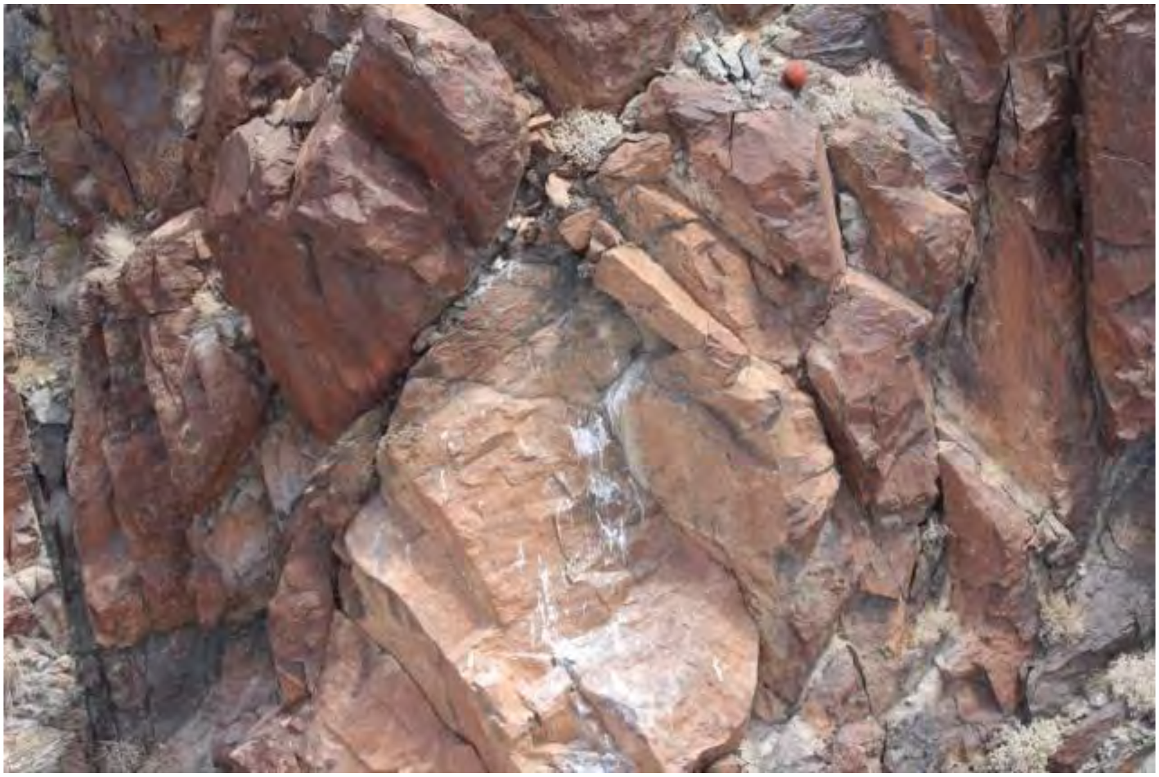
Golden Eagles should be present in significant amounts, forming a broad splatter pattern composed of long, large streaks often referred to as slices. At some locations with recently fledged multiple young, whitewash may resemble snow below the nest edge.

Although there may be no definitive determination of whether nestling(s) fledged, strong indicators should be present if the nest was active and at least contained chicks of more than a few weeks old. Whitewash sprays and slices behind the nest are not commonly deposited by adults and young. Significant accumulation of fresh whitewash behind, around, directly below, and approximately level with the nest are indicators that nestling(s) were present.

Other factors considered include the nearby presence or absence of adult and/or fledgling eagles, active nearby perch sites with fresh sign (Figure 3), and active alternative nests within close proximity to the nest in question.

Figure 2. Golden Eagle nest with fresh greenery on top. This nest was photographed in a different survey near Banning, California.

Figure 3. Golden Eagle perch site showing whitewash.



5.0 RESULTS & DISCUSSION

As noted previously in this report, the San Jacinto Mountains and other southern portions of the Study Area were not surveyed. In the northern portion of the Study Area, five Golden Eagle nests, constituting as many as four territories, were detected during BBI's 2013 surveys. Nests 14 and 17 were within 100 feet of each other, reflecting the fact that Golden Eagle pairs sometimes build two nearby nests in the same season and eventually use only one nest for the season's nesting attempt. None of the nests were determined to have been successful in 2013:

- On April 2, 2013, Bloom and Thomas identified 3 possible Golden Eagle nest locations/territories, one with 2 inactive/failed 2013 nests, one with an apparently failed 2013 nest (based on fresh whitewash and new sticks on the nests), and the last with an inactive nest. No Golden Eagles or active Golden Eagle nests were observed.
- On May 26, 2013, Bloom and Niemela flew upper and mid White Water Canyon, and nearby smaller canyons. One inactive old Golden Eagle nest location/territory was found, and 3 inactive Red-tailed Hawk nests were found. No Golden Eagles or active Golden Eagle nests were observed.

The April 1, 2013 survey covered limited area and was abandoned early because of high winds. The locations of all Golden Eagle nests within the 10-mile buffer of the project footprint, as well as those of other raptors and Common Ravens, are displayed in Exhibit 1. All of the nests were located in the San Bernardino Mountains, except for Red-tailed Hawk nest 34 which was located in the Little San Bernardino Mountains. Details regarding the status of each nest are presented in tabular format in Appendix A.

Because of the flight restrictions, which prevented a complete survey of the Study Area, it is impossible to draw conclusions about the complete status of the Golden Eagle nesting population in the Study Area for the Mesa Wind Project at this time. Based on observations gathered by BBI during bird-use count surveys (to be reported elsewhere), and the indicators of nesting attempts in 2013, Golden Eagles are indeed present within the Study Area; it is simply unclear how many, if any, nested in 2013.

6.0 LITERATURE CITED

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APPENDIX A. SURVEY RESULTS

The following is a list of all Corvid (Common Raven) and raptor nests identified in the Survey Area during spring and summer Golden Eagle nesting surveys between the dates of April 1 and May 26, 2013. For each nest, the following is indicated: (1) the nest identifier (ID) (also used in Exhibit 1), (2) the date of observation (Date), (3) species the nest was attributed to (Species), (4) substrate on which the nest was supported (Substrate), (5) contents of the nest at the time of observation (Contents), (6) the number of eggs or young (as indicated in "Contents" column) in the nest (Quantity), (7) biologist's notes regarding the observation (Notes), and (8) status of the nest at the time of the survey (Status).

ID	Date	Species	Substrate	Contents	Quantity	Notes	Status
4	5/26/2013	Golden Eagle	Cliff	Empty	0	Old nest.	Inactive
5	5/26/2013	Red-tailed Hawk	Cliff	Empty	0	Small nest made with big sticks. Possibly a GOEA nest.	Inactive
6	5/26/2013	Red-tailed Hawk	Cliff	Empty	0	large nest	Inactive
7	5/26/2013	Red-tailed Hawk	Cliff	Empty	0		Inactive
10	4/2/2013	Golden Eagle	Cliff	Empty	0		Inactive
12	4/2/2013	Peregrine Falcon	Cliff	Eggs	0	Peregrine Falcon incubating on old GOEA or RTHA nest	Active
13	4/2/2013	Golden Eagle	Cliff	Empty	0	Failed 2013 attempt	Failed
14	4/2/2013	Golden Eagle	Cliff	Empty	0	Northern nest of two GOEA nests at this point (100 feet from GOEA nest ID# 17) likely failed in 2013	Failed
17	4/2/2013	Golden Eagle	Cliff	Empty	0	Second of 2 nests within 100 feet of GOEA nest ID # 14, appears to have been a 2013 failed attempt, whitewash and fresh sticks on southern-most nest	Failed
20	4/2/2013	Red-tailed Hawk	Cliff	Eggs	0	Incubating Red-tailed Hawk	Active
21	4/2/2013	Red-tailed Hawk	Cliff	Empty	0		Active
22	4/2/2013	Red-tailed Hawk	Cliff	Empty	0		Inactive
23	4/2/2013	Red-tailed Hawk	Cliff	Empty	0		Active
24	4/2/2013	Red-tailed Hawk	Cliff	Empty	0		Active
25	4/2/2013	Red-tailed Hawk	Cliff	Empty	0		Inactive
26	4/2/2013	Common Raven	Cliff	Empty	0		Inactive
27	4/2/2013	Red-tailed Hawk	Cliff	Eggs	1	Incubating at least 1 egg	Active
28	4/2/2013	Prairie Falcon	Cliff	Unknown	0		Active

ID	Date	Species	Substrate	Contents	Quantity	Notes	Status
29	4/2/2013	Red-tailed Hawk	Cliff	Empty	0		Active
30	4/2/2013	Red-tailed Hawk	Cliff	Empty	0		Inactive
31	4/2/2013	Red-tailed Hawk	Utility Pole	Eggs	1	Incubating at least 1	Active
32	4/2/2013	Red-tailed Hawk	Cliff	Eggs	1	Incubating at least 1 egg	Active
33	4/2/2013	Red-tailed Hawk	Cliff	Eggs	1	Incubating at least 1 egg	Active
34	4/2/2013	Red-tailed Hawk	Cliff	Eggs	1	Incubating at least 1 egg	Active
35	4/2/2013	Common Raven	Cliff	Empty	0		Inactive

APPENDIX B. RESUMES

Peter H. Bloom, Ph.D. | President

Qualifications

Peter Bloom has been a professional environmental consultant for more than 35 years, principally in California. He specializes in the environmental sciences, is an internationally recognized expert in raptor biology and conservation and is considered one of the best all-around field biologists in California with his extensive knowledge and experience with all terrestrial vertebrate groups (amphibians, reptiles, birds, and mammals) and the vascular plants. Corporate clients for whom he has prepared or contributed to the production of numerous biological assessments and environmental impact reports include The Irvine Company, Rancho Mission Viejo, Tejon Ranch, Newhall Ranch, Ahmanson Ranch, Metropolitan Water District, and Los Angeles Department of Water and Power. He has also worked extensively with the Department of Defense, U.S. Fish and Wildlife Service, National Park Service, Bureau of Land Management, U.S. Forest Service, California Department of Fish and Game, and various non-profit conservation groups providing valuable research and advice, primarily on raptor ecology and conservation. He has conducted avian and herpetological research in the western United States, Alaska, Peru, Ecuador, and India and has been responsible for a wide variety of biological, ecological, and conservation studies ranging from local biological assessments to regional conservation planning. Dr. Bloom has published more than 30 peer-reviewed scientific papers and technical reports and taught California natural history at a local junior college for more than 12 years.

Professional Experience

As founder and President of Bloom Biological, Inc., Dr. Bloom has prepared numerous biological assessments and worked on an array of avian research projects in the western United States, Alaska, Peru, Ecuador, and India, spending over 600 hours conducting helicopter and fixed-wing nest survey work and aerial radio-tracking of eagles, California condors, hawks, and herons. He has also been responsible for conducting or supervising:

- fiber-optics and electrical powerline installation surveys and construction monitoring;
- surveys of nesting and wintering birds of prey for the California Department of Fish and Game (CDFG), BLM, U.S. Forest Service, Department of Defense, and numerous private land owners;
- transponder and radio-tagging of adult California red-legged frogs in Ventura County;
- focused surveys for California gnatcatcher, southwestern willow flycatcher, least Bell's vireo, yellow-billed cuckoo, Swainson’s hawks, golden eagles, arroyo toad, California red-legged frog, desert tortoise, Pacific pond turtle (including trapping and surveying habitat), coast horned lizard, flat-tailed horned lizard, Belding’s orange-throated whiptail, coastal whiptail, southern rubber boa, coastal patch-nosed snake, California glossy snake, two-striped garter snake (including trapping and surveying habitat), red-diamond rattlesnake, southern flying squirrel, and Pacific pocket mouse;
- general herpetological, small mammal, breeding and winter bird surveys in southern California;
- translocation of several hundred arroyo toads at Camp Pendleton Marine Corps Base;
- sensitive herpetological, mammal, and raptor surveys for the Transportation Corridor Agency in Orange County; and
- a raptor status and management plan for Naval Weapons Station, Seal Beach and Fallbrook Detachment.

As a research biologist at the Western Foundation of Vertebrate Zoology, served on the Science Advisory Board of the South Orange County Natural Communities Conservation Program. During his tenure there he:

- provided herpetological input into the Orange County environmental GIS and Cleveland National Forest environmental inventory.
- managed a long-term (30 yr.) raptor ecology study in California;
- managed a successful Great Blue Heron mitigation project designed to increase numbers of nesting herons through placement of artificial nest platforms;
- supervised and performed predator management activities for USFWS related to protection of California least terns, snowy plovers, and light-footed clapper rails in southwestern California from avian and other vertebrate predators (locations included Vandenberg Air Force Base, Naval Weapons Station Seal Beach, Batiquitos Lagoon, Port of Long Beach, Port of San Diego, and Tijuana Slough National Wildlife Refuge);
- supervised a two year CalTrans radio-telemetry study of nesting peregrine falcons and their relationship to California least terns in southwestern California; and
- organized and finished seven years of a MAPS passerine monitoring station.
- Together with sub-permittees, banded ~ 45,000 birds, mostly nestlings (1970 – 2013).

While serving as a research biologist and advisor in India, responsibilities included educating local biologists in the various techniques needed to capture birds, and conducting radio-telemetry research.

Served as thesis advisor to seven students at CSU Long Beach, one student at CSU Humboldt, and one student at CSU Fullerton.

As research biologist for the National Audubon Society, was responsible for writing the grant proposal and ultimately the successful award of two grants totaling $300,000 for six years of fulltime research on the ecology of southern California raptor populations. Responsibilities included project management, personnel selection, supervision of 12 volunteers, proposal and budget preparation, method design, data analysis, report writing, and publication of results. Directed the effort to capture all wild free-flying California condors for transmitter placement or captive breeding. Radio-tracked condors and conducted contaminant studies involving condors and 180 golden eagles.

As a research biologist at the University of California, Santa Cruz, was principal investigator on a three year study designed to determine the status of northern goshawk populations in California for CDFG.

Trapped and placed transmitters on great gray owls for the National Park Service , prairie falcons for CDFG, and peregrine falcons in Peru for the Bodega Bay Institute of Pollution Ecology.

As a wildlife biologist for BLM, was principal investigator of a study designed to determine the status of the Swainson's hawk in California. Surveyed all semi-arid and desert regions, reviewed literature and museum records, assessed reproduction, banded adults and young, and prepared the final report. His efforts contributed to the state-listing of Swainson's hawk as threatened.

Surveyed and reported on the ecology and distribution of raptors inhabiting the 200-square-mile Camp Pendleton Marine Corps Base.

While serving as a biological technician for BLM, conducted reptile, amphibian, small mammal, and avian surveys of 3.25 million acres of public land as part of a grazing EIS.

Education

Ph.D., Natural Resources, College of Natural Resources, University of Idaho, Moscow
M.S., Biology, California State University, Long Beach
B.S., Zoology, California State University, Long Beach

Awards

Graduation with Honors – Best Thesis Award School of Natural Sciences 1979
The Wildlife Society Western Section: Professional of the Year, 2005

Association of Field Ornithologists: Bergstrom Award, 1981
The Nature Conservancy: $27,000 for satellite transmitters, 2004 and 2006

Permits & Certifications

Federal endangered species recovery permit (TE-787376) for red-legged frog (including placement of transmitters and transponders), arroyo toad, California gnatcatcher (including banding), least Bell's vireo (including banding), southwestern willow flycatcher (including banding), California least tern, snowy plover, peregrine falcon (banding), bald eagle (banding), and Swainson's hawk (banding).

California scientific collecting permit and memorandum of understanding for all raptors, including state-threatened Swainson's hawk, reptiles, amphibians, small mammals, and many additional species of birds, including state-threatened western yellow-billed cuckoo, California least tern, snowy plover, peregrine falcon, and bald eagle
Federal Master Banding Permit No. 20431
- Federal Bird Marking and Salvage Permit
- Predator Management Permit
- Migratory Bird Relocation Permit (burrowing owl and other species)

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The biology and current status of the long-eared owl in coastal southern California. Bulletin of the Southern California Academy of Sciences 93:1-12. 1994.

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Importance of riparian systems to nesting Swainson's hawks in the Central Valley of California. Pgs. 612-618 in Warner, R.E. and K.M. Hendrix eds., California Riparian Systems, Ecology, Conservation, and Productive Management. University of California Press. 1984. (with R. D. Schlorff)

BBI

Scott Thomas | Director of Field Operations

Qualifications

Mr. Thomas has over 20 years of experience working with raptors, songbirds, small mammals, reptiles, and amphibians. He has banded several thousand raptors, including Golden Eagle; sea-eagles; Osprey; Swainson's, Red-tailed, and Red-shouldered Hawks; White-tailed Kite; Spotted and Burrowing owls, and more than 500 songbirds. He has extensive experience trapping and installing radio/satellite telemetry equipment on Red-tailed and Cooper's Hawks, Turkey Vultures, Golden Eagles, and numerous songbirds. He has performed and managed various raptor survey and monitoring studies and has served as Conservation Director for Audubon California and Raptor Program Coordinator and Regional Conservation Coordinator for the Raptor Research Foundation.

Professional Experience

Orange County Conservation Director for Sea and Sage Audubon Society and Audubon California. Duties have included: management of science programs, the Orange County Raptor Research Project, and other avian research programs; liaison and conservation with Starr Ranch Audubon Sanctuary; development of the monthly Science and Conservation Lecture Series; and development of the raptor and avian urban nesting habitat protection program. Responsibilities have also included oversight of chapter interactions with public agencies and the private sector development community.

Biological monitor at the Sunshine Canyon Landfill in Sylmar, California. Responsibilities included general biological monitoring, avian breeding surveys, raptor surveys, mist netting of several hundred passerines to determine breeding and range status, operation and management of 5 miles of reptile pit-fall traps, and capturing and relocating over 500 individuals of 15 reptile species.

Performed trapping and marking studies, habitat assessments and management programs, nest surveys, and monitoring studies for raptors and other birds. Highlights in recent years have included trapping and installing satellite transmitters on Golden Eagles in Sweden and Red-tailed Hawks and Turkey Vultures in southern California.

Completed a 15-month raptor survey for the PDV Wind Turbine Facility in the Antelope Valley. Project objectives were to survey and document resident, breeding, and migratory raptors, focusing on Swainson's Hawks, Golden Eagles, and other migrant raptors.
Performed breeding Swainson's Hawk surveys in the Antelope Valley, Owens Valley, and northeastern California. Captured and color marked 25 individuals in cooperation with the California Department of Fish and Game, and University of California, Berkeley.

Performed raptor surveys in the Las Virgenes Canyon Reserve (formerly Ohmanson Ranch) and breeding raptor surveys and subsequent construction monitoring in Moorpark, California. Performed raptor surveys in the Santa Monica Mountains Conservancy open spaces, focusing on nesting and breeding success.

Conducted raptor research and monitoring projects on the Irvine Ranch Land Reserve, the Orange County Water District at Prado Basin, and the Rancho Mission Viejo Land Conservancy. Tasks included a satellite telemetry study, monitoring of natal dispersal and philopatry, and annual report preparation.

Monitored wintering Burrowing Owls and Peregrine Falcons and conducted pre-construction surveys for breeding passerines and raptors for the City of El Segundo.

Served as field manager for a 3-year survey of Burrowing Owl densities in the Imperial Valley coordinating the work of 15-20 field biologists, and performed protocol surveys that included the capture, banding and passive relocation of approximately 15 Burrowing Owl pairs. Performed a Burrowing Owl survey and translocation project for Cal Trans in south San Diego County, which included the capture and translocation of breeding pairs. Conducted protocol Burrowing Owl surveys with CH2M Hill Inc. in Western Riverside County. Monitored and banded Burrowing Owls on the Seal Beach Naval Weapons Station, California. Performed Burrowing Owl presence/absence and breeding surveys in Menifee, Rubidoux, and Victorville, California.

Assisted with protocol Spotted Owl surveys in the Santa Ana Mountains.

Developed and managed the Orange County (California) Cactus Wren project in coordination with the Audubon Society, The Nature Conservancy, and the Nature Reserve of Orange County, which includes banding Cactus Wrens and conducting nesting surveys.

Performed numerous Arroyo Toad surveys and monitoring studies.

Education

A.S. (Environmental Science) Saddleback College
B.S. (Biology) California State University (in progress)

Permits & Certifications

California and federal permits to handle, take blood, capture, and band all diurnal and nocturnal raptors
Federal bird marking and salvage sub-permit, including eagles; approved to mark, install telemetry equipment, and take blood samples
California scientific collectors permit no. 801128-03
Federal banding sub-permit 20431-AT
Federal bird marking and salvage permit
Federal 10A(1) endangered species sub-permit TE-787376 for arroyo toad and California gnatcatcher
Federal burrowing owl translocation permit MB0022490
Federal migratory bird predator management authorization
Federal migratory bird avian relocation permit
Desert tortoise egg handling and burrow construction certificate
Desert Tortoise Council-approved for conducting desert tortoise monitoring surveys
Southwestern Willow Flycatcher Workshop

Chris Niemela | Biologist

Qualifications

Chris Niemela has more than 16 years of classroom and field experience in general ecology, with an emphasis in avian ecology and 13 years of experience in environmental consulting (surveys, biological assessment, monitoring). Ms. Niemala has particular expertise with birds of prey, having conducted her master's degree research on White-tailed Kite habitat use in southern California and banded hundreds of raptors of ten species, including both adult and nestling Golden Eagles in southern California. Ms. Niemela has also been monitoring VHF and PTT equipped California Condors, trapping Golden Eagles, and locating Golden Eagle and other raptor nests within the Tehachapi Mountains for the last five years. Ms. Niemela also has extensive experience in avian censusing, nest searching, and monitoring in various habitats as well as trapping and handling passerines, reptiles, amphibians, and small mammals.

Professional Experience

From 1998 to present, worked on a variety of projects for the Conservation Biology Institute, Imperial Irrigation District, MCB Camp Pendleton, Metropolitan Water District, National Park Service, Naval Weapons Station Seal Beach Detachment Fallbrook, Newhall Land, Rancho Mission Viejo, San Diego Gas & Electric, Santa Monica Mountains Conservancy, Southern California Edison, Sunshine Canyon Landfill, Tejon Ranch, Transportation Corridor Agency. Activities have included:

- 6 years of radio telemetry on California Condors in southern CA (2007-2013).
- Extensive Golden Eagle nest surveys (ground and helicopter), monitoring, and trapping.
- Extensive sensitive species surveying and monitoring (including California gnatcatcher, least Bell's vireo, arroyo toad, quino checkerspot butterfly, and Swainson's hawk).
- Raptor and passerine migration counts and trapping for proposed wind farm sites.
- Biological assessments and monitoring; wildlife inventories; focused breeding bird surveys.
- Extensive surveying and trapping of songbirds, amphibians, reptiles, and small mammals.
- Study, capture, band and monitor all species of southern CA diurnal and nocturnal raptors.
- Energy related bird surveys and monitoring
- Data entry/analysis, GIS, technical writing, and report preparation.

As a Conservation Scientist at the Tejon Ranch Conservancy, assisted with development and implementation of science and stewardship activities

As Lead Bird Bander for the Institute for Bird Populations MAPS station, San Juan Capistrano, coordinated volunteers and field efforts; maintained datasets; mist-netted, banded, and processed passerines for nation-wide population monitoring effort.

As a Field Investigator for USGS-BRD, Mid-continent Ecological Science Center conducted stable isotope analysis of White-tailed Kite populations. Work included trapping white-tailed kites and collecting blood and feather samples for laboratory analysis.

As a Raptor Biologist for Predator Research and Management, Institute for Wildlife Studies, San Clemente Island Loggerhead Shrike Recovery Program conducted non-lethal removal (trapping and holding) of raptors and foxes from shrike territories; island-wide raptor surveys, nest searching, and monitoring; and care, feeding, and handling of captive raptors and foxes.

As an Avian Censuser for Great Basin Bird Observatory, Reno, NV collected data on breeding birds for the Nevada Breeding Bird Atlas.

As a Wildlife Biologist/Technical Writer for Natural Resource Consultants, Laguna Beach conducted biological assessments of various habitat types throughout southern California. Work included endangered Quino checkerspot butterfly surveys: presence/absence surveys, host plant surveys, habitat suitability assessment, vegetation mapping, writing technical reports, organizing and entering data, producing graphics.

Education

M.S., Natural Resources/Wildlife, 2007, Humboldt State University, Arcata, CA
B.S., Wildlife, 1997, Humboldt State University, Arcata, CA

Permits & Certifications

Federal Fish and Wildlife Permit 10(a)(1)(A) for:

- Arroyo southwestern toad (*Bufo microscaphus californicas*) (#TE-787376-8).
- California gnatcatcher (*Polioptila californica californica*) (#TE-787376-8).
- Least Bell's Vireo (*Vireo bellii pusillus*) (#TE-787376-8).
- Quino checkerspot butterfly (*Euphydryas editha quino*), (#TE-049470-0)

Federal Bird Marking and Salvage Permit, (subpermittee #20431-AZ), since 1998. U.S. Department of Interior, National Bird Banding Laboratory. Authorized to trap and band most species.
State of California Scientific Collecting Permit and Memorandum of Understanding for all birds, reptiles, amphibians, and small mammals (#801099-01)..

APPENDIX C-5

2016 Golden Eagle Nest Surveys Report

ENVIRONMENTAL & STATISTICAL CONSULTANTS
456 SW Monroe Ave, Suite 106, Corvallis, OR 97333
Phone: 541-230-1790 ◆ www.west-inc.com ◆ Fax: 307-637-6981

MEMORANDUM

Date: August 2016

To: Brookfield Renewable Energy

From: Joel Thompson and Troy Rintz – WEST, Inc.

Subject: Mesa Golden Eagle Nest Surveys – 2015/2016 Summary

Introduction

At the request of Brookfield Renewable Energy (Brookfield), WEST, Inc. conducted aerial and ground surveys to locate and monitor golden eagle (*Aquila chrysaetos*) nesting activity in the vicinity of the Mesa Wind Energy Project (Mesa) during the 2015/2016 breeding season. This memo provides a summary of the aerial and ground nest surveys conducted in December 2015, February 2016, and May 2016.

Golden Eagle Nest Surveys

Methods

A survey for potential golden eagle nests was conducted within a 10-mile buffer area surrounding Mesa (Figure 1). Prior to conducting surveys, WEST reviewed data from prior nest surveys conducted for Mesa and requested known eagle nest location data within the 10-mile buffer from the US Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW). The survey included a search of potentially suitable nest substrates (e.g., cliffs, large trees, transmission-line towers) within the 10-mile survey buffer, as well as focused efforts to locate all previously documented eagle nests in the survey area. All large nest structures considered capable of supporting golden eagles identified during surveys were documented and assessed for occupancy. Along with nest location data, the condition and current status (e.g., occupied, unoccupied, active) of all possible eagle nests were recorded. To the extent practicable, the survey methods followed those recommended in the USFWS Eagle Conservation Plan Guidance (ECPG; USFWS 2013).

The initial survey was conducted in late December, prior to the peninsular desert bighorn (*Ovis canadensis*) lambing season closure went into effect on January 1. Late December is a time

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when resident eagles in this area should be courting and defending territories, making them relatively obvious to observers. Prior to conducting surveys, WEST contacted the US Forest Service (USFS) and obtained permission to fly at low flight levels over Wilderness areas within the 10-mile buffer.

The second round of surveys was conducted in late February and focused on areas where potential eagle nests were documented during the initial survey. This is a time when nests in this region should show evidence of nest tending or contain eggs. Surveys in February were conducted from the ground and again followed the recommendations of the ECPG (USFWS 2013), with the exception of nest 092 which was not readily accessible from the ground and was therefore assessed from the Palm Springs Aerial Tramway, which greatly limited the survey effort at this nest. A second ground-based survey was conducted in May 2016 to confirm the occupancy status of most previously identified nests. All ground-based surveys lasted for four hours, with the exception of the one survey conducted via the Aerial Tram, which was limited to a brief (approximately 5-minute) view of the nest and surrounding area.

Ground-based surveys were conducted by a single observer while aerial surveys included two observers, in addition to the pilot. All surveys were conducted by biologists with prior experience conducting golden eagle nest surveys. Data collected for each survey included the date, observer, weather and wind conditions, GPS location, nest condition and activity status, nest substrate, and presence of raptors on the nest or in the general vicinity. A GPS track flight log was recorded for the entire aerial survey.

Results

During the initial survey in December, 12 nests were documented that were considered potentially suitable for golden eagles. All 12 nests were inactive (i.e., did not contain eggs or incubating adults) and considered unoccupied (i.e., no eagles were observed in the vicinity of nests and no evidence of nest tending or recent use was observed) at the time of survey. Ten of the 12 nests identified during the initial survey were checked again during ground-based surveys conducted from February 22 – 28, 2016. Two nests (086 and 090) were not accessible due to fire closures and unsafe passage to the nest sites. All nests were again considered to be inactive and unoccupied, as no adult eagles, fresh nest materials, or whitewash was visible at any of the nest sites (Table 1).

A second ground-based survey was conducted in May 2016, during which eight of the 12 nests were surveyed. One nest (052) was determined to be occupied by a red-tailed hawk (*Buteo jamaicensis*) and one was determined to be occupied by golden eagles (Table 1). The occupied golden eagle nest structure was not visible during the survey; however a pair of adult golden eagles was observed in the vicinity of the nest site for much of the survey period. In addition, the adults were observed delivering items (assumed to be prey) to the nest area. As such, it was assumed that the nest was active and contained young, although that was not confirmed visually. Nests 086 and 090 were again not visited because of access issues due to fire closures and unsafe passage to the nest sites. Nest 049 was located just outside the 10-mi survey buffer and was not visited during the May survey. Nest 092, which was surveyed via the Tram in February, was not surveyed during the May visit. Based on the available survey data from the three survey visits during the 2015/2016 breeding season, only one nest (093) was determined to be occupied (Table 1). The one active golden eagle nest was located between 7.0 and 8.0 miles (11.2 – 12.9 km) from proposed turbine locations within the Mesa Wind Energy Project (Figure 1).

Table 1. Status of possible golden eagle nests within 10 miles of the Mesa Wind Energy Facility as of May27, 2016.

Nest ID	Nest Status Dec 2015	Nest Status Feb 2016	Nest Status May 2016	Territory Status 2015-2016
049	Inactive	Inactive	N/A	Unoccupied
051	Inactive	Inactive	Inactive[a]	Unoccupied
052	Inactive	Inactive	Active - RTHA	Occupied - RTHA
054	Inactive	Inactive	Inactive	Unoccupied
056	Inactive	Inactive	Inactive	Unoccupied
071	Inactive	Inactive	Inactive	Unoccupied
086	Inactive	N/A	N/A	Unoccupied
087	Inactive	Inactive	Inactive	Unoccupied
088	Inactive	Inactive	Inactive[a]	Unoccupied
090	Inactive	N/A	N/A	Unoccupied
092	Inactive	Inactive[b]	N/A	Unoccupied
093	Inactive	Inactive	Active GOEA[c]	Occupied - GOEA

[a] could not actually see nest, but no evidence of use based on observation of the nest area
[b] nest only visible for approximately 5 minutes from aerial tram, but no obvious evidence of use
[c] could not actually see nest, but adult golden eagles were seen delivering prey/ materials to nest area

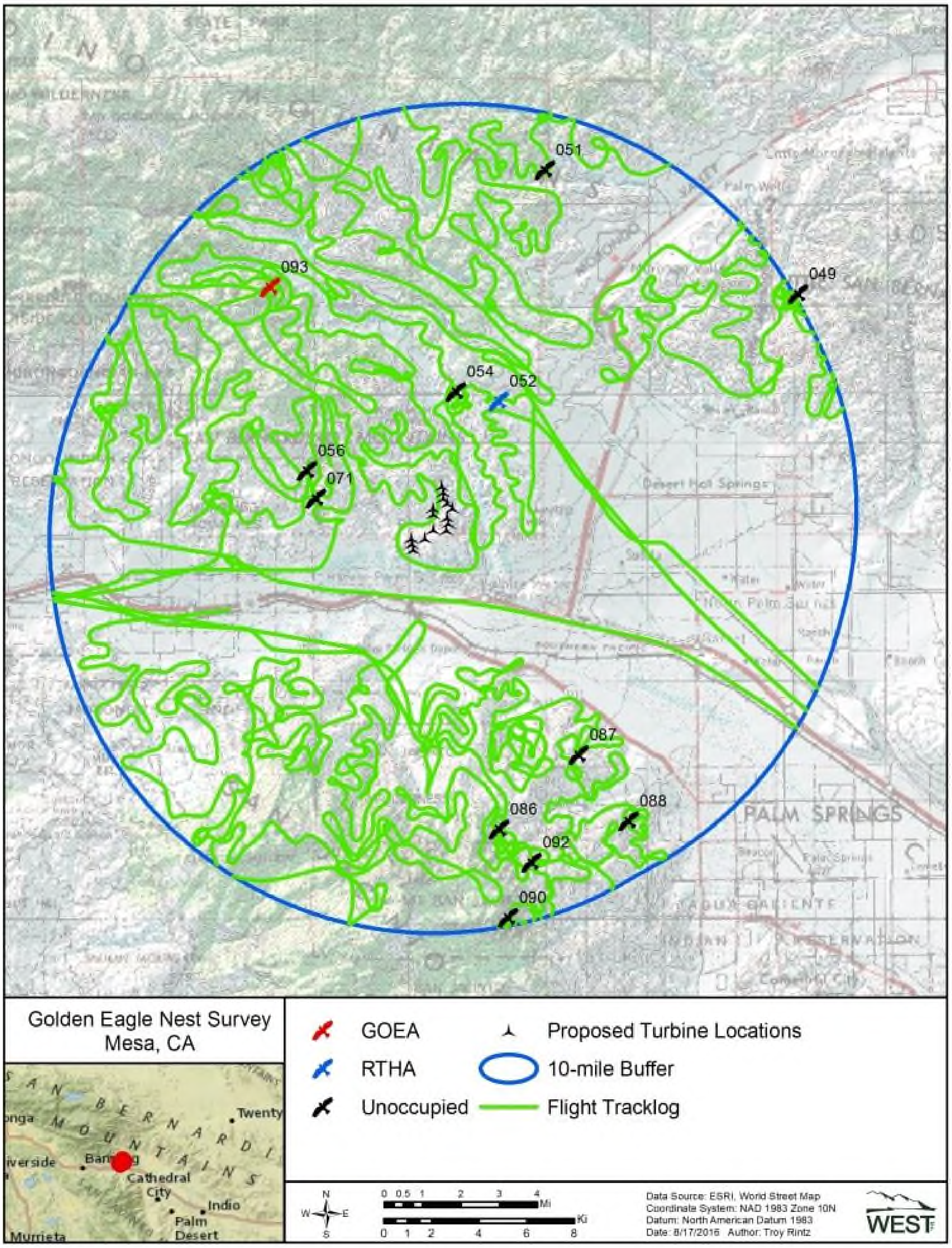

Figure 1. Results of December 2015 and February 2016 golden eagle nest surveys within 10 miles of the Mesa Wind Energy Facility.

APPENDIX C-6

2017 Large Bird Use Surveys Report

Large Bird Use Surveys for the Mesa Wind Energy Repower Project Riverside County, California

Final Report

November 2015 – November 2016

Prepared for:

Brookfield Renewable Energy Group

Western US Regional Operations

Prepared by:

Western EcoSystems Technology, Inc.
456 SW Monroe Ave, Suite 106
Corvallis, Oregon 97333

March 20, 2017

EXECUTIVE SUMMARY

In 2015, Brookfield Renewable Energy Partners, L.P. (Brookfield) contracted Western Ecosystems Technology, Inc. to conduct avian use surveys at the proposed Mesa Wind Energy Repower Project (Mesa or Project) to estimate the potential impacts of wind energy facility construction and operations on large birds, particularly golden eagles and other diurnal raptor species. This document provides the results of large bird/eagle observation surveys conducted at Mesa between November 2015 and November 2016.

The existing 30-megawatt (MW) Mesa Wind Energy Project, which Brookfield is proposing to repower, is located within the San Gorgonio Wind Resource Area, a region of high density wind energy development in Riverside County, California. The Project is located approximately 13 kilometers (km; eight miles) northwest of Palm Springs in the southeastern San Bernardino Mountains.

The principal objectives of the large bird/eagle observation surveys were: 1) to provide site-specific avian resource and use data that would be useful in evaluating potential impacts of the proposed Project on diurnal raptors and other large bird groups; and 2) to collect data to evaluate the temporal and spatial use of the Mesa site specifically by golden eagles to support development of an Eagle Conservation Plan for the Project, if deemed warranted. Weekly fixed-point large bird/eagle surveys were conducted at three surveys stations located throughout the Project from November 13, 2015, through November 7, 2016.

A total of 159 2-hour (hr) large bird/eagle surveys were conducted, during which time 394 large bird observations within 167 separate groups were recorded and 12 unique bird species were identified. Eight diurnal raptor species, one vulture species, one waterbird species, one waterfowl species, and one large corvid species were recorded. Overall large bird use and diversity was highest during winter and lowest in summer. The most abundant large bird species observed were Canada goose (145 observations in three groups), common raven (105 observations in 77 groups), and American kestrel (44 observations in 42 groups). A total of four golden eagle observations were recorded during the study: three in winter and one in fall.

Diurnal raptor use was higher during the winter and spring (0.78 and 0.55 birds per 800-meter [m; 2,625-foot (ft)] plot per 2-hr survey, respectively) compared to summer and fall (0.19 and 0.39 birds/800-m plot/2-hr survey, respectively). American kestrel had the highest mean use of all diurnal raptor species in the summer, fall, and spring (0.14, 0.22, and 0.40 birds/800-m plot/2-hr survey, respectively), while American kestrel and red-tailed hawk had the highest use during winter (both with 0.31 birds/800-m plot/2-hr survey).

The majority of diurnal raptors (84.7%) were observed flying at the proposed rotor swept height, while the majority of vultures (93.5%) and all (100%) of waterbirds and waterfowl were observed flying above the rotor swept zone. Of the four eagle observations, only one was recorded at or below 200 m (656 ft) above ground level within the 800-m survey plot, resulting in a total of

three eagle minutes recorded during the study. Species with the highest exposure indices were common raven (0.44), American kestrel (0.19), and red-tailed hawk (0.14).

Based on seasonal mean use during the study period, it is expected that risk to raptors would be unequal across seasons, with the highest risk in the winter and lowest risk during summer. While surveys at Mesa were conducted over a 2-hr survey period, for comparison to studies at other wind energy facilities that historically collected data during 20-minutes (min) surveys, we calculated a use estimate based on the first 20 min of the survey to ensure data were comparable. The adjusted mean annual diurnal raptor use at Mesa was 0.09 raptors/800-meter plot/20-min survey, which ranked third lowest compared to use at 46 other studies of wind energy facilities where protocols similar to the present study were implemented and data were collected for three or four different seasons.

Seven sensitive bird species were observed during surveys or incidentally within or near the Project. None of these seven sensitive species are state- or federal-listed species. Based on the data collected to date, there is some potential for impacts to species of concern within Mesa; however, given the levels of use documented to date, combined with fatality data from other facilities, impacts to sensitive species are not expected to be significant.

Two full years of Tier 3 avian studies under the WEG (USFWS 2012) and ECPG (USFWS 2013) have now been conducted at Mesa. While this report is specific to large bird use, previous avian use survey, eagle nest surveys, and acoustic bat surveys have been or are being conducted at Mesa and are reported on elsewhere. Combined, these data provide a solid baseline of information for comparison with future Tier 4 post-construction monitoring studies. Consistent with the WEG, the development of a Bird and Bat Conservation Strategy is recommended such that all available data for the Project are summarized in a single document, along with Brookfield's strategy for managing and reducing the risk of impacts to birds and bats at Mesa over the long term.

STUDY PARTICIPANTS

Western EcoSystems Technology

Joel Thompson	Project Manager
Carmen Boyd	Data Manager
Wendy Bruso	Report Manager
Mandy Kauffman	Statistician
Jean-Paul Wilson	Data Analysis
Andrea Chatfield	Report Compiler
Andrea Palochak	Technical Editor
Troy Rintz	GIS Technician
Troy Rintz	Field Coordinator
Darin Blood	Field Technician
Bill Deppe	Field Technician
John Edwards	Field Technician

REPORT REFERENCE

Western EcoSystems Technology, Inc. (WEST). 2017. Large Bird Use Surveys for the Mesa Wind Energy Repower Project, Riverside County, California. Final Report: November 2015 – November 2016. Prepared for Brookfield Renewable Energy Partners, L.P., Western US Regional Operations. Prepared by Western EcoSystems Technology, Inc. (WEST), Corvallis, Oregon. March 20, 2017.

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INTRODUCTION

In 2015, Brookfield Renewable Energy Partners, L.P. (Brookfield) contracted Western Ecosystems Technology, Inc. (WEST) to conduct large bird use surveys at the proposed Mesa Wind Energy Repower Project (Mesa or Project) to estimate the potential impacts of Project construction and operations on large birds, particularly golden eagles (*Aquila chrysaetos*) and other diurnal raptor species. This document provides the results of large bird use surveys conducted at Mesa between November 2015 and November 2016. Studies at Mesa were designed to address the questions posed under Tier 3 of the US Fish and Wildlife Service (USFWS) *Land-Based Wind Energy Guidelines* (WEG; USFWS 2012) and USFWS *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013). The principal objective of the study was to provide site-specific golden eagle (and other large bird) resource and use data that would be useful in evaluating the potential impacts of the Project. A golden eagle nest survey was also conducted in support of the Project, the results of which are presented in a separate report.

STUDY AREA

The existing 30-megawatt (MW) Mesa Wind Energy Project, which Brookfield is proposing to repower, is located within the San Gorgonio Wind Resource Area (SGWRA), a region of high-density wind energy development in Riverside County, California (Figure 1). Currently, the project consists of 460 Vestas V-15 65kw turbines. The proposed repower will replace the old turbines with approximately 15 modern turbines, with the final number dependent on turbine specifications. The Project is located approximately 13 kilometers (km; eight miles) northwest of Palm Springs in the southeastern San Bernardino Mountains. The Project lies at the northwestern-most limits of the Sonoran Desert, within the Sonoran Basin and Range Ecoregion (US Environmental Protection Agency [USEPA] 2017). The Mojave Basin and Range Ecoregion is situated directly to the northeast of the Project and the Southern California Mountain Ecoregion lies directly to the west. The Sonoran Basin and Range Ecoregion contains scattered low mountains and has large tracts of federally owned land, most of which is used for military training. The region experiences very hot summers, mild winters, frequent gusty winds, and very little annual rainfall, averaging less than six inches (15 centimeters) per year. Temperatures exceed an average of 100 degrees Fahrenheit (°F; 38 °Celcius [C]) for four months each year.

Vegetation within the Project is primarily Sonoran mixed woody and succulent scrub, and includes creosote bush (*Larrea tridentata*), and a variety of woody and herbaceous plants, including indigo bush (*Psorothamnus arborescens*), catclaw (*Acacia greggii*), desert lavender (*Hyptis emoryi*), rock daisy (*Perityle emoryi*), and palo verde . There are no surface waters within the Project area; however, several ephemeral washes are present within the site. Existing turbines are generally oriented in north to south running rows along the tops of steeply sloped ridges. Elevations within the Project range from about 600 to 900 meters (m; 1,969 to 2,953 feet [ft]) above mean sea level.

Figure 1. Location of the Mesa Wind Energy Repower Project, Riverside County, California.

METHODS

The 2015-2016 avian use surveys conducted at Mesa consisted of weekly large bird/eagle observation surveys. Incidental wildlife observations were recorded when surveyors encountered wildlife species of interest when traveling between survey points or were otherwise working within the Project area.

Large Bird Use Surveys

The objectives of the surveys were 2-fold: 1) to provide information that could be used to predict potential impacts to diurnal raptors and other large bird species by estimating the temporal and spatial use of the project area by these bird types; and 2) to evaluate the distribution and flight behavior of golden eagles within the Project area and inform development of an Eagle Conservation Plan, if deemed warranted based on the data.

Survey Plots

Three fixed-point survey stations were selected to provide 100% visual coverage of all proposed turbine locations within the Project (Figure 2), exceeding the survey coverage recommended in the ECPG (USFWS 2013). Survey plots consisted of an 800-m (2,625-ft) radius circle centered on the survey station.

Survey Methodology

Surveys included all large birds (crow size or larger); however, an emphasis was placed on diurnal raptor species and golden eagles in particular. For each large bird observation, the distance from the surveyor was recorded, along with the behavior of each bird and the habitat in which or over which the bird occurred. Flight direction and approximate flight height above ground level (AGL) at first observation, along with the lowest and highest flight heights observed during the survey, were also recorded. Additionally, for each golden eagle observed, flight height and behavior were recorded at 1-minute (min) intervals throughout the duration of the observation for later use in an eagle risk assessment, if warranted. Laser range finders and/or topographic maps with pre-loaded distance bands (i.e., 400 m [1,312 ft] and 800 m) around the survey point were used to assist with estimation of flight heights and distances. Perch locations and flight paths of large birds and other species of interest were mapped on US Geological Survey (USGS) 1:24,000 topographic maps and given corresponding observation numbers. Flight paths were later digitized using ArcGIS 10.3.

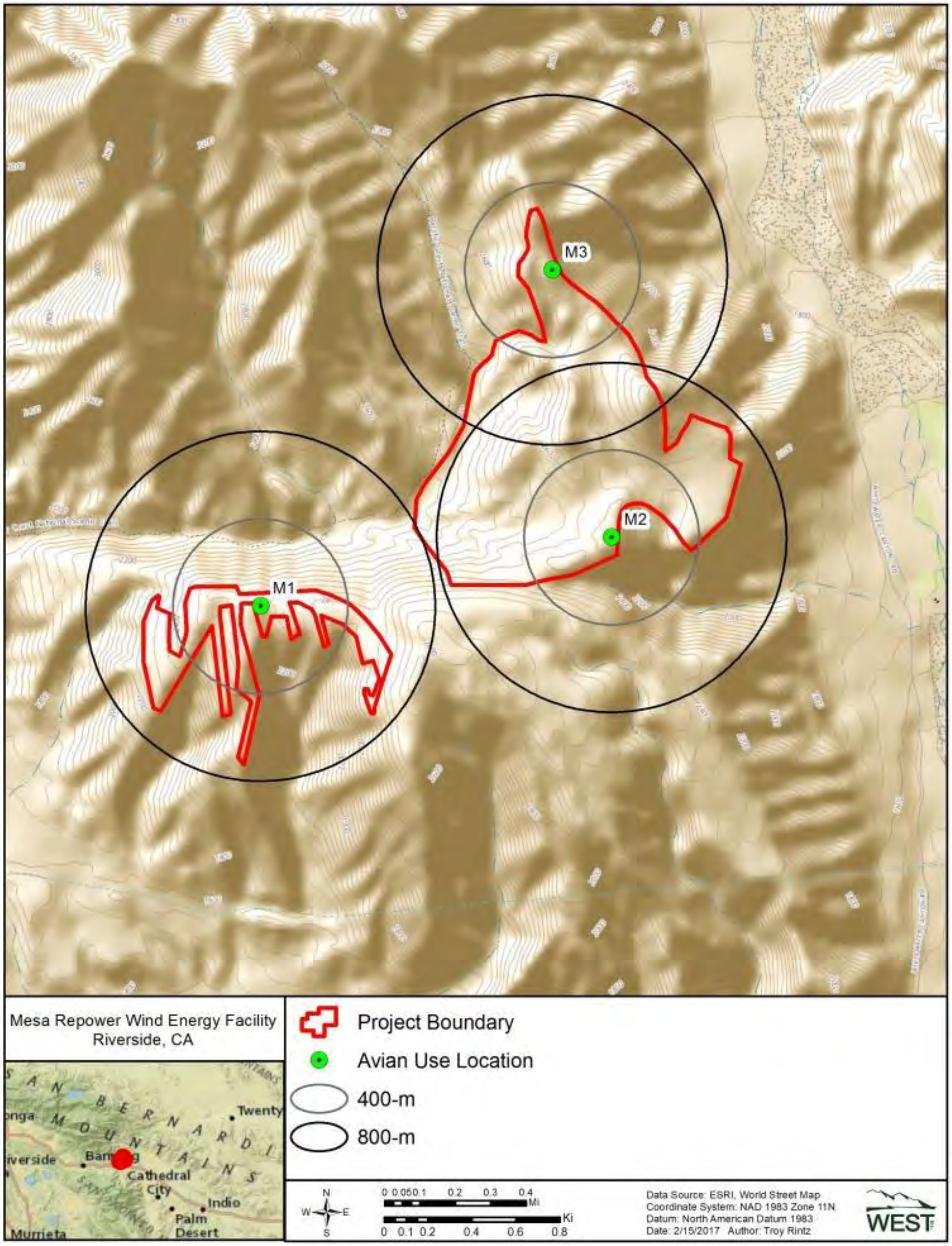

Figure 2. Locations of large bird use survey plots in the Mesa Wind Energy Repower Project, Riverside County, California.

Survey Schedule

Sampling intensity was designed to document bird use and behavior both spatially and temporally within the Mesa Project. Surveys at each station were conducted for a period of two hours each week during all four seasons, with seasons defined as spring (March 01 – May 31), summer (June 1 – August 31), fall (September 1 – November 15), and winter (November 16 – February 29). This survey scheduled allowed for each plot to be surveyed for eight hours every four weeks, exceeding the USFWS minimum recommendation of 1-2 hours per month (USFWS 2013). Surveys were conducted during daylight hours and survey periods were varied to cover a variety of daylight hours during each season.

Incidental Observations

Incidental wildlife observations provide records of wildlife seen outside of the standardized surveys. Diurnal raptors, unusual or unique birds, sensitive species, mammals, reptiles, and amphibians observed outside of standardized surveys were recorded as incidental observations, and the date, time, species, number of individuals, sex/age class, and location were recorded. The location of sensitive species was recorded using a hand-held Global Positioning System unit.

Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) measures were implemented at all stages of the study, including in the field, during data entry and analysis, and report writing. Following surveys, observers were responsible for inspecting data forms for completeness, accuracy, and legibility. Potentially erroneous data was identified using a series of database queries. Irregular codes or data suspected as being questionable were discussed with the observer and/or project manager. Errors, omissions, or problems identified in later stages of analysis were traced back to the raw data forms, and appropriate changes in all steps were made.

Data Compilation and Storage

A SQL Server database was used to store, organize, and retrieve survey data. Data were keyed into the electronic database using a pre-defined protocol to facilitate subsequent QA/QC and analysis. All data forms and electronic data files were retained for reference.

Statistical Analysis

For analysis purposes, a visit was defined as the required length of time, in days, to survey all of the plots once. Visits were assigned according to the following criteria: 1) a single visit had to be completed in a single season; and 2) a visit could be spread across multiple dates, but a single date could not contain surveys from multiple visits.

Large Bird Diversity and Species Richness

Bird diversity was illustrated by the total number of unique species observed. Species lists (with the number of observations and the number of groups) were generated by season and included all observations of birds detected, regardless of their distance from the observer. In some cases, the tally may represent repeated sightings of the same individual. For example, a sum of 20 observations of red-tailed hawk (*Buteo jamaicensis*) may be 20 unique birds, or it may consist of a single bird observed on 20 separate occasions, or some combination in between. Species richness by season was calculated by averaging the total number of species observed within each plot during a visit, then averaging across plots within each visit, followed by averaging across visits within the season. Overall species richness was calculated as a weighted average of seasonal values weighted by the number of days in each season. Species diversity and richness were compared among seasons.

Large Bird Use, Percent of Use, and Frequency of Occurrence

Standardized large bird use estimates included all large birds detected within the 800-m radius plot. The metric used to measure mean bird use was the number of birds per plot per survey. These standardized estimates of mean bird use were used to compare differences between bird types, seasons, survey points, and other studies where similar methods were used. Mean use by season was calculated by summing the total number of birds seen within each plot during a visit, then averaging across plots within each visit, followed by averaging across visits within the season. Overall mean use was calculated as a weighted average of seasonal values, weighted by the number of days in each season. While surveys at Mesa were conducted over a 2-hr survey period, for comparison to studies at other wind energy facilities that historically collected data during 20-min surveys, a separate use estimate was also calculated based on only the first 20 min of the survey.

Large Bird Flight Height and Behavior

Bird flight heights are important metrics to assess potential exposure to turbine blades. Flight height information was used to calculate the percentage of birds observed flying within the rotor swept height (RSH) for turbines likely to be used at the Project. A RSH of 25 to 150 m (82 to 492 ft) AGL was used for the purposes of assessing potential collision with turbine blades. The flight height recorded during the initial observation was used to calculate mean flight heights and the percentage of birds flying within the RSH. The percentage of birds flying within the RSH at any time was calculated using the lowest and highest flight heights recorded.

Bird Exposure Index

The bird exposure index was used as a relative measure of species-specific risk of turbine collision and the species most likely to occur as fatalities at the wind energy facility. A relative index of bird exposure (R) was calculated for bird species observed during the surveys using the following formula:

$$R = A \times P_f \times P_t$$

where A equals mean relative use for species *i* averaged across all surveys, P_f equals the proportion of all observations of species *i* where activity was recorded as flying (an index to the approximate percentage of time species *i* spends flying during the daylight period), and P_t equals the proportion of all initial flight height observations of species *i* within the likely RSH.

The exposure index does not account for other possible collision risk factors, such as foraging or courtship behavior.

Spatial Use

Flight paths were qualitatively compared to Project area characteristics (e.g., topographic features). The objective of mapping observed large bird locations and flight paths was to identify areas of concentrated use by diurnal raptors and other large birds and/or consistent flight patterns within the Project area. This information can be useful in turbine layout design or micro-siting individual turbines to reduce risk to birds.

RESULTS

Large Bird Use Surveys

Surveys at Mesa were conducted from November 13, 2015, through November 7, 2016, during which time 53 visits, totaling 159 2-hour surveys were completed (Table 1).

Table 1. Summary of species richness (species/800-meter plot/2-hour survey), and sample size by season and overall during the large bird/eagle surveys at the Mesa Wind Energy Repower Project from November 13, 2015 – November 7, 2016.

Season	Number of Visits	# Surveys Conducted	# Unique Species	Species Richness
Spring	14	42	6	1.10
Summer	12	36	3	0.31
Fall	12	36	5	0.81
Winter	15	45	8	0.76
Overall	**53**	**159**	**12**	**0.74**

Bird Diversity and Species Richness

Twelve unique large bird species were observed over the course of the surveys (Table 1; Appendix A). Overall large bird diversity ranged from a high of eight unique species in winter to a low of three unique species in summer (Table 1). Species richness was highest during the spring (1.10 species/800-m plot/2-hr survey) and lowest in the summer (0.31 species/800-m plot/2-hr survey; Table 1), which indicates that more species were observed per plot on average during spring, with fewer species observed during summer.

A total of 394 bird observations were recorded within 167 separate groups during the large bird/eagle surveys. Eight diurnal raptor species, one waterbird species, one waterfowl species, one vulture species, and one large corvid species were recorded (Appendix A). Canada goose (*Branta canadensis*) accounted for the largest number of large bird observations (145 observations in three groups), followed by common raven (*Corvus corax*; 105 observations in 77 groups), and American kestrel (*Falco sparverius*; 44 observations in 42 groups). Four golden eagle observations were recorded: three in winter and one in fall (Appendix A).

Bird Use, Percent of Use, and Frequency of Occurrence

Mean bird use, percent of use, and frequency of occurrence were calculated by season for all large bird types and species (Table 2). The highest overall large bird use occurred during the winter (4.47 birds/800-m plot/2-hr survey), followed by spring, fall, and summer (3.07, 1.28, and 0.33 birds/plot/2-hr survey, respectively; Table 2). American kestrel and common raven had the highest mean use among large birds during the summer (both with 0.14 birds/plot/2-hr survey), while common raven had the highest use in the fall and spring (0.89 and 1.62 birds/plot/2-hr survey, respectively), and Canada goose had the highest use in winter (3.22 birds/plot/2-hr survey).

Diurnal raptor use was higher during the winter and spring (0.78 and 0.55 birds/800-m plot/2-hr survey, respectively) compared to summer and fall (0.19 and 0.39 birds/800-m plot/2-hr survey, respectively; Table 2). American kestrel and red-tailed hawk (*Buteo jamaicensis*) accounted for the majority of diurnal raptor use during each season; use by all other diurnal raptor species occurred during only one season. Ferruginous hawk (*B. regalis*), northern harrier (*Circus cyaneus*), golden eagle, and prairie falcon (*Falco mexicanus*) were observed only during winter, while Cooper's hawk (*Accipiter cooperii*) was observed only in spring, and peregrine falcon (*F. peregrinus*) was observed only in fall (Table 2). Diurnal raptors accounted for the majority of large bird use in the summer (58.3%), while large corvids accounted for the majority of large bird use in fall and spring (69.6% and 52.7%, respectively), and waterfowl comprised the majority of use in winter (72.1%; Table 2).

Table 2. Mean bird use (number of birds/800-meter plot/2-hour survey), percent of total use (%), and frequency of occurrence (%) for each large bird type and species by season during the large bird/eagle observation surveys at the Mesa Wind Energy Repower Project from November 13, 2015 – November 7, 2016.

	Mean Use				% of Use				% Frequency			
Type / Species	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**
Waterbirds	**0**	**0**	**0**	**0.67**	**0**	**0**	**0**	**21.7**	**0**	**0**	**0**	**0**
double-crested cormorant	0	0	0	0.67	0	0	0	21.7	0	0	0	0
Waterfowl	**0**	**0**	**3.22**	**0**	**0**	**0**	**72.1**	**0**	**0**	**0**	**4.4**	**0**
Canada goose	0	0	3.22	0	0	0	72.1	0	0	0	4.4	0
Diurnal Raptors	**0.19**	**0.39**	**0.78**	**0.55**	**58.3**	**30.4**	**17.4**	**17.8**	**16.7**	**27.8**	**51.1**	**16.7**
Accipiters	*0*	*0*	*0*	*0.02*	*0*	*0*	*0*	*0.8*	*0*	*0*	*0*	*0*
Cooper's hawk	0	0	0	0.02	0	0	0	0.8	0	0	0	0
Buteos	*0.06*	*0.11*	*0.33*	*0.12*	*16.7*	*8.7*	*7.5*	*3.9*	*5.6*	*5.6*	*26.7*	*5.6*
ferruginous hawk	0	0	0.02	0	0	0	0.5	0	0	0	2.2	0
red-tailed hawk	0.06	0.11	0.31	0.12	16.7	8.7	7.0	3.9	5.6	5.6	26.7	5.6
Northern Harrier	*0*	*0*	*0.04*	*0*	*0*	*0*	*1.0*	*0*	*0*	*0*	*4.4*	*0*
northern harrier	0	0	0.04	0	0	0	1.0	0	0	0	4.4	0
Eagles	*0*	*0*	*0.02*	*0*	*0*	*0*	*0.5*	*0*	*0*	*0*	*2.2*	*0*
golden eagle	0	0	0.02	0	0	0	0.5	0	0	0	2.2	0
Falcons	*0.14*	*0.25*	*0.38*	*0.40*	*41.7*	*19.6*	*8.5*	*13.2*	*13.9*	*25.0*	*28.9*	*13.9*
American kestrel	0.14	0.22	0.31	0.40	41.7	17.4	7.0	13.2	13.9	22.2	24.4	13.9
peregrine falcon	0	0.03	0	0	0	2.2	0	0	0	2.8	0	0
prairie falcon	0	0	0.07	0	0	0	1.5	0	0	0	6.7	0
Other Raptors	*0*	*0.03*	*0*	*0*	*0*	*2.2*	*0*	*0*	*0*	*2.8*	*0*	*0*
unidentified raptor	0	0.03	0	0	0	2.2	0	0	0	2.8	0	0
Vultures	**0**	**0**	**0.47**	**0.24**	**0**	**0**	**10.4**	**7.8**	**0**	**0**	**4.4**	**0**
turkey vulture	0	0	0.47	0.24	0	0	10.4	7.8	0	0	4.4	0
Large Corvids	**0.14**	**0.89**	**0**	**1.62**	**41.7**	**69.6**	**0**	**52.7**	**11.1**	**47.2**	**0**	**11.1**
common raven	0.14	0.89	0	1.62	41.7	69.6	0	52.7	11.1	47.2	0	11.1
Overall	**0.33**	**1.28**	**4.47**	**3.07**	**100**	**100**	**100**	**100**				

Bird Flight Height and Behavior

Flight height characteristics were estimated for large bird types and raptor sub-types based on initial flight height observations and estimated use (Table 3). During the 2-hr surveys, 147 groups of large birds were observed flying within the 800-m plots, totaling 374 observations. Overall, 36.6% of flying large birds were recorded within the RSH of 25 to 150 m AGL for potential collision with turbine blades, while 6.4% of birds were below the RSH. Over half (57.0%) of large birds were recorded flying above the RSH; however, this was primarily due to 100% of waterbirds, 100% of waterfowl, and 93.5% of vultures flying at heights above 150 m AGL (Table 3). The majority (84.7%) of flying diurnal raptors were observed within the RSH, while only 9.7% were below the RSH and 5.6% were observed above the RSH (Table 3).

Table 3. Flight height characteristics by bird type and raptor subtype during large bird/eagle observation surveys at the Mesa Wind Energy Repower Project from November 13, 2015 – November 7, 2016.

Bird Type	# Groups Flying	# Obs Flying	Mean Flight Height (m)	% Obs Flying	% within Flight Height Categories		
					0 - 25 m	25 - 150 m[a]	> 150 m
Waterbirds	**1**	**28**	**500.00**	**100**	**0**	**0**	**100**
Waterfowl	**3**	**145**	**616.67**	**100**	**0**	**0**	**100**
Diurnal Raptors	**69**	**72**	**62.32**	**91.1**	**9.7**	**84.7**	**5.6**
Accipiters	*1*	*1*	*100*	*100*	*0*	*100*	*0*
Buteos	*25*	*26*	*76.20*	*100*	*0*	*88.5*	*11.5*
Northern Harrier	*2*	*2*	*45.00*	*100*	*0*	*100*	*0*
Eagles	*1*	*1*	*30.00*	*100*	*0*	*100*	*0*
Falcons	*39*	*41*	*54.49*	*85.4*	*17.1*	*80.5*	*2.4*
Other Raptors	*1*	*1*	*50.00*	*100*	*0*	*100*	*0*
Vultures	**4**	**31**	**162.50**	**100**	**0**	**6.5**	**93.5**
Large Corvids	**70**	**98**	**70.50**	**93.3**	**17.3**	**75.5**	**7.1**
Large Birds Overall	**147**	**374**	**83.23**	**96.4**	**6.4**	**36.6**	**57.0**

[a] The likely "rotor-swept height" for potential collision with a turbine blade, or 25 to 150 m (82 to 492 ft) above ground level.

Bird Exposure Index

A relative exposure index based on initial flight height observations and relative abundance (defined as the use estimate) was calculated for each bird species (Table 4). Common raven, American kestrel, and red-tailed hawk had the highest exposure indices of all large birds observed during the surveys (0.44, 0.19, and 0.14, respectively); all other large bird species had exposure indices of 0.01 or less (Table 4).

Table 4. Relative exposure index and flight characteristics for each species observed during large bird/eagle observation surveys at the Mesa Wind Energy Repower Project from November 13, 2015 – November 7, 2016.

Species	# Groups Flying[a]	Overall Mean Use[b]	% Flying	% Flying within RSH[c] based on Initial Obs.	Exposure Index	% Within RSH at Anytime
common raven	70	0.63	93.3	75.5	0.44	87.8
American kestrel	35	0.27	84.1	81.1	0.19	94.6
red-tailed hawk	24	0.16	100	88.0	0.14	88.0
northern harrier	2	0.01	100	100	0.01	100
prairie falcon	3	0.02	100	66.7	0.01	66.7
turkey vulture	4	0.19	100	6.5	0.01	71.0
golden eagle	1	<0.01	100	100	<0.01	100
ferruginous hawk	1	<0.01	100	100	<0.01	100
Cooper's hawk	1	<0.01	100	100	<0.01	100
unidentified raptor	1	<0.01	100	100	<0.01	100
peregrine falcon	1	<0.01	100	100	<0.01	100

[a] Only includes observations of groups flying within 800-m (2,625-ft) radius plots.
[b.] Use estimates based on observations within 800-m radius plots
[c] The likely "rotor-swept height" for potential collision with a turbine blade, or 25 to 150 m (82 to 492 ft) above ground level.

Spatial Use

For all large bird species combined, use was highest at Point M3 (4.32 birds/800-m plot/2-hr survey) and lowest at Point M1 (0.75 birds/800-m plot/2-hr survey; Table 5). Large bird use was dominated by large corvids at Point M1, while use was fairly evenly split between waterfowl, raptors, and large corvids at Point M2. Waterfowl accounted for almost half the large bird use at Point M3, with the remainder of large bird use well distributed among species groups (Table 5). Diurnal raptor use was highest at Point M2 and Point M3 (0.66 and 0.60 birds/800-m plot/2-hr survey, respectively). Golden eagle use was observed only at Point M3 (0.02 birds/800-m plot/2-hr survey; Table 5).

Point of first observation, approximate flight paths, and perch locations were mapped for all diurnal raptors observed during surveys (Figures 3-6). Red-tailed hawks were observed throughout the Project area, with somewhat more concentrated use within the northern portion of the survey plot at Point M3 (Figure 3). A single ferruginous hawk, a single Cooper's hawk, and a single unknown raptor were mapped, all within the survey plot at Point M2 (Figure 3). Two peregrine falcons and one prairie falcon were mapped within plots at Point M2 and Point M3 (Figure 4), while American kestrels were mapped throughout the Project, although use by American kestrels was more concentrated around Point M2 and Point M3 (Figure 5). Single observations of northern harrier were mapped near Point M2 and Point M3 (Figure 5). All four golden eagle observations were recorded from Point M3, and the observations were generally to the north and east of the Project (Figure 6).

Table 5. Mean large bird use (number of birds/800-meter plot/2-hour survey) by point for all large bird types and diurnal raptor subtypes observed at the Mesa Wind Energy Repower Project during large bird/eagle observation surveys from November 13, 2015 – November 7, 2016.

	Survey Point		
Bird Type	**M1**	**M2**	**M3**
Waterbirds	0	0	0.53
Waterfowl	0	0.75	1.98
Diurnal Raptors	0.23	0.66	0.60
Accipiters	*0*	*0.02*	*0*
Buteos	*0.06*	*0.17*	*0.26*
Northern Harrier	*0*	*0.02*	*0.02*
Eagles	*0*	*0*	*0.02*
Falcons	*0.17*	*0.43*	*0.30*
Other Raptors	*0*	*0.02*	*0*
Vultures	0.02	0.19	0.38
Large Corvids	0.51	0.64	0.83
All Large Birds	**0.75**	**2.25**	**4.32**

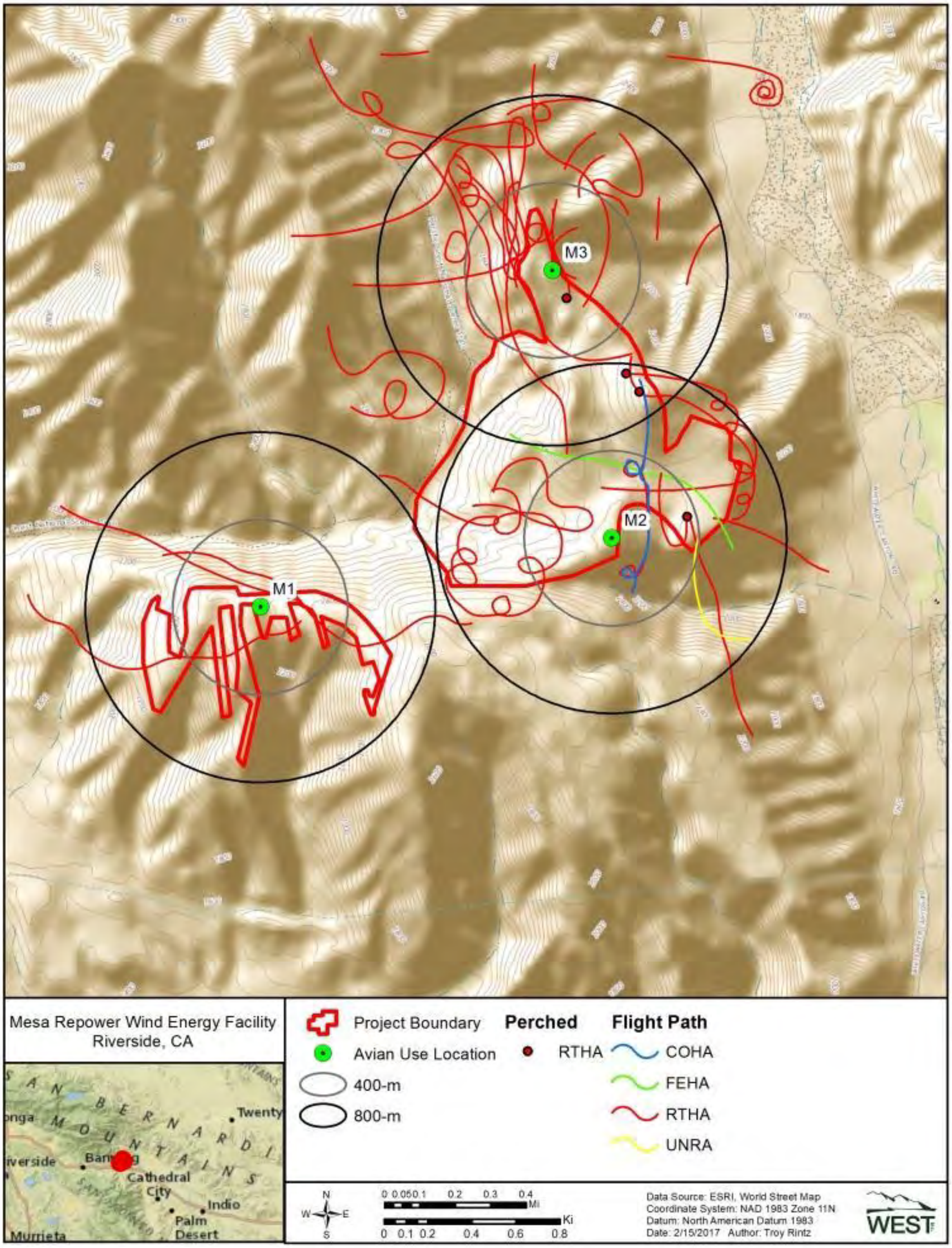

Figure 3. Flight paths observed for buteos and accipiters during large bird/eagle surveys at the Mesa Wind Energy Repower Project, Riverside County, California, from November 13, 2015 – November 7, 2016.

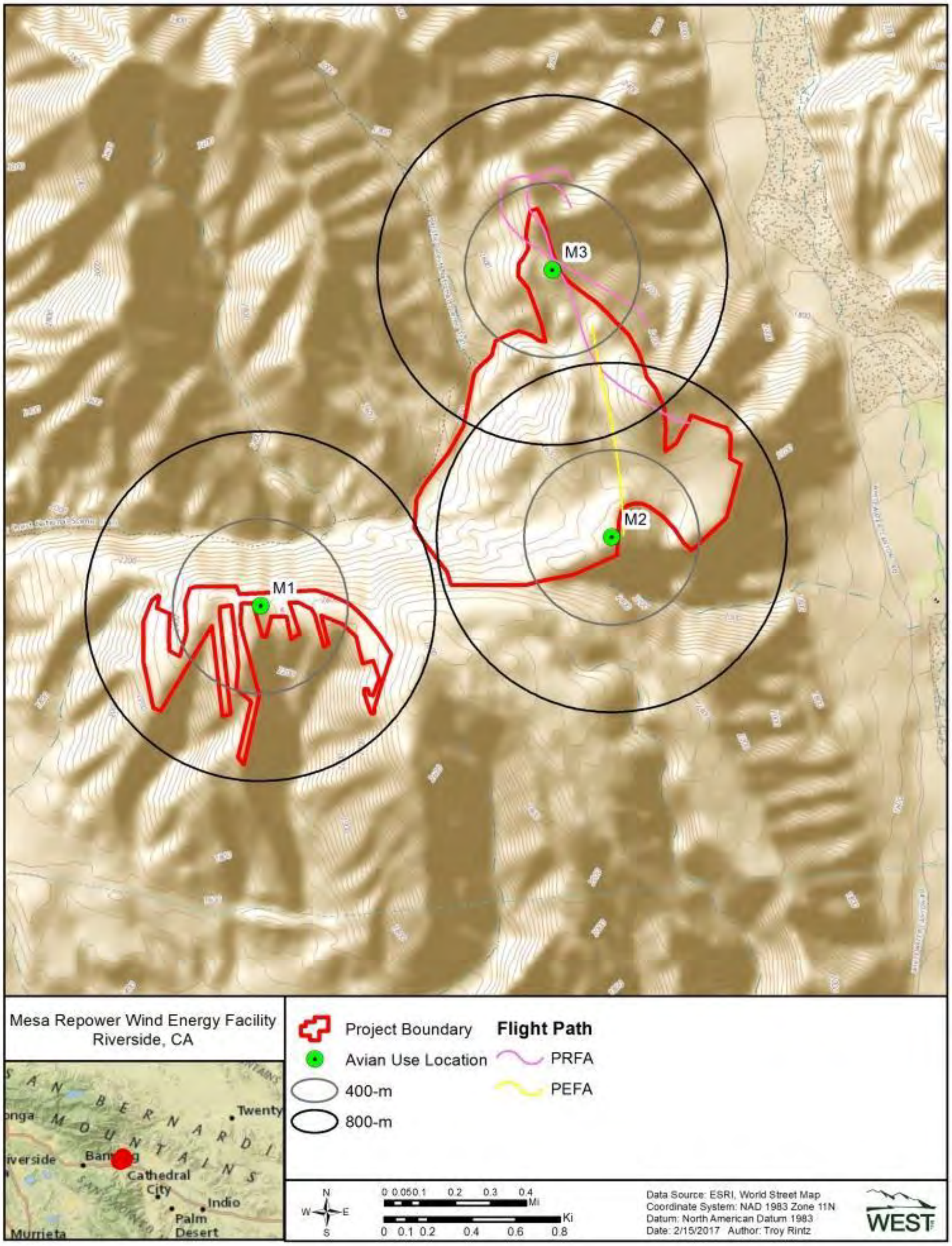

Figure 4. Flight paths observed for prairie falcons and peregrine falcons during large bird/eagle surveys at the Mesa Wind Energy Repower Project, Riverside County, California, from November 13, 2015 – November 7, 2016.

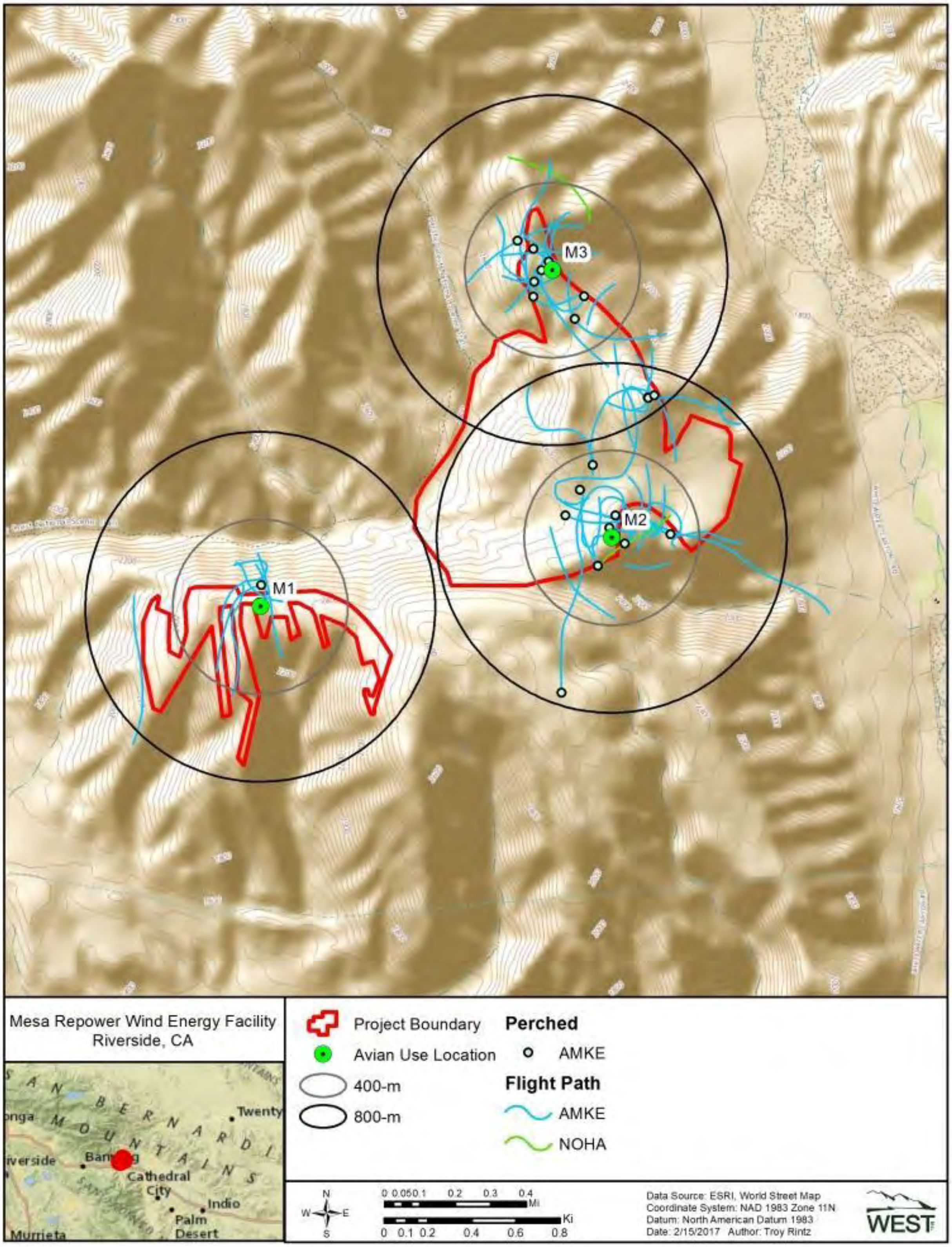

Figure 5. Flight paths observed for American kestrels and northern harriers during large bird/eagle surveys at the Mesa Wind Energy Repower Project, Riverside County, California, from November 13, 2015 – November 7, 2016.

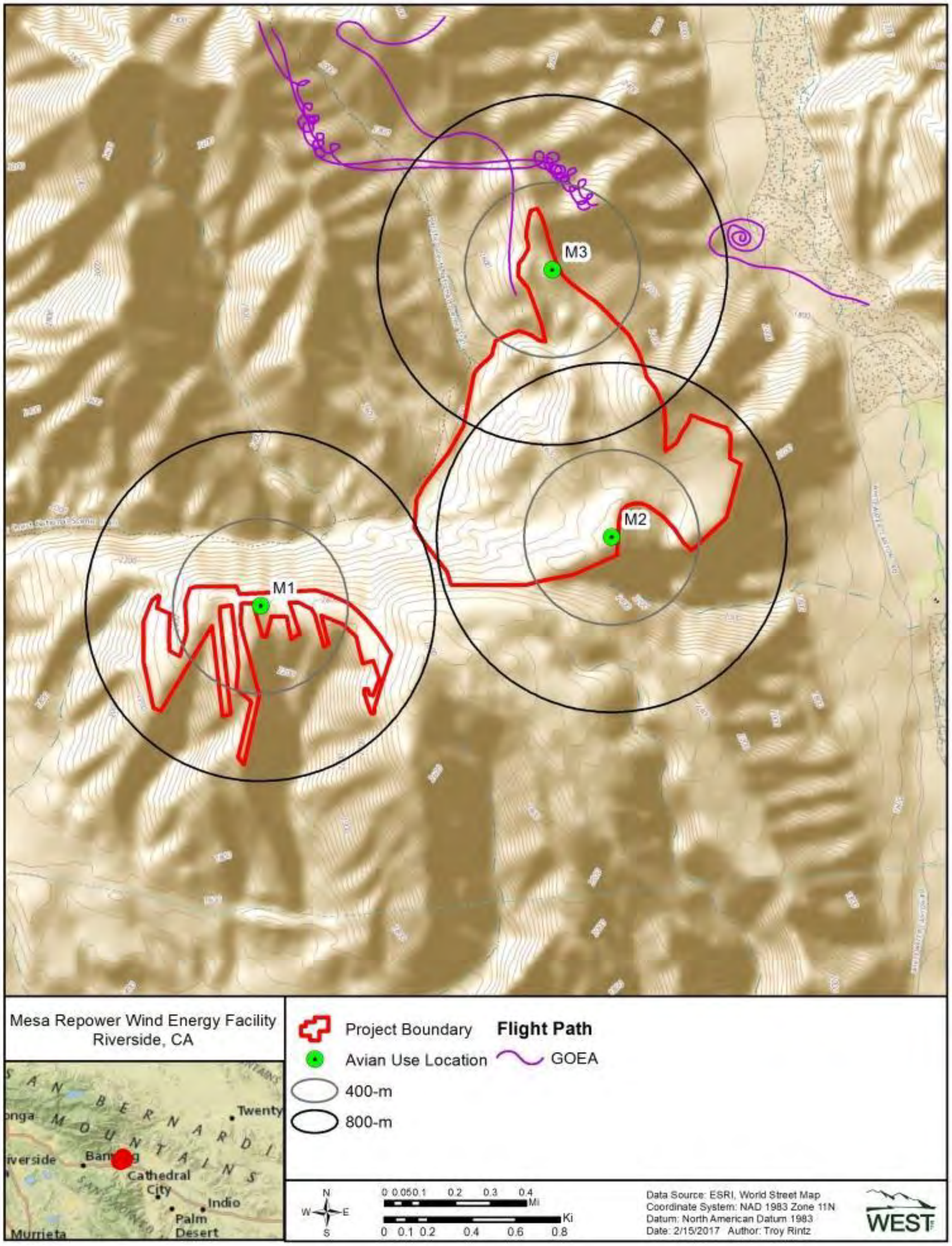

Figure 6. Flight paths observed for golden eagles during large bird/eagle surveys at the Mesa Wind Energy Repower Project, Riverside County, California, from November 13, 2015 – November 7, 2016.

Golden Eagle Use and Flight Behavior

As noted above, a total of four golden eagle observations were recorded (three observations in winter and one in fall; Appendix A) over the course of 318 hours of survey effort. Of these four eagle observations, only one was recorded at or below 200 m (656 ft) AGL within the 800-m survey plot, resulting in a total of three eagle minutes (an eagle minute is defined as one minute of flight at or below 200 m AGL within 800-m of the observations point; Table 6). All three eagle minutes occurred during the winter from Point M3 (Table 6, Figure 6).

Table 6. Eagle minutes by season for golden eagles (GOEA) observed during large bird/eagle observation surveys at the Mesa Wind Energy Repower Project from November 13, 2015 – November 7, 2016. Eagle minutes are defined as the total number of minutes golden eagles were observed flying within the 800-meter radius plot and at or below 200 meters above ground level (AGL).

Parameter	Spring	Summer	Fall	Winter	Total
Survey Hours	84	72	72	90	318
GOEA Observations	0	0	1	3	4
GOEA Observations ≤800m and ≤ 200m AGL	0	0	0	1	1
Eagle Minutes ≤800 m and ≤ 200m AGL	0	0	0	3	3

Incidental Observations

Thirty-four bird species, totaling 404 observations within 177 separate groups, were observed incidentally over the course of the large bird use surveys at the Project (Table 7). No golden eagles or other diurnal raptor species were recorded incidentally outside of standardized survey periods. One mammal species, desert bighorn sheep (*Ovis canadensis nelsoni*; 31 observations in four groups) was also observed at the Project (Table 7).

Table 7. Incidental wildlife observed while conducting all surveys at the Mesa Wind Energy Repower Project from November 13, 2015 and November 7, 2016.

Species	Scientific Name	# grps	# obs
California quail	*Callipepla californica*	3	5
chukar	*Alectoris chukar*	1	5
Gambel's quail	*Callipepla gambelii*	1	6
mourning dove	*Zenaida macroura*	6	21
common raven	*Corvus corax*	1	3
greater roadrunner	*Geococcyx californianus*	4	4
Bewick's wren	*Thryomanes bewickii*	6	6
black-headed grosbeak	*Pheucticus melanocephalus*	1	3
Brewer's blackbird	*Euphagus cyanocephalus*	1	1
black-throated sparrow	*Amphispiza bilineata*	24	29
cactus wren	*Campylorhynchus brunneicapillus*	2	2
Cassin's finch	*Haemorhous cassinii*	1	1
California towhee	*Melozone crissalis*	3	4
cliff swallow	*Petrochelidon pyrrhonota*	1	20
house finch	*Haemorhous mexicanus*	24	66
horned lark	*Eremophila alpestris*	3	12
lark sparrow	*Chondestes grammacus*	6	6
lesser goldfinch	*Spinus psaltria*	1	1
loggerhead shrike	*Lanius ludovicianus*	6	6

Table 7. Incidental wildlife observed while conducting all surveys at the Mesa Wind Energy Repower Project from November 13, 2015 and November 7, 2016.

Species	Scientific Name	# grps	# obs
mountain bluebird	*Sialia currucoides*	2	9
rock wren	*Salpinctes obsoletus*	36	37
Say's phoebe	*Sayornis saya*	2	2
tree swallow	*Tachycineta bicolor*	1	20
unidentified swallow		1	1
verdin	*Auriparus flaviceps*	5	5
white-crowned sparrow	*Zonotrichia leucophrys*	11	39
western kingbird	*Tyrannus verticalis*	1	1
western meadowlark	*Sturnella neglecta*	7	9
western tanager	*Piranga ludoviciana*	2	3
Wilson's warbler	*Cardellina pusilla*	2	4
yellow-rumped warbler	*Setophaga coronata*	3	21
unidentified hummingbird		3	3
Vaux's swift	*Chaetura vauxi*	1	15
white-throated swift	*Aeronautes saxatalis*	5	34
Bird Subtotal	**34 Species**	**177**	**404**
desert bighorn sheep	*Ovis canadensis nelsoni*	4	31
Mammal Subtotal	**1 Species**	**4**	**31**

Sensitive Species Observations

Seven sensitive bird species were recorded during scheduled large bird/eagle observation surveys or incidentally within the Project (Table 8). The sensitive bird species include two state fully protected species (golden eagle and peregrine falcon), three state species of special concern (loggerhead shrike [*Lanius ludovicianus*], northern harrier, and Vaux's swift [*Chaetura vauxi*]; California Department of Fish and Wildlife [CDFW] 2017), and three federal species of concern (ferruginous hawk, northern harrier, and prairie falcon; USFWS 2008). The golden eagle is further protected under the Bald and Golden Eagle Protection Act (BGEPA 1940).

Table 8. Summary of sensitive species observed at the Mesa Wind Energy Repower Project during large bird/eagle observation surveys and as incidental wildlife observations from November 13, 2015 – November 7, 2016.

			Large Bird/Eagle Surveys		Incidentals		Total	
Species	**Scientific Name**	**Status***	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
ferruginous hawk	*Buteo regalis*	FSOC	1	1	0	0	1	1
golden eagle	*Aquila chrysaetos*	EA, SFP	4	4	0	0	4	4
loggerhead shrike	*Lanius ludovicianus*	SSC	0	0	6	6	6	6
northern harrier	*Circus cyaneus*	FSOC, SSC	2	2	0	0	2	2
peregrine falcon	*Falco peregrinus*	SFP	1	1	0	0	1	1
prairie falcon	*Falco mexicanus*	FSOC	3	3	0	0	3	3
Vaux's swift	*Chaetura vauxi*	SSC	0	0	1	15	1	15
Total	**7 species**		**11**	**11**	**7**	**21**	**18**	**42**

*FSOC = federal species of concern (USFWS 2008); EA = BGEPA (1940); SFP = state fully protected species (CDFW 2017); SSC = state species of special concern (CDFW 2017)

DISCUSSION AND IMPACT ASSESSMENT

The WEG use a tiered approach to assess impacts to species and their habitats (USFWS 2012). Tier 3 studies, as defined in the WEG, were targeted to address questions regarding impacts that could not be sufficiently addressed using available literature (i.e., Tier 1 and Tier 2 desktop analyses). These studies provide additional data that, when combined with available literature reviewed in previous Tiers, allows for assessing risk of potential significant adverse impacts to species of concern; identifying measures to mitigate significant adverse impacts, if necessary; and/or identifying a need for more field studies, if necessary. While the large bird use surveys reported on herein included all large bird species observed, this report and impact assessment focuses on a smaller group of species, namely golden eagles and other diurnal raptors.

Potential Impacts

Wind energy facilities can directly or indirectly impact wildlife resources. Direct impacts include fatalities from construction and operation of the wind energy facility and the loss of habitat where infrastructure is placed. Indirect impacts include the displacement of wildlife, either temporarily or permanently, during construction or operation of a wind energy facility and by the facility rendering habitat unsuitable through fragmentation of the landscape.

Mortality or injury due to collisions with turbines or other infrastructure is the most probable direct impact to birds from wind energy facilities. Collisions may occur with resident birds foraging and flying locally within the Project, or with migrant birds moving seasonally through the area. Repowering the Project could affect birds through loss of habitat or fatalities from construction equipment, although potential direct impacts from construction equipment is expected to be relatively low, as equipment used in wind energy facility construction generally moves at slow rates or is stationary for long periods (e.g., cranes). The highest risk of direct mortality to birds during the removal of the existing turbines and construction of the new turbines is likely the potential destruction of nests of ground- and shrub-nesting species; however, because Mesa is an operational project with much infrastructure already in place (e.g., roads, operations and maintenance building, substations), impacts from construction should be reduced relative to construction of a new project.

Post-construction fatality monitoring reports from California and the Pacific Northwest show varying levels of bird mortality, ranging from 0.16 to 17.44 birds/MW/year (Figure 7). Publicly available data for the SGWRA is scarce; however, at the Dillon Wind Energy Facility, located about five miles (eight km) to the east of Mesa, the overall avian fatality rate was estimated to be 4.71 birds/MW/year (Chatfield et al. 2009). Approximately 100 miles (161 km) to the northwest in the Tehachapi Wind Resource Area (TWRA), avian fatality rates have been low to moderate, ranging from 0.55 to 7.80 birds/MW/year (Chatfield et al. 2010b, 2014, respectively; Figure 7, Appendix B1).

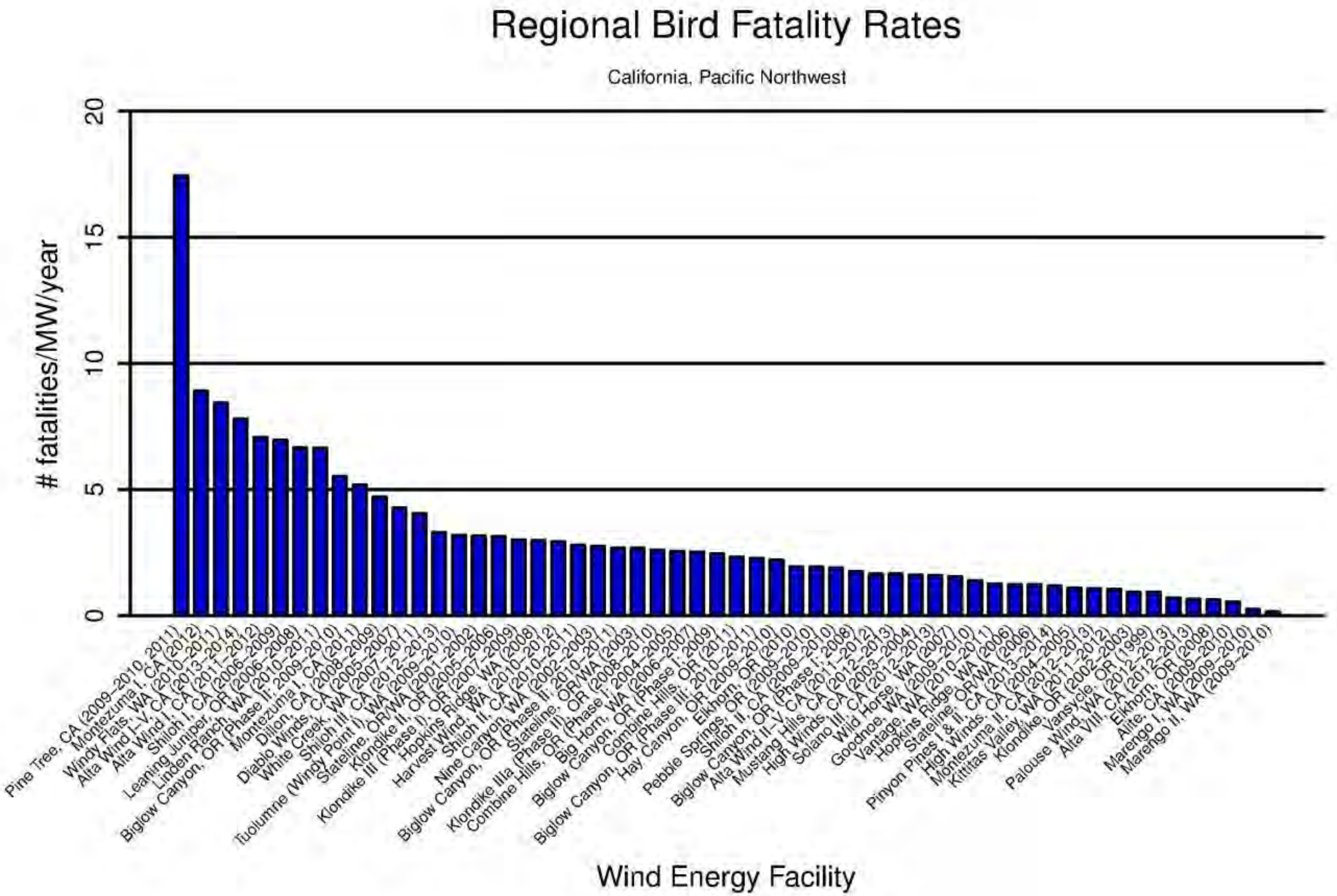

Figure 7. Fatality rates for all birds (number of birds per megawatt per year) from publicly available studies at wind energy facilities in the California and Pacific Northwest regions of North America.

Figure 7 (*continued*). Fatality rates for all birds (number of birds per megawatt per year) from publicly available studies at wind energy facilities in the California and Pacific Northwest regions of North America.

Data from the following sources:

Wind Energy Facility	Estimate Reference	Wind Energy Facility	Estimate Reference	Wind Energy Facility	Estimate Reference
Pine Tree, CA (09-10, 11)	BioResource Consultants 2012	Harvest Wind, WA (10-12)	Downes and Gritski 2012a	Solano III, CA (12-13)	AECOM 2013
Montezuma I, CA (12)	ICF International 2013	Shiloh II, CA (10-11)	Kerlinger et al. 2013a	Wild Horse, WA (07)	Erickson et al. 2008
Windy Flats, WA (10-11)	Enz et al. 2011	Nine Canyon, WA (02-03)	Erickson et al. 2003c	Goodnoe, WA (09-10)	URS Corporation 2010a
Alta Wind I-V, CA (13-14)	Chatfield et al. 2014	Biglow Canyon, OR (Phase II; 10-11)	Enk et al. 2012b	Vantage, WA (10-11)	Ventus Environmental Solutions 2012
Alta Wind I, CA (11-12)	Chatfield et al. 2012	Stateline, OR/WA (03)	Erickson et al. 2004	Hopkins Ridge, WA (06)	Young et al. 2007a
Shiloh I, CA (06-09)	Kerlinger et al. 2009	Klondike IIIa (Phase II), OR (08-10)	Gritski et al. 2011	Stateline, OR/WA (06)	Erickson et al. 2007
Leaning Juniper, OR (06-08)	Gritski et al. 2008	Combine Hills, OR (Phase I; 04-05)	Young et al. 2006	Pinyon Pines I & II, CA (13-14)	Chatfield and Russo 2014
Linden Ranch, WA (10-11)	Enz and Bay 2011	Big Horn, WA (06-07)	Kronner et al. 2008	High Winds, CA (04-05)	Kerlinger et al. 2006
Biglow Canyon, OR (Phase II; 09-10)	Enk et al. 2011a	Biglow Canyon, OR (Phase I; 09)	Enk et al. 2010	Montezuma II, CA (12-13)	Harvey & Associates 2013
Montezuma I, CA (11)	ICF International 2012	Combine Hills, OR (11)	Enz et al. 2012	Kittitas Valley, WA (11-12)	Stantec Consulting Services 2012
Dillon, CA (08-09)	Chatfield et al. 2009	Biglow Canyon, OR (Phase III; 10-11)	Enk et al. 2012a	Klondike, OR (02-03)	Johnson et al. 2003
Diablo Winds, CA (05-07)	WEST 2006, 2008	Hay Canyon, OR (09-10)	Gritski and Kronner 2010a	Vansycle, OR (99)	Erickson et al. 2000
White Creek, WA (07-11)	Downes and Gritski 2012b	Elkhorn, OR (10)	Enk et al. 2011b	Palouse Wind, WA (12-13)	Stantec 2013
Shiloh III, CA (12-13)	Kerlinger et al. 2013b	Pebble Springs, OR (09-10)	Gritski and Kronner 2010b	Alta VIII, CA (12-13)	Chatfield and Bay 2014
Tuolumne (Windy Point I), WA (09-10)	Enz and Bay 2010	Shiloh II, CA (09-10)	Kerlinger et al. 2010, 2013a	Elkhorn, OR (08)	Jeffrey et al. 2009b
Stateline, OR/WA (01-02)	Erickson et al. 2004	Biglow Canyon, OR (Phase I; 08)	Jeffrey et al. 2009a	Alite, CA (09-10)	Chatfield et al. 2010b
Klondike II, OR (05-06)	NWC and WEST 2007	Alta Wind II-V, CA (11-12)	Chatfield et al. 2012	Marengo I, WA (09-10)	URS Corporation 2010b
Klondike III (Phase I), OR (07-09)	Gritski et al. 2010	Mustang Hills, CA (12-13)	Chatfield and Bay 2014	Marengo II, WA (09-10)	URS Corporation 2010c
Hopkins Ridge, WA (08)	Young et al. 2009	High Winds, CA (03-04)	Kerlinger et al. 2006		

In addition to direct effects through collision mortality, wind energy development indirectly affects wildlife resources, causing a loss of habitat where infrastructure is placed and loss of habitat through behavioral avoidance and perhaps habitat fragmentation. Loss of habitat from installation of wind energy facility infrastructure (i.e., turbines, access roads, maintenance buildings, substations and overhead transmission lines) can be long-term or temporary; however, long-term infrastructure generally occupies only 5% to 10% of the entire development area (Bureau of Land Management [BLM] 2005). Estimates of temporary construction impacts range from 0.2 to 1.0 hectares (0.5 to 2.5 acres) per turbine (Strickland and Johnson 2006, Denholm et al. 2009). The greatest concern for indirect impact of wind energy facilities on wildlife resources is where these facilities have been constructed in native vegetation communities, such as grasslands or shrub steppe that provide comparatively rare, high-quality habitat for bird types and species of concern (USFWS 2012). The Project is located in the SGWRA, which already contains a high density of wind energy development, and the Mesa area itself currently contains 460 older 65kw turbines. The repowering will replace all (or nearly all) of the 460 65kw turbines with approximately 15 modern turbines, which will result in a large reduction in the overall project footprint and a much greater distance between turbines. As a result, although repowering the Project may cause some temporary displacement during the removal of the existing turbines and construction of new turbines, due to the decreased footprint and more dispersed turbines, the long term result may be less displacement as habitats recover following the removal and construction phases of the repower.

Bird Types of Concern

The bird species most commonly observed during this study are not of conservation concern. Canada goose and common raven were the most abundant species observed during surveys, accounting for about 63% of all observations. Despite the abundance of these two species, waterfowl and large corvids are rarely found as fatalities at wind energy fatalities (see Erickson et al. 2014) and the three large groups of Canada geese observed during surveys were flying above the RSH.

Shorebirds, passerines, and diurnal raptors are bird types that have shown some susceptibility to the potentially adverse impacts of wind energy development. Because the focus of this study was on large birds, passerines and other small birds were not recorded during surveys unless they were sensitive species. While no shorebirds were observed during surveys, diurnal raptors were observed with some regularity, and are considered a bird type of concern in the region. Some sensitive raptors species were observed in comparatively low numbers and generally during only one season. These sensitive diurnal raptor species included golden eagle, ferruginous hawk, northern harrier, peregrine falcon, and prairie falcon. The most abundant diurnal raptor species observed at Mesa were American kestrel and red-tailed hawk.

Diurnal Raptors

<u>Use Comparison</u>

Diurnal raptors occur in most areas with the potential for wind energy development (National Research Council 2007). For comparison to other wind energy facilities that implemented similar protocols and had data for three or four seasons the annual mean diurnal raptor use at Mesa

(0.09 raptors/plot/20-min survey) was calculated based on the first 20 min of each survey such that data were comparable to methods used at the other facilities. The annual mean diurnal raptor use at these wind energy facilities ranged from 2.34 raptors/plot/20-min survey at the High Winds facility in California to 0.06 raptors/plot/20-min survey at the Alta-Oak Creek Mojave (AOCM) facility in California (Kerlinger et al. 2005, Chatfield et al. 2010a, respectively; Figure 8). A relative ranking of annual mean raptor use was developed based on the results from these wind energy facilities as low (zero – 0.5 raptors/800-m plot/20-min survey), moderate (0.5 – 1.0), and high (higher than 1.0). Under this ranking, the adjusted annual mean diurnal raptor use at Mesa is considered to be low compared to the other wind energy facilities across North America (Figure 8).

Fatality Studies

Johnson and Stephens (2011) summarized mortality data recorded at wind energy facilities in western North America. Raw fatality counts were available at 21 facilities, while estimates of fatality rates were available at 18 facilities. Raptor fatality rates ranged from zero to 1.79 raptor fatalities per MW per year (mean: 0.19, median: 0.09 fatalities/MW/year) at the 18 facilities; Johnson and Stephens 2011).

Raptor fatality rates at facilities in California and the Pacific Northwest have varied greatly, ranging from zero to 1.06 raptors/MW/year (Figure 9, Appendix B2); however, fatality rates at facilities in the southern California desert (e.g., the Tehachapi Pass and San Gorgonio Pass wind resource areas) have been considerably lower, ranging from zero to 0.27 raptors/MW/year (Figure 9, Appendix B2). While publicly available mortality data is limited in the SGWRA, at the nearby Dillon Wind Energy Facility, no raptor fatalities were encountered during a 1-year monitoring study (Chatfield et al. 2009).

Fatalities of 13 diurnal raptor species have been recorded during studies at facilities in the California and Pacific Northwest regions (Table 9). American kestrel and red-tailed hawk have accounted for the majority (78%) of diurnal raptor fatalities reported in these regions, while golden eagles have accounted for approximately 5% of diurnal raptor fatalities (Table 9). American kestrel and red-tailed hawk were the two most commonly observed diurnal raptor species during large bird/eagle surveys at Mesa, and the only two raptor species observed year-round (Appendix A). It is likely that these two species would be among the most common raptor fatalities within the Project, should raptor fatalities occur.

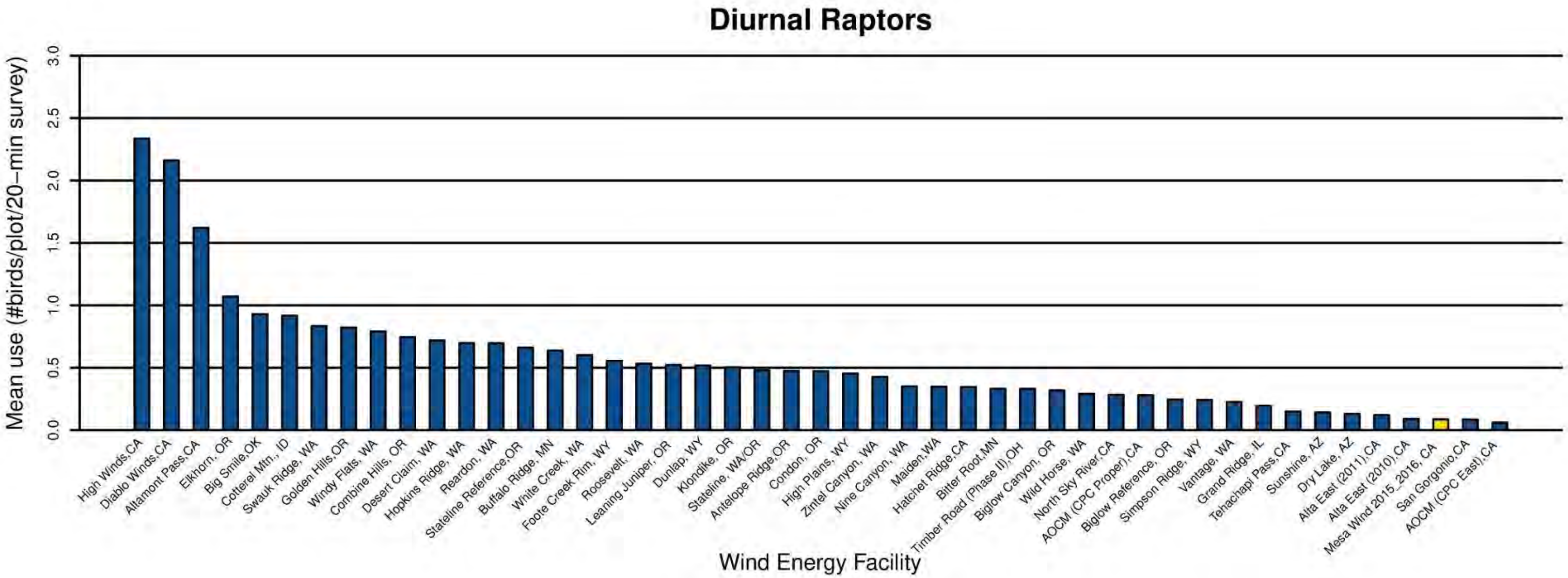

Figure 8. Comparison of estimated annual diurnal raptor use during large bird/eagle surveys at the Mesa Wind Energy Repower Project from November 13, 2015, to November 7, 2016 (adjusted to 20-minute surveys for comparison), and diurnal raptor use at other US wind resource areas with three or four seasons of similarly collected raptor use data.

Data from the following sources:

Study and Location	Reference	Study and Location	Reference	Study and Location	Reference
Mesa, CA	This study.				
High Winds, CA	Kerlinger et al. 2005	Foote Creek Rim, WY	Johnson et al. 2000b	Wild Horse, WA	Erickson et al. 2003d
Diablo Winds, CA	WEST 2006	Roosevelt, WA	NWC and WEST 2004	North Sky River, CA	Erickson et al. 2011
Altamont Pass, CA	Orloff and Flannery 1992	Leaning Juniper, OR	Kronner et al. 2005	AOCM (CPC Proper), CA	Chatfield et al. 2010a
Elkhorn, OR	WEST 2005a	Dunlap, WY	Johnson et al. 2009a	Biglow Reference, OR	WEST 2005c
Big Smile (Dempsey), OK	Derby et al. 2010	Klondike, OR	Johnson et al. 2002	Simpson Ridge, WY	Johnson et al. 2000b
Cotterel Mtn., ID	BLM 2006	Stateline, WA/OR	Erickson et al. 2003a	Vantage, WA	Jeffrey et al. 2007
Swauk Ridge, WA	Erickson et al. 2003b	Antelope Ridge, OR	WEST 2009	Grand Ridge, IL	Derby et al. 2009
Golden Hills, OR	Jeffrey et al. 2008	Condon, OR	Erickson et al. 2002b	Tehachapi Pass, CA	Anderson et al. 2000, Erickson et al. 2002b
Windy Flats, WA	Johnson et al. 2007	High Plains, WY	Johnson et al. 2009b	Sunshine, AZ	WEST and the CPRS 2006
Combine Hills, OR	Young et al. 2003c	Zintel Canyon, WA	Erickson et al. 2002a, 2003c	Dry Lake, AZ	Young et al. 2007c
Desert Claim, WA	Young et al. 2003b	Nine Canyon, WA	Erickson et al. 2001b	Alta East (2011), CA	Chatfield et al. 2011
Hopkins Ridge, WA	Young et al. 2003a	Maiden, WA	Young et al. 2002	Alta East (2010), CA	Chatfield et al. 2011
Reardon, WA	WEST 2005b	Hatchet Ridge, CA	Young et al. 2007b	San Gorgonio, CA	Anderson et al. 2000, Erickson et al. 2002b
Stateline Reference, OR	URS et al. 2001	Bitter Root. MN	Derby and Dahl 2009	AOCM (CPC East), CA	Chatfield et al. 2010a
Buffalo Ridge, MN	Johnson et al. 2000a	Timber Road (Phase II), OH	Good et al. 2010		
White Creek, WA	NWC and WEST 2005	Biglow Canyon, OR	WEST 2005c		

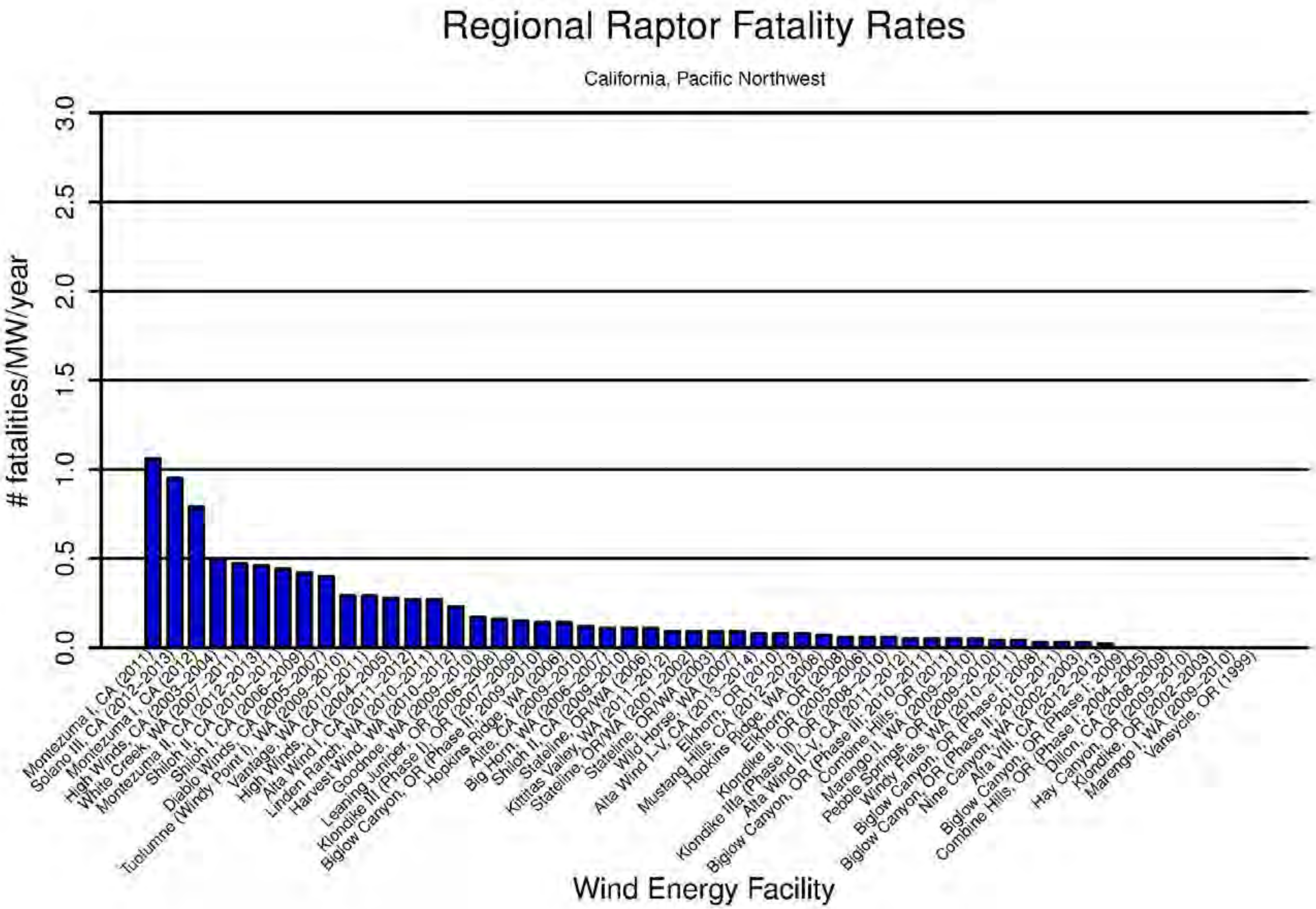

Figure 9. Fatality rates for diurnal raptors (number of diurnal raptors per megawatt per year) from publicly available studies at wind energy facilities in the California and Pacific Northwest regions of North America.

Figure 9 (*continued*). Fatality rates for diurnal raptors (number of diurnal raptors per megawatt per year) from publicly available studies at wind energy facilities in the California and Pacific Northwest regions of North America.

Data from the following sources:

Wind Energy Facility	Reference	Wind Energy Facility	Reference	Wind Energy Facility	Reference
Montezuma I, CA (11)	ICF International 2012	Biglow Canyon, OR (Phase II; 09-10)	Enk et al. 2011a	Biglow Canyon, OR (Phase III; 10-11)	Enk et al. 2012a
Solano III, CA (12-13)	AECOM 2013	Hopkins Ridge, WA (06)	Young et al. 2007a	Combine Hills, OR (11)	Enz et al. 2012
Montezuma I, CA (12)	ICF International 2013	Alite, CA (09-10)	Chatfield et al. 2010b	Marengo II, WA (09-10)	URS Corporation 2010c
High Winds, CA (03-04)	Kerlinger et al. 2006	Big Horn, WA (06-07)	Kronner et al. 2008	Pebble Springs, OR (09-10)	Gritski and Kronner 2010b
White Creek, WA (07-11)	Downes and Gritski 2012b	Shiloh II, CA (09-10)	Kerlinger et al. 2010, 2013a	Windy Flats, WA (10-11)	Enz et al. 2011
Montezuma II, CA (12-13)	Harvey & Associates 2013	Stateline, OR/WA (06)	Erickson et al. 2007	Biglow Canyon, OR (Phase I; 08)	Jeffrey et al. 2009a
Shiloh II, CA (10-11)	Kerlinger et al. 2013a	Kittitas Valley, WA (11-12)	Stantec Consulting Services 2012	Biglow Canyon, OR (Phase II; 10-11)	Enk et al. 2012b
Shiloh I, CA (06-09)	Kerlinger et al. 2009	Stateline, OR/WA (01-02)	Erickson et al. 2004	Nine Canyon, WA (02-03)	Erickson et al. 2003c
Diablo Winds, CA (05-07)	WEST 2006, 2008	Stateline, OR/WA (03)	Erickson et al. 2004	Alta VIII, CA (12-13)	Chatfield and Bay 2014
Tuolumne (Windy Point I), WA (09-10)	Enz and Bay 2010	Wild Horse, WA (07)	Erickson et al. 2008	Biglow Canyon, OR (Phase I; 09)	Enk et al. 2010
Vantage, WA (10-11)	Ventus Environmental Solutions 2012	Alta Wind I-V, CA (13-14)	Chatfield et al. 2014	Combine Hills, OR (Phase I; 04-05)	Young et al. 2006
High Winds, CA (04-05)	Kerlinger et al. 2006	Elkhorn, OR (10)	Enk et al. 2011b	Dillon, CA (08-09)	Chatfield et al. 2009
Alta Wind I, CA (11-12)	Chatfield et al. 2012	Mustang Hills, CA (12-13)	Chatfield and Bay 2014	Hay Canyon, OR (09-10)	Gritski and Kronner 2010a
Linden Ranch, WA (10-11)	Enz and Bay 2011	Hopkins Ridge, WA (08)	Young et al. 2009	Klondike, OR (02-03)	Johnson et al. 2003
Harvest Wind, WA (10-12)	Downes and Gritski 2012a	Elkhorn, OR (08)	Jeffrey et al. 2009b	Marengo I, WA (09-10)	URS Corporation 2010b
Goodnoe, WA (09-10)	URS Corporation 2010a	Klondike II, OR (05-06)	NWC and WEST 2007	Vansycle, OR (99)	Erickson et al. 2000
Leaning Juniper, OR (06-08)	Gritski et al. 2008	Klondike IIIa (Phase II), OR (08-10)	Gritski et al. 2011		
Klondike III (Phase I), OR (07-09)	Gritski et al. 2010	Alta Wind II-V, CA (11-12)	Chatfield et al. 2012		

Table 9. Summary of raptor fatalities, by species, recorded at new-generation wind energy facilities in the California and Pacific Northwest regions.

Species	Scientific Name	Number of Raptor Fatalities*	Percent Composition of Raptor Fatalities
American kestrel	*Falco sparverius*	192	40.76
red-tailed hawk	*Buteo jamaicensis*	177	37.58
golden eagle	*Aquila chrysaetos*	22	4.67
northern harrier	*Circus cyaneus*	16	3.40
Swainson's hawk	*Buteo swainsoni*	15	3.18
rough-legged hawk	*Buteo lagopus*	12	2.55
ferruginous hawk	*Buteo regalis*	8	1.70
unidentified raptor		5	1.06
Cooper's hawk	*Accipiter cooperii*	5	1.06
prairie falcon	*Falco mexicanus*	5	1.06
unidentified buteo	*Buteo spp*	4	0.85
merlin	*Falco columbarius*	3	0.64
white-tailed kite	*Elanus leucurus*	3	0.64
sharp-shinned hawk	*Accipiter striatus*	2	0.42
peregrine falcon	*Falco peregrinus*	1	0.21
unidentified accipiter	*Accipiter spp*	1	0.21
Total	**16 Species**	**471**	**100**

These are raw data and are not corrected for searcher efficiency or scavenging.

Cumulative fatalities and species from data compiled by Western EcoSystems Technology, Inc. from publicly available fatality documents from wind energy projects located in the California and Pacific Northwest regions of North America (see below for list of all the publicly available studies for these regions).

Project, Location	Reference	Project, Location	Reference
Alite, CA (09-10)	Chatfield et al. 2010b	Leaning Juniper, OR (06-08)	Gritski et al. 2008
Alta Wind I, CA (11-12)	Chatfield et al. 2012	Linden Ranch, WA (10-11)	Enz and Bay 2011
Alta Wind I-V, CA (13-14)	Chatfield et al. 2014	Marengo I, WA (09-10)	URS Corporation 2010b
Alta Wind II-V, CA (11-12)	Chatfield et al. 2012	Marengo II, WA (09-10)	URS Corporation 2010c
Alta VIII, CA (12-13)	Chatfield and Bay 2014	Montezuma I, CA (11)	ICF International 2012
Big Horn, WA (06-07)	Kronner et al. 2008	Montezuma I, CA (12)	ICF International 2013
Biglow Canyon, OR (Phase I; 08)	Jeffrey et al. 2009a	Montezuma II, CA (12-13)	Harvey & Associates 2013
Biglow Canyon, OR (Phase I; 09)	Enk et al. 2010	Mustang Hills, CA (12-13)	Chatfield and Bay 2014
Biglow Canyon, OR (Phase II; 09-10)	Enk et al. 2011a	Nine Canyon, WA (02-03)	Erickson et al. 2003c
Biglow Canyon, OR (Phase II; 10-11)	Enk et al. 2012b	Nine Canyon II, WA (04)	Erickson et al. 2005
Biglow Canyon, OR (Phase III; 10-11)	Enk et al. 2012a	Pacific, CA (12-13)	Sapphos 2014
Buena Vista, CA (08-09)	Insignia Environmental 2009	Palouse Wind, WA (12-13)	Stantec 2013
Combine Hills, OR (Phase I; 04-05)	Young et al. 2006	Pebble Springs, OR (09-10)	Gritski and Kronner 2010b
Combine Hills, OR (11)	Enz et al. 2012	Pine Tree, CA (09-10)	BioResource Consultants 2010
Condon, OR	Fishman Ecological Services 2003	Pinyon Pines I & II, CA (13-14)	Chatfield and Russo 2014
Diablo Winds, CA (05-07)	WEST 2006, 2008	Shiloh I, CA (06-09)	Kerlinger et al. 2009
Dillon, CA (08-09)	Chatfield et al. 2009	Shiloh II, CA (09-10)	Kerlinger et al. 2010
Elkhorn, OR (08)	Jeffrey et a. 2009b	Shiloh II, CA (10-11)	Kerlinger et al. 2013a
Elkhorn, OR (10)	Enk et al. 2011b	Shiloh III, CA (12-13)	Kerlinger et al. 2013b
Goodnoe, WA (09-10)	URS Corporation 2010a	SMUD Solano, CA (04-05)	Erickson and Sharp 2005
Harvest Wind, WA (10-12)	Downes and Gritski 2012a	Solano III, CA (12-13)	AECOM 2013
Hay Canyon, OR (09-10)	Gritski and Kronner 2010a	Stateline, OR/WA (01-02)	Erickson et al. 2004
High Winds, CA (03-04)	Kerlinger et al. 2006	Stateline, OR/WA (03)	Erickson et al. 2004
High Winds, CA (04-05)	Kerlinger et al. 2006	Stateline, OR/WA (06)	Erickson et al. 2007
Hopkins Ridge, WA (06)	Young et al. 2007a	Tuolumne (Windy Point I), WA (09-10)	Enz and Bay 2010
Hopkins Ridge, WA (08)	Young et al. 2009	Vansycle, OR (99)	Erickson et al. 2000
Kittitas Valley, WA (11-12)	Stantec Consulting 2012	Vantage, WA (10-11)	Ventus Environmental Solutions 2012
Kittitas Valley, WA (12-13)	Stantec Consulting 2013	Vasco, CA (12-13)	Brown et al. 2013
Klondike, OR (02-03)	Johnson et al. 2003	White Creek, WA (07-11)	Downes and Gritski 2012b
Klondike II, OR (05-06)	NWC and WEST 2007	Wild Horse, WA (07)	Erickson et al. 2008
Klondike III (Phase I), OR (07-09)	Gritski et al. 2010	Windy Flats, WA (10-11)	Enz et al. 2011
Klondike IIIa (Phase II), OR (08-10)	Gritski et al. 2011		

Use versus Fatality Rates

Results from several studies suggest that mortality for some species is not necessarily related to abundance and can vary widely between facilities. For example, American kestrel use at the

High Winds Energy Center in California was nearly seven times higher than that recorded at the Altamont Pass Wind Farm (Kerlinger et al. 2005), yet American kestrel mortality at Altamont was nearly seven times higher than at High Winds (Kerlinger et al. 2006, Altamont Pass Avian Monitoring Team 2008). Relatively few northern harrier (*Circus cyaneus*) fatalities have been reported in publicly available documents, despite the fact that they are commonly observed during fixed-point bird counts at these facilities (Erickson et al. 2001a, Whitfield and Madders 2006, Smallwood and Karas 2009). Northern harriers typically fly close to the ground (MacWhirter and Bildstein 1996), with some studies reporting up to 97% of flights below 20 m (66 ft; Whitfield and Madders 2006); therefore, risk of collision with turbine blades is considered low for this species (Whitfield and Madders 2005, 2006). Raptor mortality rates at two wind energy facilities in Spain were not correlated with raptor abundance; the authors state that species-specific flight behaviors may dictate risk (de Lucas et al. 2008). One exception to this was in a study at 34 wind energy facilities in Spain for turbine-related mortality of griffon vultures (*Gyps fulvus*), a large bird with a soaring-gliding flight pattern similar to raptors (Carrete et al. 2012). While abundance is intuitively connected to raptor fatality risk, it is likely that other factors are also important in predicting fatality risk for individual species.

Within the California and Pacific Northwest regions, data is lacking that show a correlation between pre-construction raptor use and post-construction raptor mortality data (Appendix B2). The few California studies that have paired data, do show somewhat of a trend with the Alta projects (Alta I-V and Alta VIII) having both low raptor use and low raptor mortality, while projects to the north in west-central California (Diablo Winds and High Winds) have relatively high raptor use and more moderate raptor mortality (Figures 8 and 9, Appendix B2). Due to the relatively low sample size and other biological factors that can influence raptor fatality rates as discussed above, it is not known if the relationship between raptor use and fatality rates is linear. Additionally, mortality estimation for wind resource areas with moderate to high raptor use is subject to greater uncertainty due to a lack of available data, as few wind resource areas have reported moderate or high pre-construction raptor use estimates. Furthermore, variation in species composition is likely to influence overall raptor mortality; however, data are not available at this time to perform species-specific regression analyses.

WEST used the available data to assess risk to raptors by examining the mean and range of mortality for wind energy facilities considered to have low raptor use. The proposed Project is classified as having low raptor use; therefore, raptor fatality rates for this project are expected to be within the range of other wind energy facilities that also have low raptor use (i.e., a use of zero to 0.5 raptors/800-m plot/20-min survey), with a mean fatality rate of 0.05 fatalities/MW/year and a range of zero to 0.09 raptor fatalities/MW/year (Appendix B2). Given the proposed 30-MW size of the Mesa project, this would equate to roughly one to three raptor fatalities per year. As noted above, based on raptor use and comparable fatality data from regional projects, American kestrel and red-tailed hawk are likely to account for a majority of raptor fatalities, assuming some fatalities do occur.

For eagles specifically, overall use was low, with only four golden eagle observations recorded during the surveys or incidentally, all of which occurred in the fall (one observation) and winter (three observations). Prior surveys conducted at the Project also reported relatively low eagle use (Bloom 2013), although the two studies cannot be directly compared due to the use of different methods and metrics (e.g., survey effort across seasons, survey duration, and standardized use metric). However, although methods and metrics varied among studies, the overall results were similar in that eagle use was relatively low. Bloom (2013) used the USFWS Bayesian collision risk model (USFWS 2013) to predict an estimated take of one golden eagle every 14 years. Although we did not conduct a formal risk analysis using the USFWS collision model, given the lower level of use detected during this study (2015-2016), the predicted level of take would be even lower than that indicated by Bloom (2013). Assuming the repowered Project will consist of 15 or fewer turbines and eagle use remains consistent with the levels documented in this effort and Bloom (2013), a low rate of eagle mortality should be expected at the Project, on the order of one eagle every 10-15 years. However, a formal risk analysis following the current USFWS guidance (USFWS 2013, 2016) is recommended to estimate a predicted level of eagle take based on all available data and incorporating the final specification of the Project.

Other Avian Species of Concern

Seven sensitive bird species were recorded during surveys or incidentally within the Project (see Table 8). All seven species are protected under the Migratory Bird Treaty Act (1918) and are listed as species of concern by the USFWS (2008) or by the state of California (CDFW 2017). Additionally, both the golden eagle and the peregrine falcon are listed as fully protected species in California (CDFW 2017), and the golden eagle is further protected under the BGEPA (1940). Given the presence of these species within the Project, there is some potential for direct impacts (i.e., collision mortality) to sensitive species.

CONCLUSIONS AND RECOMMENDATIONS

Tier 3 studies are used to address questions regarding impacts that could not be sufficiently addressed using available literature (i.e., during Tier 1 and 2 desktop analyses). These studies provide additional data that, when combined with available literature reviewed in previous tiers, allow for a better-informed assessment of the risk of significant adverse impacts to species of concern at the Project. Currently, few published regional studies are available that correlate raptor use and mortality rates near the Project. Raptor use at Mesa was generally lower than use levels recorded at other wind energy facilities throughout the US, and diurnal raptor fatality rates are therefore expected to be within the range of fatality rates observed at other facilities where raptor use levels are lower. To date, no relationships have been observed between overall use by other bird types and fatality rates of those bird types at wind energy facilities. However, the flight characteristics, breeding and foraging habits of some species may result in increased exposure for some species. To date, overall fatality rates for birds (including nocturnal migrants) at wind energy facilities have been highly variable throughout California and the Pacific Northwest, ranging from 0.16 to 17.44 birds/MW/year (Figure 7, Appendix B1). Based on the data collected to date, there is some potential for impacts to species of concern within Mesa; however, given the levels of use documented to date, combined with fatality data from other facilities, impacts to sensitive species are not expected to be significant.

Two full years of Tier 3 avian studies under the WEG (USFWS 2012) and ECPG (USFWS 2013) have now been conducted at Mesa. While this report is specific to large bird use, previous avian use surveys, eagle nest surveys, and acoustic bat surveys have been or are being conducted at Mesa, and are reported on elsewhere. Combined, these data provides a solid baseline of information for comparison with future Tier 4 post-construction monitoring studies. Consistent with the WEG, the development of a Bird and Bat Conservation Strategy is recommended such that all available data for the Project are summarized in a single document, along with Brookfield's strategy for managing and reducing the risk of impacts to birds and bats over the long term operation of the Mesa Project.

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Appendix A. All Large Bird Types and Species Observed at the Mesa Wind Energy Repower Project, Riverside County, California from November 13, 2015 – November 7, 2016

Appendix A. Summary of individuals and group observations by bird type and species for large bird/eagle observation surveys at the Mesa Wind Energy Repower Project, November 13, 2015 – November 07, 2016.

		Summer		Fall		Winter		Spring		Total	
Type / Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Waterbirds		**0**	**0**	**0**	**0**	**0**	**0**	**1**	**28**	**1**	**28**
double-crested cormorant	*Phalacrocorax auritus*	0	0	0	0	0	0	1	28	1	28
Waterfowl		**0**	**0**	**0**	**0**	**3**	**145**	**0**	**0**	**3**	**145**
Canada goose	*Branta canadensis*	0	0	0	0	3	145	0	0	3	145
Diurnal Raptors		**8**	**8**	**14**	**15**	**38**	**38**	**22**	**24**	**82**	**85**
Accipiters		*0*	*0*	*0*	*0*	*0*	*0*	*1*	*1*	*1*	*1*
Cooper's hawk	*Accipiter cooperii*	0	0	0	0	0	0	1	1	1	1
Buteos		*3*	*3*	*3*	*4*	*16*	*16*	*6*	*6*	*28*	*29*
ferruginous hawk	*Buteo regalis*	0	0	0	0	1	1	0	0	1	1
red-tailed hawk	*Buteo jamaicensis*	3	3	3	4	15	15	6	6	27	28
Northern Harrier		*0*	*0*	*0*	*0*	*2*	*2*	*0*	*0*	*2*	*2*
northern harrier	*Circus cyaneus*	0	0	0	0	2	2	0	0	2	2
Eagles		*0*	*0*	*1*	*1*	*3*	*3*	*0*	*0*	*4*	*4*
golden eagle	*Aquila chrysaetos*	0	0	1	1	3	3	0	0	4	4
Falcons		*5*	*5*	*9*	*9*	*17*	*17*	*15*	*17*	*46*	*48*
American kestrel	*Falco sparverius*	5	5	8	8	14	14	15	17	42	44
peregrine falcon	*Falco peregrinus*	0	0	1	1	0	0	0	0	1	1
prairie falcon	*Falco mexicanus*	0	0	0	0	3	3	0	0	3	3
Other Raptors		*0*	*0*	*1*	*1*	*0*	*0*	*0*	*0*	*1*	*1*
unidentified raptor		0	0	1	1	0	0	0	0	1	1
Vultures		**0**	**0**	**0**	**0**	**2**	**21**	**2**	**10**	**4**	**31**
turkey vulture	*Cathartes aura*	0	0	0	0	2	21	2	10	4	31
Large Corvids		**5**	**5**	**25**	**32**	**0**	**0**	**47**	**68**	**77**	**105**
common raven	*Corvus corax*	5	5	25	32	0	0	47	68	77	105
Overall		**13**	**13**	**39**	**47**	**43**	**204**	**72**	**130**	**167**	**394**

[a] Regardless of distance from observer.

Appendix B. Fatality Summary Tables for Wind Energy Facilities within the California and Pacific Northwest Regions of North America

Appendix B1. Wind energy facilities in the California and Pacific Northwest regions of North America with publicly available and comparable fatality data for all bird species.

Wind Energy Facility	Fatality Estimate[A]	No. of Turbines	Total MW
	California		
Pine Tree, CA (2009-2010, 2011)	17.44	90	135
Montezuma I, CA (2012)	8.91	16	36.8
Alta Wind I-V, CA (2013-2014)	7.8	290	720 (150 GE, 570 vestas)
Alta Wind I, CA (2011-2012)	7.07	100	150
Shiloh I, CA (2006-2009)	6.96	100	150
Montezuma I, CA (2011)	5.19	16	36.8
Dillon, CA (2008-2009)	4.71	45	45
Diablo Winds, CA (2005-2007)	4.29	31	20.46
Shiloh III, CA (2012-2013)	3.3	50	102.5
Shiloh II, CA (2010-2011)	2.8	75	150
Shiloh II, CA (2009-2010)	1.9	75	150
Mustang Hills, CA (2012-2013)	1.66	50	150
Alta Wind II-V, CA (2011-2012)	1.66	190	570
High Winds, CA (2003-2004)	1.62	90	162
Solano III, CA (2012-2013)	1.6	55	128
Pinyon Pines I & II, CA (2013-2014)	1.18	100	NA
High Winds, CA (2004-2005)	1.1	90	162
Montezuma II, CA (2012-2013)	1.08	34	78.2
Alta VIII, CA (2012-2013)	0.66	50	150
Alite, CA (2009-2010)	0.55	8	24
	Pacific Northwest		
Windy Flats, WA (2010-2011)	8.45	114	262.2
Leaning Juniper, OR (2006-2008)	6.66	67	100.5
Linden Ranch, WA (2010-2011)	6.65	25	50
Biglow Canyon, OR (Phase II; 2009-2010)	5.53	65	150
White Creek, WA (2007-2011)	4.05	89	204.7
Tuolumne (Windy Point I), WA (2009-2010)	3.2	62	136.6
Stateline, OR/WA (2001-2002)	3.17	454	299
Klondike II, OR (2005-2006)	3.14	50	75
Klondike III (Phase I), OR (2007-2009)	3.02	125	223.6
Hopkins Ridge, WA (2008)	2.99	87	156.6
Harvest Wind, WA (2010-2012)	2.94	43	98.9
Nine Canyon, WA (2002-2003)	2.76	37	48.1
Biglow Canyon, OR (Phase II; 2010-2011)	2.68	65	150
Stateline, OR/WA (2003)	2.68	454	299
Klondike IIIa (Phase II), OR (2008-2010)	2.61	51	76.5
Combine Hills, OR (Phase I; 2004-2005)	2.56	41	41
Big Horn, WA (2006-2007)	2.54	133	199.5
Biglow Canyon, OR (Phase I; 2009)	2.47	76	125.4
Combine Hills, OR (2011)	2.33	104	104
Biglow Canyon, OR (Phase III; 2010-2011)	2.28	76	174.8
Hay Canyon, OR (2009-2010)	2.21	48	100.8
Elkhorn, OR (2010)	1.95	61	101
Pebble Springs, OR (2009-2010)	1.93	47	98.7
Biglow Canyon, OR (Phase I; 2008)	1.76	76	125.4
Wild Horse, WA (2007)	1.55	127	229
Goodnoe, WA (2009-2010)	1.4	47	94
Vantage, WA (2010-2011)	1.27	60	90
Hopkins Ridge, WA (2006)	1.23	83	150
Stateline, OR/WA (2006)	1.23	454	299
Kittitas Valley, WA (2011-2012)	1.06	48	100.8
Klondike, OR (2002-2003)	0.95	16	24

Appendix B1. Wind energy facilities in the California and Pacific Northwest regions of North America with publicly available and comparable fatality data for all bird species.

Wind Energy Facility	Fatality Estimate[A]	No. of Turbines	Total MW
Vansycle, OR (1999)	0.95	38	24.9
Palouse Wind, WA (2012-2013)	0.72	58	104.4
Elkhorn, OR (2008)	0.64	61	101
Marengo I, WA (2009-2010)	0.27	78	140.4
Marengo II, WA (2009-2010)	0.16	39	70.2

A=number of bird fatalities/MW/year
Data from the following sources:

Wind Energy Facility	Estimate Reference	Wind Energy Facility	Estimate Reference
Alite, CA (09-10)	Chatfield et al. 2010b	Klondike IIIa (Phase II), OR (08-10)	Gritski et al. 2011
Alta Wind I, CA (11-12)	Chatfield et al. 2012	Leaning Juniper, OR (06-08)	Gritski et al. 2008
Alta Wind I-V, CA (13-14)	Chatfield et al. 2014	Linden Ranch, WA (10-11)	Enz and Bay 2011
Alta Wind II-V, CA (11-12)	Chatfield et al. 2012	Marengo I, WA (09-10)	URS Corporation 2010b
Alta VIII, CA (12-13)	Chatfield and Bay 2014	Marengo II, WA (09-10)	URS Corporation 2010c
Big Horn, WA (06-07)	Kronner et al. 2008	Montezuma I, CA (11)	ICF International 2012
Biglow Canyon, OR (Phase I; 08)	Jeffrey et al. 2009a	Montezuma I, CA (12)	ICF International 2013
Biglow Canyon, OR (Phase I; 09)	Enk et al. 2010	Montezuma II, CA (12-13)	Harvey & Associates 2013
Biglow Canyon, OR (Phase II; 09-10)	Enk et al. 2011a	Mustang Hills, CA (12-13)	Chatfield and Bay 2014
Biglow Canyon, OR (Phase II; 10-11)	Enk et al. 2012b	Nine Canyon, WA (02-03)	Erickson et al. 2003c
Biglow Canyon, OR (Phase III; 10-11)	Enk et al. 2012a	Palouse Wind, WA (12-13)	Stantec 2013
Combine Hills, OR (Phase I; 04-05)	Young et al. 2006	Pebble Springs, OR (09-10)	Gritski and Kronner 2010b
Combine Hills, OR (11)	Enz et al. 2012	Pine Tree, CA (09-10, 11)	BioResource Consultants 2012
Diablo Winds, CA (05-07)	WEST 2006, 2008	Pinyon Pines I & II, CA (13-14)	Chatfield and Russo 2014
Dillon, CA (08-09)	Chatfield et al. 2009	Shiloh I, CA (06-09)	Kerlinger et al. 2009
Elkhorn, OR (08)	Jeffrey et al. 2009b	Shiloh II, CA (09-10)	Kerlinger et al. 2010, 2013a
Elkhorn, OR (10)	Enk et al. 2011b	Shiloh II, CA (10-11)	Kerlinger et al. 2013a
Goodnoe, WA (09-10)	URS Corporation 2010a	Shiloh III, CA (12-13)	Kerlinger et al. 2013b
Harvest Wind, WA (10-12)	Downes and Gritski 2012a	Solano III, CA (12-13)	AECOM 2013
Hay Canyon, OR (09-10)	Gritski and Kronner 2010a	Stateline, OR/WA (01-02)	Erickson et al. 2004
High Winds, CA (03-04)	Kerlinger et al. 2006	Stateline, OR/WA (03)	Erickson et al. 2004
High Winds, CA (04-05)	Kerlinger et al. 2006	Stateline, OR/WA (06)	Erickson et al. 2007
Hopkins Ridge, WA (06)	Young et al. 2007a	Tuolumne (Windy Point I), WA (09-10)	Enz and Bay 2010
Hopkins Ridge, WA (08)	Young et al. 2009	Vansycle, OR (99)	Erickson et al. 2000
Kittitas Valley, WA (11-12)	Stantec Consulting Services 2012	Vantage, WA (10-11)	Ventus Environmental Solutions 2012
Klondike, OR (02-03)	Johnson et al. 2003	White Creek, WA (07-11)	Downes and Gritski 2012b
Klondike II, OR (05-06)	NWC and WEST 2007	Wild Horse, WA (07)	Erickson et al. 2008
Klondike III (Phase I), OR (07-09)	Gritski et al. 2010	Windy Flats, WA (10-11)	Enz et al. 2011

Appendix B2. Wind energy facilities in the California and Pacific Northwest regions of North America with publicly available and comparable use and fatality data for raptors.

Wind Energy Facility	Use Estimate[A]	Raptor Fatality Estimate[B]	No. of Turbines	Total MW
Mesa Wind, CA	**0.086**			
California				
Montezuma I, CA (2011)	NA	1.06	16	36.8
Solano III, CA (2012-2013)	NA	0.95	55	128
Montezuma I, CA (2012)	NA	0.79	16	36.8
High Winds, CA (2003-2004)	2.337	0.5	90	162
Montezuma II, CA (2012-2013)	NA	0.46	34	78.2
Shiloh II, CA (2010-2011)	NA	0.44	75	150
Shiloh I, CA (2006-2009)	NA	0.42	100	150
Diablo Winds, CA (2005-2007)	2.161	0.4	31	20.46
High Winds, CA (2004-2005)	2.337	0.28	90	162
Alta Wind I, CA (2011-2012)	0.19	0.27	100	150
Alite, CA (2009-2010)	NA	0.12	8	24
Shiloh II, CA (2009-2010)	NA	0.11	75	150
Mustang Hills, CA (2012-2013)	NA	0.08	50	150
Alta Wind I-V, CA (2013-2014)	NA	0.08	290	720 (150 GE, 570 vestas)
Alta Wind II-V, CA (2011-2012)	0.04	0.05	190	570
Alta VIII, CA (2012-2013)	0.04	0.02	50	150
Dillon, CA (2008-2009)	NA	0	45	45
Pacific Northwest				
White Creek, WA (2007-2011)	NA	0.47	89	204.7
Tuolumne (Windy Point I), WA (2009-2010)	0.77	0.29	62	136.6
Vantage, WA (2010-2011)	NA	0.29	60	90
Linden Ranch, WA (2010-2011)	NA	0.27	25	50
Harvest Wind, WA (2010-2012)	NA	0.23	43	98.9
Goodnoe, WA (2009-2010)	NA	0.17	47	94
Leaning Juniper, OR (2006-2008)	0.522	0.16	67	100.5
Klondike III (Phase I), OR (2007-2009)	NA	0.15	125	223.6
Hopkins Ridge, WA (2006)	0.698	0.14	83	150
Biglow Canyon, OR (Phase II; 2009-2010)	0.318	0.14	65	150
Big Horn, WA (2006-2007)	0.511	0.11	133	199.5
Stateline, OR/WA (2006)	0.478	0.11	454	299
Kittitas Valley, WA (2011-2012)	NA	0.09	48	100.8
Wild Horse, WA (2007)	0.291	0.09	127	229
Stateline, OR/WA (2001-2002)	0.478	0.09	454	299
Stateline, OR/WA (2003)	0.478	0.09	454	299
Elkhorn, OR (2010)	1.07	0.08	61	101
Hopkins Ridge, WA (2008)	0.698	0.07	87	156.6
Elkhorn, OR (2008)	1.07	0.06	61	101
Klondike II, OR (2005-2006)	0.504	0.06	50	75
Klondike IIIa (Phase II), OR (2008-2010)	NA	0.06	51	76.5
Combine Hills, OR (2011)	0.746	0.05	104	104
Biglow Canyon, OR (Phase III; 2010-2011)	0.318	0.05	76	174.8
Marengo II, WA (2009-2010)	NA	0.05	39	70.2
Windy Flats, WA (2010-2011)	NA	0.04	114	262.2
Pebble Springs, OR (2009-2010)	NA	0.04	47	98.7
Biglow Canyon, OR (Phase I; 2008)	0.318	0.03	76	125.4
Biglow Canyon, OR (Phase II; 2010-2011)	0.318	0.03	65	150
Nine Canyon, WA (2002-2003)	0.35	0.03	37	48.1
Hay Canyon, OR (2009-2010)	NA	0	48	100.8
Biglow Canyon, OR (Phase I; 2009)	0.318	0	76	125.4
Marengo I, WA (2009-2010)	NA	0	78	140.4
Klondike, OR (2002-2003)	0.504	0	16	24
Vansycle, OR (1999)	0.66	0	38	24.9
Combine Hills, OR (Phase I; 2004-2005)	0.746	0	41	41

A=number of raptors/plot/20min survey
B=number of fatalities/MW/year

Appendix B2. Wind energy facilities in the California and Pacific Northwest regions of North America with publicly available and comparable use and fatality data for raptors.

Data from the following sources:

Wind Energy Facility	Estimate Reference	Wind Energy Facility	Estimate Reference
Alite, CA (09-10)	Chatfield et al. 2010b	Klondike II, OR (05-06)	NWC and WEST 2007
Alta Wind I, CA (11-12)	Chatfield et al. 2012	Klondike III (Phase I), OR (07-09)	Gritski et al. 2010
Alta Wind I-V, CA (13-14)	Chatfield et al. 2014	Klondike IIIa (Phase II), OR (08-10)	Gritski et al. 2011
Alta Wind II-V, CA (11-12)	Chatfield et al. 2012	Leaning Juniper, OR (06-08)	Gritski et al. 2008
Alta VIII, CA (12-13)	Chatfield and Bay 2014	Linden Ranch, WA (10-11)	Enz and Bay 2011
Big Horn, WA (06-07)	Kronner et al. 2008	Marengo I, WA (09-10)	URS Corporation 2010b
Biglow Canyon, OR (Phase I; 08)	Jeffrey et al. 2009a	Marengo II, WA (09-10)	URS Corporation 2010c
Biglow Canyon, OR (Phase I; 09)	Enk et al. 2010	Montezuma I, CA (11)	ICF International 2012
Biglow Canyon, OR (Phase II; 09-10)	Enk et al. 2011a	Montezuma I, CA (12)	ICF International 2013
Biglow Canyon, OR (Phase II; 10-11)	Enk et al. 2012b	Montezuma II, CA (12-13)	Harvey & Associates 2013
Biglow Canyon, OR (Phase III; 10-11)	Enk et al. 2012a	Mustang Hills, CA (12-13)	Chatfield and Bay 2014
Combine Hills, OR (Phase I; 04-05)	Young et al. 2006	Nine Canyon, WA (02-03)	Erickson et al. 2003c
Combine Hills, OR (11)	Enz et al. 2012	Pebble Springs, OR (09-10)	Gritski and Kronner 2010b
Diablo Winds, CA (05-07)	WEST 2006, 2008	Shiloh I, CA (06-09)	Kerlinger et al. 2009
Dillon, CA (08-09)	Chatfield et al. 2009	Shiloh II, CA (09-10)	Kerlinger et al. 2010, 2013a
Elkhorn, OR (08)	Jeffrey et al. 2009b	Shiloh II, CA (10-11)	Kerlinger et al. 2013a
Elkhorn, OR (10)	Enk et al. 2011b	Shiloh III, CA (12-13)	Kerlinger et al. 2013b
Goodnoe, WA (09-10)	URS Corporation 2010a	Stateline, OR/WA (01-02)	Erickson et al. 2004
Harvest Wind, WA (10-12)	Downes and Gritski 2012a	Stateline, OR/WA (03)	Erickson et al. 2004
Hay Canyon, OR (09-10)	Gritski and Kronner 2010a	Stateline, OR/WA (06)	Erickson et al. 2007
High Winds, CA (03-04)	Kerlinger et al. 2006	Tuolumne (Windy Point I), WA (09-10)	Enz and Bay 2010
High Winds, CA (04-05)	Kerlinger et al. 2006	Vansycle, OR (99)	Erickson et al. 2000
Hopkins Ridge, WA (06)	Young et al. 2007a	Vantage, WA (10-11)	Ventus Environmental Solutions 2012
Hopkins Ridge, WA (08)	Young et al. 2009	White Creek, WA (07-11)	Downes and Gritski 2012b
Kittitas Valley, WA (11-12)	Stantec Consulting Services 2012	Wild Horse, WA (07)	Erickson et al. 2008
Klondike, OR (02-03)	Johnson et al. 2003	Windy Flats, WA (10-11)	Enz et al. 2011

APPENDIX C-7

2018 Bat Activity Report

Bat Activity Studies for the Mesa Wind Energy Repower Project Riverside County, California

Final Report

June 28, 2016 – October 1, 2017

Prepared for:

Brookfield Renewable Energy Partners, L.P.

Western US Regional Operations

Prepared by:

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February 22, 2018

EXECUTIVE SUMMARY

In June 2016, Brookfield Renewable Energy Partners, L.P. (Brookfield) contracted Western Ecosystems Technology, Inc. to conduct bat activity surveys at the proposed Mesa Wind Energy Repower Project (Project) in Riverside County, California. The bat acoustic survey conducted at the Project was designed to estimate levels of bat activity throughout the Project throughout the year.

Acoustic surveys were conducted between June 28, 2016, and October 1, 2017, at two meteorological (met) towers located in desert scrub land cover types representative of potential turbine locations. AnaBat™ SD1 and SD2 detectors were paired at each met tower, with one placed near the ground at 1.5 meters (five feet) and one elevated to 45 meters (148 feet) above ground level. The raised detector was placed to sample bat activity near the potential rotor-swept zone.

During the 1,519 detector nights surveyed, the average bat activity rate (± standard error) was relatively low at 1.59 ± 0.17 bat passes per detector-night. Overall average bat activity was lowest in the winter (0.63 ± 0.20; November 15, 2016 – February 28, 2017) and was highest during the spring (3.43 ± 0.75; March 1 – April 30, 2017). Overall weekly bat activity peaked in late September in 2016, and in early August in 2017. The average bat activity rate at the ground-based detectors (2.34 ± 0.23 bat passes per detector-night) was nearly three times the activity rate at the raised detectors (0.83 ± 0.13 bat passes per detector-night) throughout the study.

Similar numbers of high-frequency (54.5%; calls greater than 30 kilohertz [kHz]; e.g., *Myotis* bats) and low-frequency (43.5%; calls less than or equal to 30 kHz; e.g., big brown bats, hoary bats, Mexican free-tailed bats, and pocketed free-tailed bats) bat passes were recorded at all stations. Automated call classification identified calls for 14 of the 18 bat species that could potentially occur at the Project. A bat biologist manually identified one additional species, the big free-tailed bat. Hoary bat/pocketed free-tailed bats (two species grouped together due to difficulty in distinguishing their echolocation calls) were the main species group detected, present on 27% of operational detector-nights, followed by canyon bats and Mexican free-tailed bat, present on 21% of detector-nights.

Activity during the standardized Fall Migration Period was 3.29 ± 0.61 bat passes per detector-night in 2016 and 4.55 ± 0.76 bat passes per detector-night in 2017, which is comparable with data at other wind energy facilities that have recorded both pre-construction bat activity and post-construction bat fatalities. The Alta I Wind Energy facility, located in California in a similar landscape, had a similar pre-construction activity rate (4.42 bat passes per detector-night) as the Project, and a relatively low fatality rate (1.28 fatalities/megawatt [MW]/year). All facilities in the Pacific Northwest, California, and Southwestern regions have reported fewer than 4.5 bat fatalities per MW per year. Given the low activity rates measured at the Project and available bat mortality data from other regional projects, it is expected that bat fatality rates at the Project

will be less than 5.0 bat fatalities/MW/year, will occur mainly during the fall migratory period, and will be composed primarily of species such as Mexican free-tailed bat and hoary bat.

STUDY PARTICIPANTS

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John Edwards	Field Technician

REPORT REFERENCE

Rintz, T., L. Bishop-Boros, D.I. Solick, and J. Thompson. 2017. Bat Activity Studies for the Mesa Wind Project, Riverside County, California. Draft Final Report: June 28, 2016 – October 1, 2017. Prepared for Brookfield Renewable Energy Partners, L.P., Western US Regional Operations. Prepared by Western EcoSystems Technology, Inc. (WEST), Corvallis, Oregon. February 22, 2018.

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INTRODUCTION

Brookfield Renewable Energy Partners, L.P. (Brookfield) is considering repowering the Mesa Wind Energy Project (Project) in Riverside County, California. Brookfield contracted Western EcoSystems Technology, Inc. (WEST) to complete a study of bat activity following the recommendations of the US Fish and Wildlife Service (USFWS) Land-based Wind Energy Guidelines (USFWS 2012) and Kunz et al. (2007). WEST conducted acoustic monitoring surveys to estimate levels of bat activity at the Project throughout the year. The following report describes the results of acoustic monitoring surveys conducted at the Project between June 28, 2016, and October 1, 2017.

STUDY AREA

The proposed 369-acre Project is located in Riverside County, California, approximately 13 kilometers (km; eight miles) northwest of Palm Springs in the southeastern San Bernardino Mountains (Figure 1). The existing 30-megawatt (MW) Project, which Brookfield is proposing to repower, is located within the San Gorgonio Wind Resource Area, a region of high-density wind energy development. The Project lies at the northwestern-most limits of the Sonoran Desert, within the Sonoran Basin and Range Ecoregion (US Environmental Protection Agency [USEPA] 2017). The Mojave Basin and Range Ecoregion is situated directly to the northeast of the Project and the Southern California Mountain Ecoregion lies directly to the west. The Sonoran Basin and Range Ecoregion contains scattered low mountains and has large tracts of federally owned land, most of which is used for military training. This ecoregion is slightly warmer than the Mojave Basin and Range Ecoregion and contains a variety of desert-adapted trees, shrubs, and cacti (USEPA 2017). The region experiences very hot summers, mild winters, frequent gusty winds, and less than six inches (15 centimeters) of rainfall per year on average.

Land cover within the Project is predominately herbaceous (65.7%) and desert shrub/scrub (19.2%; Figure 2, Table 1). Vegetation is primarily Sonoran mixed woody and succulent scrub, and includes a variety of woody and herbaceous plants, including creosote bush (*Larrea tridentata)*, indigo bush (*Psorothamnus arborescens*), catclaw (*Acacia greggii*), desert lavender (*Hyptis emoryi*), rock daisy (*Perityle emoryi*), and palo verde (*Circidium floridum*). Approximately 9.7% of the Project is barren and 5.4% is open space (Figure 2, Table 1). There are no surface waters; however, several ephemeral washes are present within the Project. Existing turbines are generally oriented in north to south rows along the tops of steeply sloped ridges. Elevations within the Project range from about 600 to 900 meters (m; 1,969 to 2,953 feet [ft]) above mean sea level.

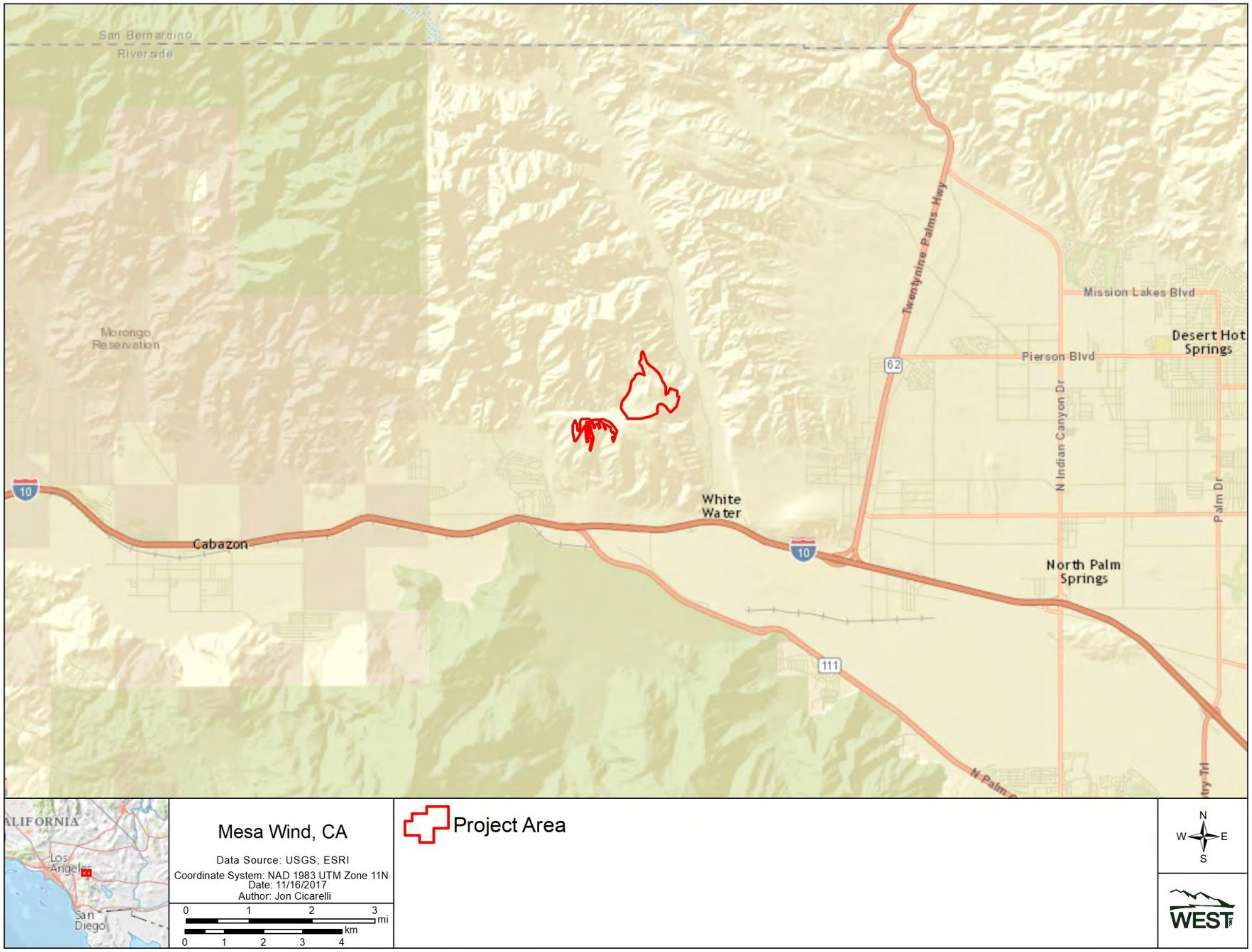

Figure 1. Map showing the location of the Mesa Wind Energy Repower Project.

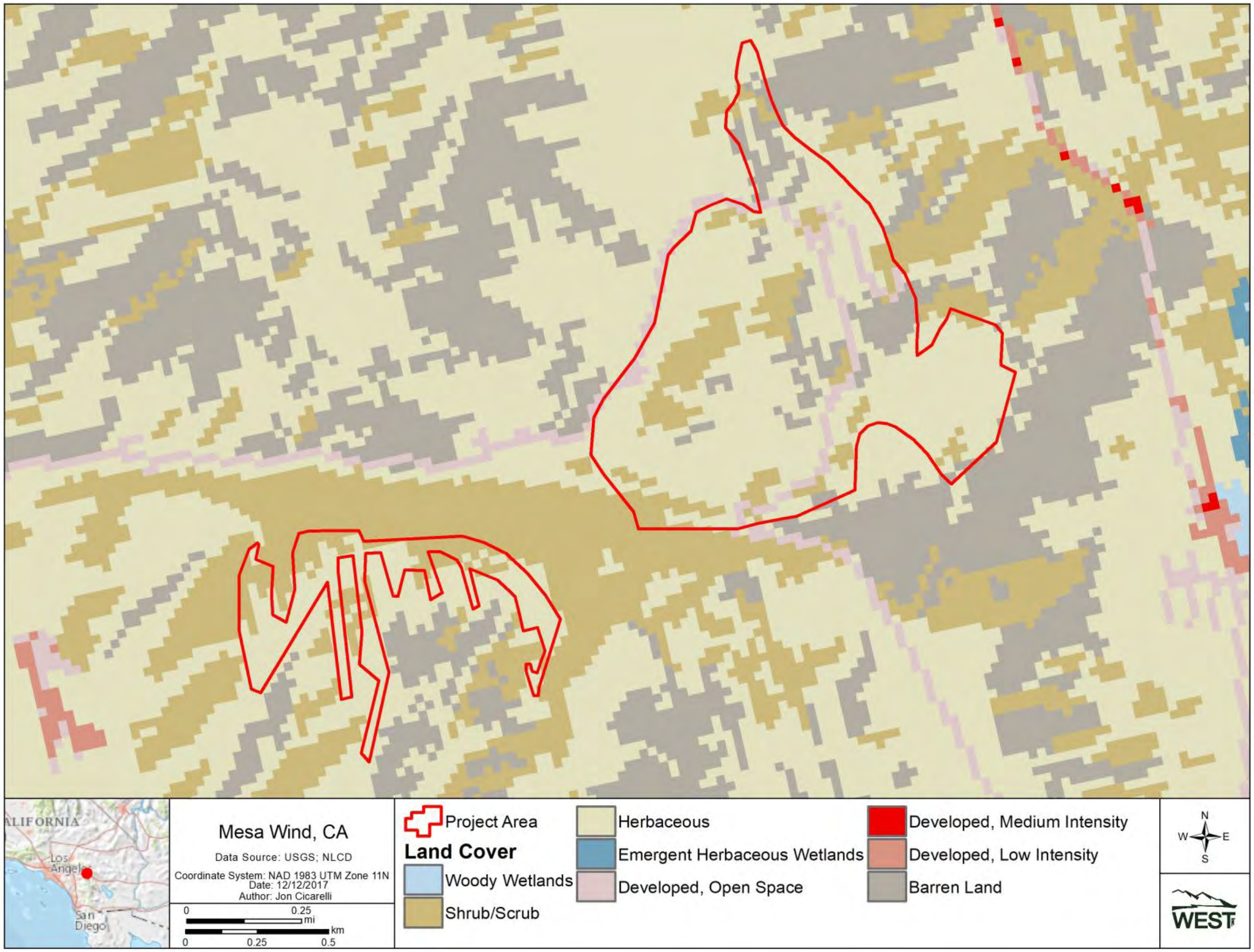

Figure 2. Land cover in the Mesa Wind Energy Repower Project (US Geological Survey [USGS] National Land Cover Dataset [NLCD] 2011).

Table 1. Land cover in the Mesa Wind Energy Repower Project according to the United States Geological Survey National Land Cover Dataset (USGS NLCD 2011).

Land Cover	Acres	% Composition
Herbaceous/Grassland	242.36	65.7
Shrub/Scrub	70.81	19.2
Barren	35.74	9.7
Dev; Open Space	20.08	5.4
Total	**368.99**	**100%**

Overview of Bat Diversity

Eighteen species of bat have potential to occur at the Project (Table 2), none of which are federally protected. Eleven of the potentially occurring bat species have been documented as fatalities at other wind energy facilities and seven are considered Species of Special Concern in the state of California by the California Department of Fish and Wildlife (CDFW; Table 2).

Table 2. Bat species with potential to occur within the Mesa Wind Energy Repower Project (International Union for Conservation of Nature 2016) categorized by echolocation call frequency.

Common Name	Scientific Name
High-Frequency (> 30 kilohertz [kHz])	
California bat	*Myotis californicus*
California leaf-nosed bat	*Macrotus californicus*
canyon bat[1]	*Parastrellus hesperus*
little brown bat[1]	*Myotis lucifugus*
long-legged myotis[1]	*Myotis volans*
western long-eared bat[1]	*Myotis evotis*
western red bat[1,2,3]	*Lasiurus blossevillii*
western yellow bat[1,3]	*Lasiurus xanthinus*
Yuma bat	*Myotis yumanensis*
Low-Frequency (15 – 30 kHz)	
big brown bat[1]	*Eptesicus fuscus*
fringed bat	*Myotis thysanodes*
hoary bat[1,2]	*Lasiurus cinereus*
Mexican free-tailed bat[1,2]	*Tadarida brasiliensis mexicana*
pallid bat[3]	*Antrozous pallidus*
pocketed free-tailed bat[1,3]	*Nyctinomops femorosaccus*
Townsend's big-eared bat[3]	*Corynorhinus townsendii*
Very Low-Frequency (< 15 kHz)	
big free-tailed bat[1,3]	*Nyctinomops macrotis*
western mastiff bat[3]	*Eumops perotis californicus*

[1] species known to have been killed at wind energy facilities;
[2] long-distance migrant;
[3] species of special concern in California (CDFW 2017).

METHODS

Bat Acoustic Surveys

WEST conducted acoustic monitoring surveys to estimate levels of bat activity at the Project during the study period. Although it remains unclear whether baseline acoustic data are able to adequately predict post-construction mortality (Hein et al. 2013a), ultrasonic detectors do collect information on the spatial distribution, timing, and species composition that can provide insights into the possible impacts of wind energy development on bats (Kunz et al. 2007; Britzke et al. 2013) and inform potential mitigation strategies (Weller and Baldwin 2012).

Survey Stations

Four AnaBat SD1 or SD2 ultrasonic bat detectors (Titley™ Scientific, Colombia, Missouri, USA) were used to record bat echolocation calls. The detectors were deployed at two meteorological (met) towers (Figure 3), with one detector placed near ground level (approximately 1.5 meter above ground level [AGL]) at each met tower (Figure 4) and another within the rotor-swept zone (approximately 45 m [147 ft] AGL). Both met towers were located in herbaceous/grassland vegetation types, which was the most common land cover type (Table 1) and representative of most potential turbine locations at the Project. Species activity levels and composition can vary with altitude (Baerwald and Barclay 2009; Collins and Jones 2009; Müeller et al. 2013); therefore, it can be useful to monitor activity at different heights (Kunz et al. 2007b). Ground-based detectors likely detect a more complete sample of the bat species present within the project area, whereas elevated detectors may give a more accurate assessment of risk to bat species flying at rotor swept heights (Kunz et al. 2007b; Müeller et al. 2013; but see Amorim et al. 2012).

Each ground-level detector was placed inside a plastic weather-tight container that had a hole cut in the side through which the microphone extended. Each microphone was encased in a 45-degree angle poly-vinyl chloride (PVC) tube, and holes were drilled in the PVC tube to allow water to drain. Raised detector microphones were elevated on the met tower using a pulley system and standard Bat-Hat weatherproof housing which was modified to use a 45-degree angle PVC elbow.

Figure 3. Location of AnaBat stations used during bat acoustic surveys at the Mesa Wind Energy Repower Project.

Figure 4. Acoustic sampling station at base of met tower showing near-ground detector mounted on 1.5-meter pole and base unit mounted to elevated microphone.

Survey Schedule

Bats were surveyed at the Project from June 28, 2016, to October 1, 2017, with detectors programmed to turn on approximately 30 minutes (min) before sunset and turn off approximately 30 min after sunrise each night. To highlight seasonal activity patterns, the study was divided into seven survey periods: Summer 2016 (June 28 – September 15, 2016), Fall 2016 (September 16 – November 14, 2016), Winter 2016/2017 (November 15, 2016 – February 28, 2017), Spring 2017 (March 1 – April 30, 2017), Summer 2017 (May 1 – September 15, 2017), and Fall 2017 (September 16 – October 1, 2017). Average bat activity was also calculated for the full study period, as well as for standardized Fall Migration Periods (FMP), defined here as July 30 – October 16 (for Fall 2016) and from July 30 – October 1 (for Fall

2017). The FMP is defined by WEST as a standard for comparison with activity from other wind energy facilities. During this time, bats begin moving toward wintering areas and many species of bats initiate reproductive behaviors (Cryan 2008). This period of increased landscape-scale movement and reproductive behavior is often associated with increased levels of bat fatalities at operational wind energy facilities (Arnett et al. 2008; Arnett and Baerwald 2013).

Data Collection and Call Analysis

AnaBat detectors use a broadband high-frequency microphone to detect the echolocation calls of bats. Incoming echolocation calls are digitally processed and stored on a high capacity compact flash card. The resulting files can be viewed in appropriate software (e.g., AnalookW©) as digital sonograms that show changes in echolocation call frequency over time (Figure 5). Frequency versus time displays were used to separate bat calls from other types of ultrasonic noise (e.g., wind, insects, etc.) and to determine the call frequency category and (when possible) the species of bat that generated the calls.

To standardize acoustic sampling effort across the Project, detectors were calibrated and sensitivity levels were set to six (Larson and Hayes 2000), a level that balanced the goal of recording bat calls against the need to reduce interference from other sources of ultrasonic noise (Brooks and Ford 2005).

For each survey location, bat passes were sorted into three groups based on their minimum frequency. High-frequency (HF) bats such as *Myotis* species have minimum frequencies greater than 30 kHz. Low-frequency (LF) bats such as big brown bats (*Eptesicus fuscus*), Mexican free-tailed bats (*Tadarida brasiliensis*), and hoary bats (*Lasiurus cinereus*) typically emit echolocation calls with minimum frequencies between 15 and 30 kHz. Very low-frequency (VLF) bats, such as the big free-tailed bat (*Nyctinomops macrotis*), have minimum echolocation frequencies below 15 kHz. HF, LF, and VLF species that may occur in the study area are listed in Table 2.

To identify species occurrence at the Project, files that had been identified as HF, LF, or VLF bats were run through an automated acoustic identification program, Kaleidoscope (Pro version 4.2.0; Wildlife Acoustics). The Bats of North America classifier (version 4.2.0) was used, at a sensitivity setting of neutral (0), to select for the 18 bat species that potentially occur in the Project (Table 2). The classifier does not include the western yellow bat (*Lasiurus xanthinus*),

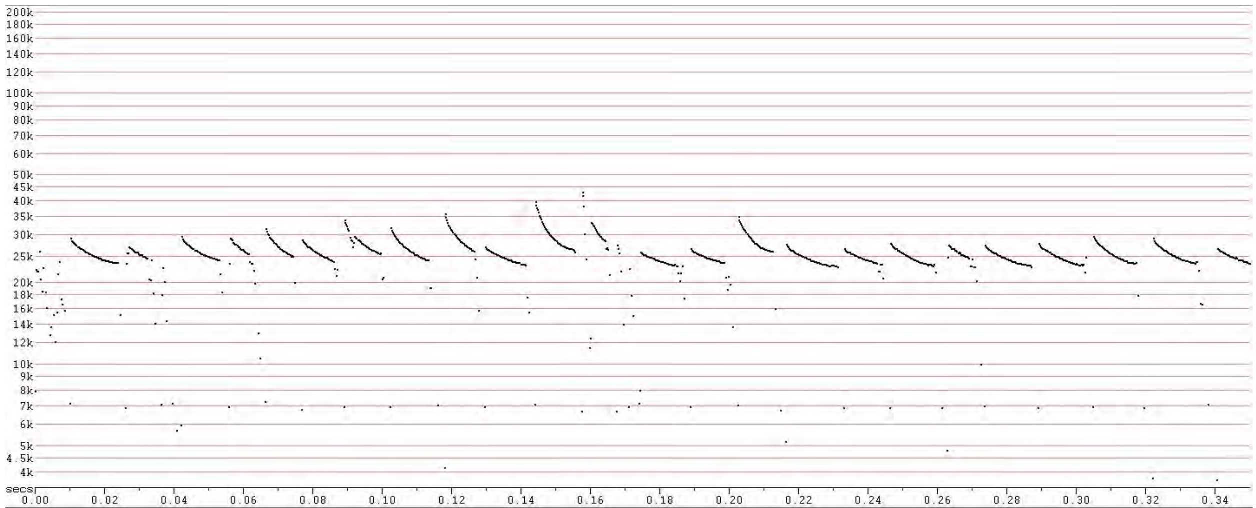

Figure 5. Time-frequency sonogram of a Mexican free-tailed bat (*Tadarida brasiliensis mexicana*), displayed in Analook viewing software. The minimum frequency for this call sequence is approximately 24 kHz, making this a low-frequency (LF) species.

California leaf-nosed bat (*Macrotus californicus*), pocketed free-tailed bat (*Nyctinomops femorosaccus*), or the big free-tailed bat. Therefore; these species were not identified by Kaleidoscope. However, a qualified bat biologist viewed all of the calls to identify California leaf-nosed bats and big free-tailed bats, which produce distinctive echolocation calls. The bat biologist also visually identified calls made by western mastiff bats, a species included in the Kaleidoscope classifier but prone to being classified as false positives. Since Kaleidoscope could not identify pocketed free-tailed bat calls, and because these calls are similar to the calls of hoary bats, files that were classified as hoary bats were placed in a hoary bat/pocketed free-tailed bat species group.

Statistical Analysis

The standard metric used for measuring bat activity is the number of bat passes per detector-night, and this metric was used as an index of bat activity in the Project area. A bat pass was defined as a sequence of at least two echolocation calls (pulses) produced by an individual bat with no pause between calls of more than one second (Fenton 1980, White and Gehrt 2001, Gannon et al. 2003). A detector-night was defined as one detector operating for one entire night. The terms bat pass and bat call are used interchangeably. Bat passes per detector-night were calculated for all bats, and for HF, LF, and VLF bats. Bat pass rates represent indices of bat activity and do not represent numbers of individuals. The number of bat passes was determined by an experienced bat biologist using Analook.

Average bat activity was calculated by detector and by season, with an overall average calculated as an unweighted average of total activity at each individual detector station. Using detector-nights as a metric for calculating bat activity controls for differences in sampling effort among individual detector stations and provides unbiased estimates for the deployed nights.

The periods of peak sustained bat activity during each year of the study were defined as the seven-day period with the highest average bat activity. If multiple seven-day periods equaled the peak sustained bat activity rate, all dates in these seven-day periods were reported. This and all multi-detector averages in this report were calculated as an unweighted average of total activity at each detector.

Risk Assessment

To assess potential for bat fatalities, bat activity in the Project was compared to existing data at other wind energy facilities in the California, Southwestern, and Pacific Northwest regions. Among studies measuring both activity and fatality rates, most data were collected during the summer and fall using Anabat detectors placed near the ground. Therefore, to make valid comparisons to the publically available data, this report uses the activity rate recorded at ground detectors during the FMP as a standard for comparison with activity data from other wind energy facilities. Given the relatively small number of publically available studies and the significant ecological differences between geographically dispersed facilities, the risk assessment is qualitative, rather than quantitative.

RESULTS

Bat Acoustic Surveys

Bat activity was monitored at four stations for a total of 1,519 detector-nights between June 28, 2016, and October 1, 2017. AnaBat detectors were operating for 82.4% of the sampling period (Figure 6). Data were occasionally lost at each acoustic survey station due to reduced battery life, equipment malfunction, or memory cards exceeding their capacity due to high levels of non-bat noise (e.g., insects and wind) between site visits (typically on a weekly or bi-weekly basis). Detectors recorded 2,567 bat passes for an average (± standard error) of 1.59 ± 0.17 bat passes per detector-night (Table 3).

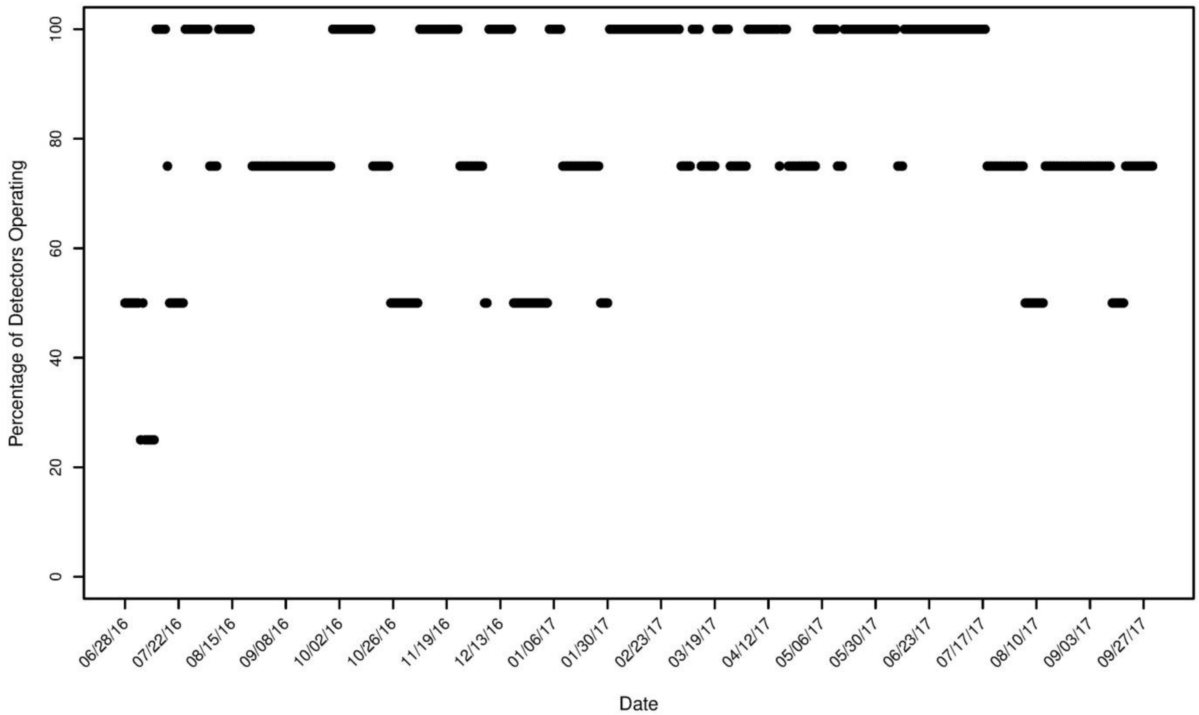

Figure 6. Operational status of bat detectors (n = 4) operating at the Mesa Wind Energy Repower Project during each night of the study period between June 28, 2016, and October 1, 2017.

Table 3. Results of bat acoustic surveys conducted at the Mesa Wind Energy Repower Project from June 28, 2016, to October 1, 2017. Passes are separated by call frequency: high frequency (HF), low frequency (LF), and very low frequency (VLF).

Detector Station	Type	# of HF Bat Passes	# of LF Bat Passes	# of VLF Bat Passes	# western mastiff bat passes	# big free-tailed bat passes	Total Bat Passes	Detector-Nights	Bat Passes/ Night***
M1g	ground	973	377	18	1	17	1,368	437	3.13 ± 0.32
M1r	raised	17	249	9	2	7	275	322	0.85 ± 0.14
M2g	ground	396	234	11	0	11	641	413	1.55 ± 0.20
M2r	raised	13	256	14	2	12	283	347	0.82 ± 0.20
Total Ground Stations		1,369	611	29	1	28	2,009	850	2.34 ± 0.23
Total Raised Stations		30	505	23	4	19	558	669	0.83 ± 0.13
Overall Average		**1,399**	**1116**	**52**	**5**	**47**	**2,567**	**1,519**	**1.59 ± 0.17**

*** ± bootstrapped standard error.

Spatial Variation

Bat activity in the Project varied among stations (Table 3), ranging from an average (± standard error) of 0.82 ± 0.20 bat passes per detector-night at station M2r to a high of 3.13 ± 0.32 bat passes per detector night at station M1g (Figure 7). Combined, raised detectors recorded 558 bat passes on 669 detector-nights for an average of 0.83 ± 0.13 bat passes per detector-night. In contrast, ground stations recorded 2,009 bat passes on 850 detector-nights for an average of 2.34 ± 0.23 bat passes per detector-night (Table 3; Figures 7, 8). Overall, bat activity averaged 1.59 ± 0.17 bat passes per detector-night across all stations (Table 3, Figure 7).

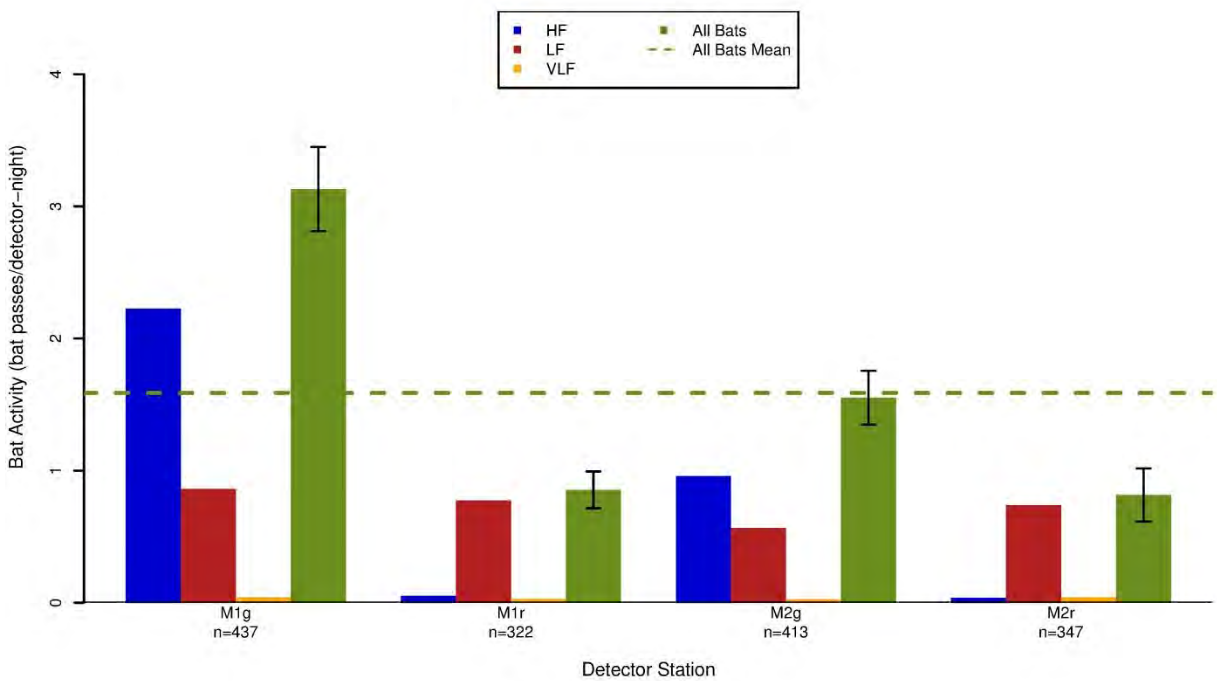

Figure 7. Number of high-frequency (HF), low-frequency (LF), and very low-frequency (VLF) bat passes per detector-night recorded at AnaBat stations in the Mesa Wind Energy Repower Project from June 28, 2016, to October 1, 2017. The bootstrapped standard errors are represented by the black error bars on the 'All Bats' columns.

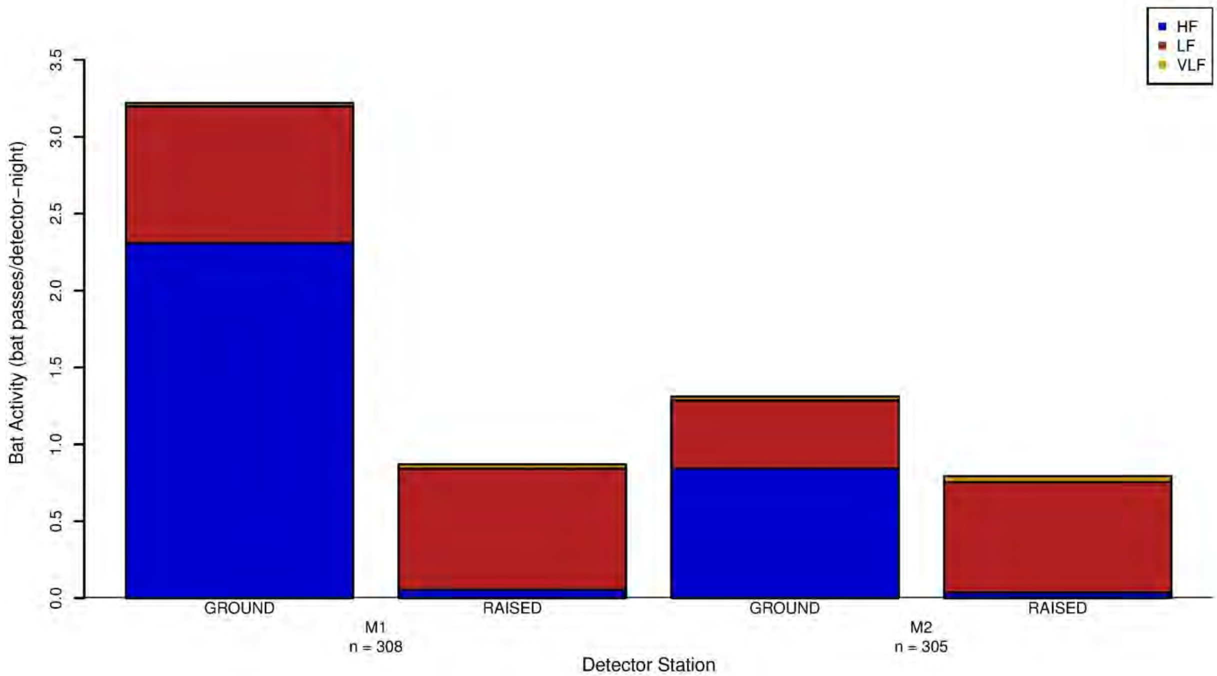

Figure 8. Number of high-frequency (HF), low-frequency (LF), and very low frequency (VLF) bat passes per detector-night recorded at the paired AnaBat stations in the Mesa Wind Energy Repower Project between June 28, 2016, and October 1, 2017.

Temporal Variation

Overall bat activity varied throughout the study period, from a high of 3.43 ± 0.75 bat passes per detector-night during the spring of 2017 to a low of 0.63 ± 0.20 during the winter (Table 4; Figure 9). Weekly bat activity also varied during the study period (Figure 10). When considering all possible consecutive seven-day periods, overall bat activity peaked during the period from September 19 – 25 (11.14 bat passes per detector-night) in 2016, and from August 1 – 7 (8.30 bat passes per detector-night; Table 5) in 2017. Activity during the FMP at ground stations ranged from 3.29 ± 0.61 bat passes per detector-night in 2016 (Table 4a) to 4.55 ± 0.76 bat passes per detector-night in 2017 (Table 4b).

Table 4a. The number of bat passes per detector-night recorded from June 28, 2016 through February 28, 2017 at AnaBat stations in the Mesa Wind Energy Repower Project during each season and during the standardized Fall Migration Period, separated by call frequency: high-frequency (HF), low-frequency (LF), very low frequency (VLF), and all bats (AB).

Station	Call Frequency	Summer Jun 28 – Sept 15	Fall Sept 16 – Nov 14	Winter Nov 15, 2016 – Feb 28, 2017	Fall Migration Period Jul 30 – Oct 1*
M1g	VLF	0.03	0.07	0	0.06
	LF	0.28	0.90	0.42	0.70
	HF	1.37	2.70	0.18	2.87
	AB	1.68	3.67	0.59	3.64
M1r	VLF	0.03	0.09	0	0.06
	LF	0.40	0.94	0.66	0.66
	HF	0.03	0.11	0	0.09
	AB	0.45	1.13	0.66	0.82
M2g	VLF	0.01	0.07	0.01	0.04
	LF	0.09	1.30	0.18	0.99
	HF	0.68	1.78	0.06	1.92
	AB	0.78	3.15	0.24	2.95
M2r	VLF	0.03	0.08	0.02	0.05
	LF	0.06	0.27	0.98	0.11
	HF	0	0	0	0
	AB	0.09	0.35	1.00	0.16
Ground Stations Totals	**VLF**	**0.02 ± 0.02**	**0.07 ± 0.03**	**0.01 ± 0.01**	**0.05 ± 0.02**
	LF	**0.19 ± 0.05**	**1.10 ± 0.36**	**0.30 ± 0.06**	**0.84 ± 0.28**
	HF	**1.02 ± 0.29**	**2.24 ± 0.43**	**0.12 ± 0.03**	**2.40 ± 0.41**
	AB	**1.23 ± 0.31**	**3.41 ± 0.70**	**0.42 ± 0.07**	**3.29 ± 0.61**
Raised Stations Totals	**VLF**	**0.03 ± 0.02**	**0.08 ± 0.05**	**0.01 ± 0.01**	**0.06 ± 0.03**
	LF	**0.23 ± 0.05**	**0.60 ± 0.17**	**0.82 ± 0.38**	**0.39 ± 0.10**
	HF	**0.01 ± 0.01**	**0.05 ± 0.04**	**0.00 ± 0.00**	**0.05 ± 0.02**
	AB	**0.27 ± 0.06**	**0.74 ± 0.22**	**0.83 ± 0.38**	**0.49 ± 0.13**
Overall	**VLF**	**0.03 ± 0.02**	**0.07 ± 0.03**	**0.01 ± 0.01**	**0.06 ± 0.03**
	LF	**0.21 ± 0.04**	**0.85 ± 0.25**	**0.56 ± 0.20**	**0.61 ± 0.19**
	HF	**0.52 ± 0.13**	**1.15 ± 0.24**	**0.06 ± 0.01**	**1.22 ± 0.21**
	AB	**0.75 ±0.15**	**2.07 ± 0.43**	**0.63 ± 0.20**	**1.89 ± 0.34**

* The FMP was cut-off on October 1, the last date of data collection.

Table 4b. The number of bat passes per detector-night recorded from March 1 through October 1, 2017, at AnaBat stations in the Mesa Wind Energy Repower Project during each season and during the standardized Fall Migration Period, separated by call frequency: high-frequency (HF), low-frequency (LF), very low frequency (VLF), and all bats (AB).

Station	Call Frequency	Spring March 1 – April 30	Summer May 1 – Sept 15	Fall Sept 16 – Oct 1	Fall Migration Period Jul 30 – Oct 1
M1g	VLF	0	0.08	0.12	0.18
	LF	2.46	0.71	1.19	1.44
	HF	5.05	2.80	2.12	3.96
	AB	7.51	3.59	3.44	5.58
M1r	VLF	0.02	0.03	NA	NA
	LF	1.95	0.20	NA	NA
	HF	0.15	0.01	NA	NA
	AB	2.11	0.24	NA	NA
M2g	VLF	0	0.04	0	0.09
	LF	1.50	0.42	0.85	0.84
	HF	0.89	1.27	2.15	2.59
	AB	2.39	1.73	3.00	3.52
M2r	VLF	0.04	0.05	0.06	0.11
	LF	1.51	0.63	0.06	0.75
	HF	0.17	0.03	0.06	0.08
	AB	1.72	0.70	0.19	0.94
Ground Stations Totals	**VLF**	**0.00 ± 0.00**	**0.06 ± 0.02**	**0.06 ± 0.06**	**0.13 ± 0.04**
	LF	**1.98 ± 0.54**	**0.57 ± 0.09**	**1.02 ± 0.32**	**1.14 ± 0.19**
	HF	**2.97 ± 0.91**	**2.03 ± 0.33**	**2.14 ± 0.83**	**3.27 ± 0.61**
	AB	**4.95 ± 1.16**	**2.66 ± 0.39**	**3.22 ± 0.93**	**4.55 ± 0.76**
Raised Stations Totals	**VLF**	**0.03 ± 0.02**	**0.04 ± 0.02**	**0.06 ± 0.07**	**0.11 ± 0.05**
	LF	**1.73 ± 0.43**	**0.42 ± 0.13**	**0.06 ± 0.07**	**0.75 ± 0.29**
	HF	**0.16 ± 0.09**	**0.02 ± 0.01**	**0.06 ± 0.06**	**0.08 ± 0.04**
	AB	**1.92 ± 0.44**	**0.47 ± 0.13**	**0.19 ± 0.10**	**0.94 ± 0.31**
Overall	**VLF**	**0.01 ± 0.01**	**0.05 ± 0.01**	**0.06 ± 0.05**	**0.13 ± 0.04**
	LF	**1.86 ± 0.49**	**0.49 ± 0.09**	**0.70 ± 0.24**	**1.01 ± 0.20**
	HF	**1.56 ± 0.44**	**1.03 ± 0.18**	**1.45 ± 0.56**	**2.21 ± 0.41**
	AB	**3.43 ± 0.75**	**1.57 ± 0.23**	**2.21 ± 0.60**	**3.35 ± 0.57**

Table 5. Periods of peak activity for high-frequency (HF), low-frequency (LF), and all bats at stations at the Mesa Wind Project for the study period June 28, 2016 to October 1, 2017. Peak activity was not calculated for very low-frequency (VLF) bats due to low activity rates (< 1.0 bat passes per detector-night) in either year.

Species Group	Start Date of Peak Activity	End Date of Peak Activity	Bat Passes per Detector-Night
2016			
HF	September 19	September 25	5.81
LF	September 19	September 25	5.00
All Bats	September 19	September 25	11.14
2017			
HF	August 1	August 7	6.29
LF	April 4	April 11	3.89
All Bats	August 1	August 7	8.30

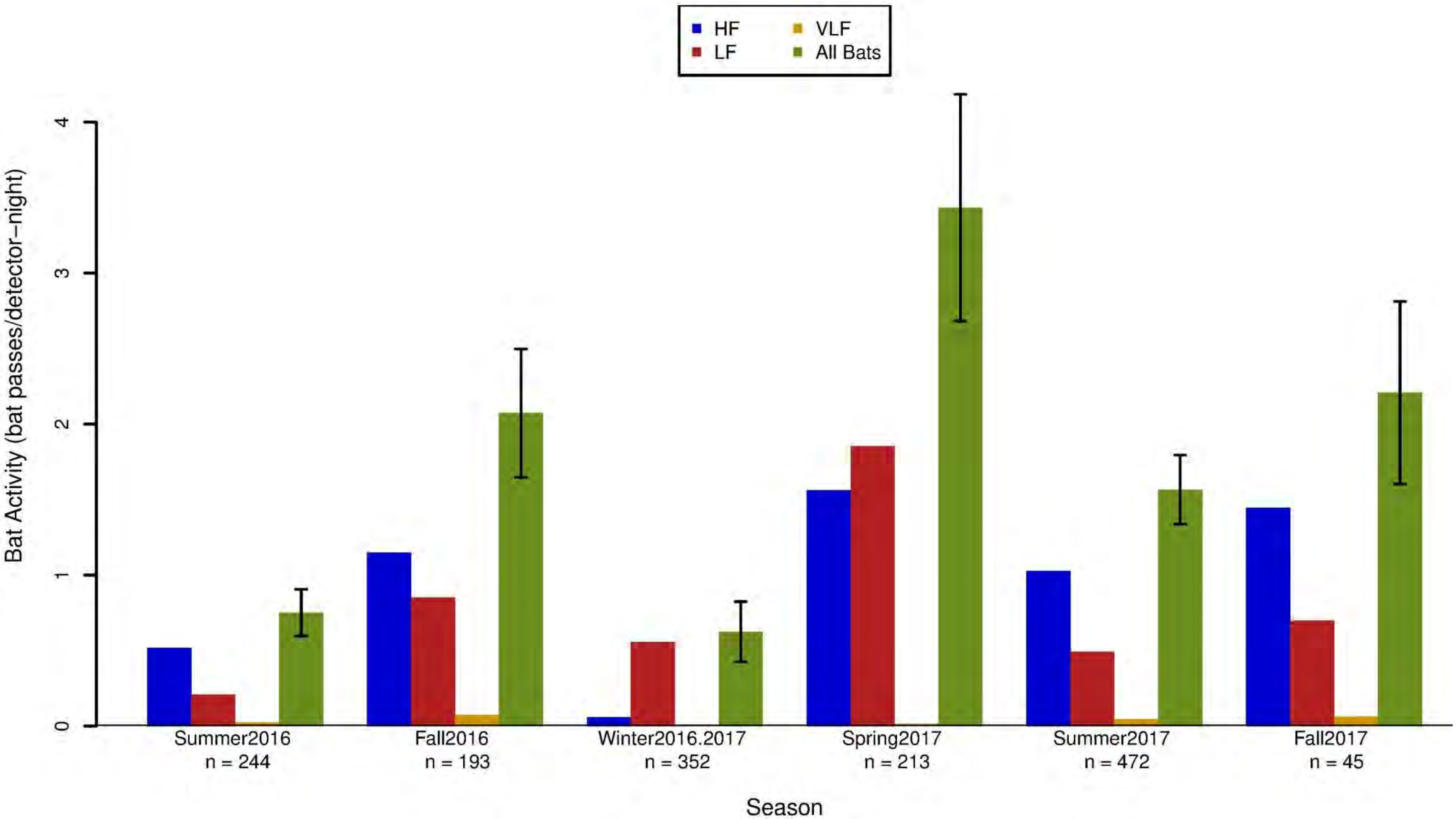

Figure 9. Seasonal bat activity by high-frequency (HF), low-frequency (LF), very low-frequency (VLF), and all bats at stations at the Mesa Wind Energy Repower Project for the study period June 28, 2016, to October 1, 2017. The bootstrapped standard errors are represented by the black error bars on the 'All Bats' columns.

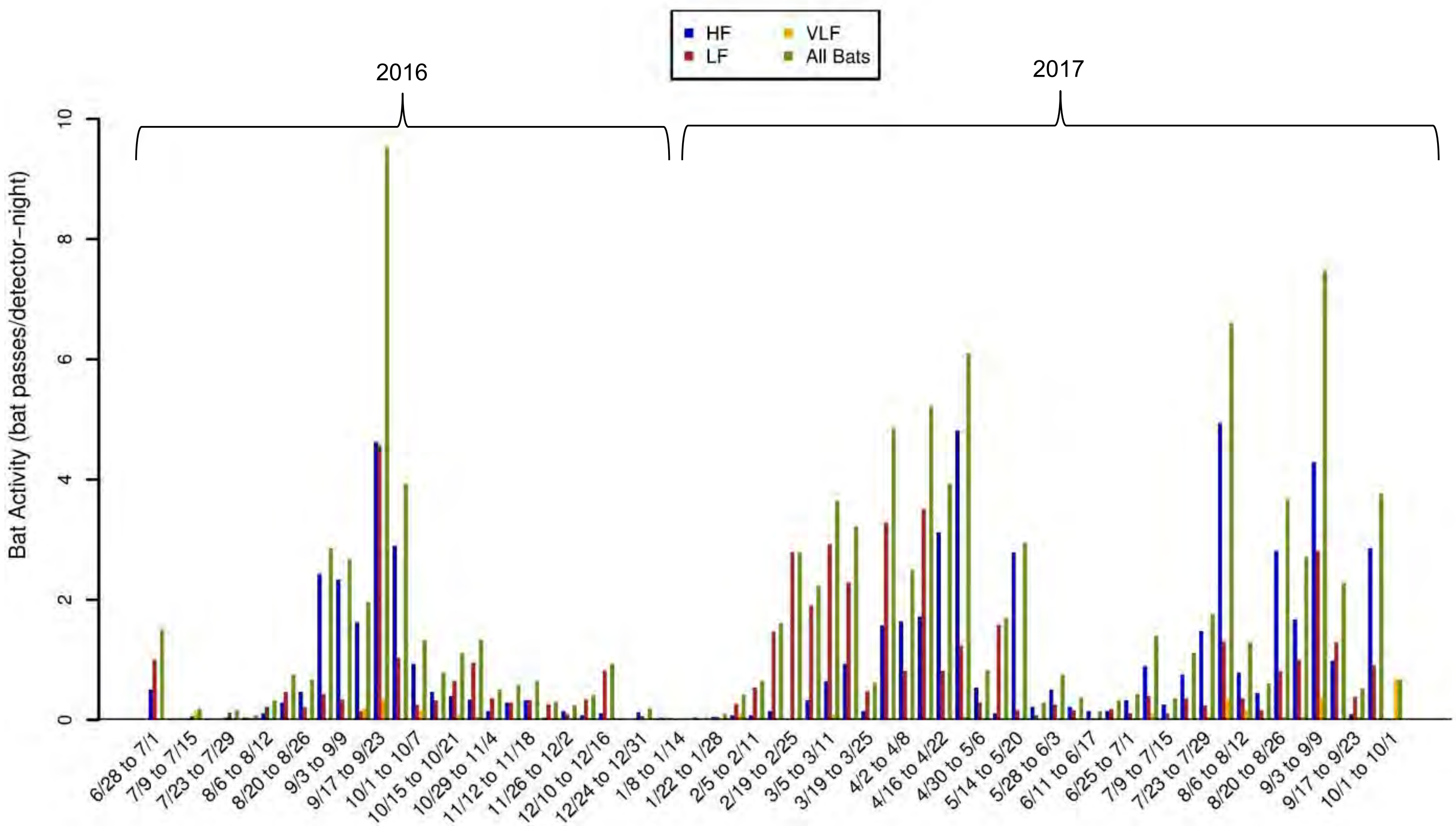

Figure 10. Weekly patterns of bat activity by high-frequency (HF), low-frequency (LF), very low-frequency (VLF), and all bats at the Mesa Wind Energy Repower Project for the study period June 28, 2016, to October 1, 2017.[1]

Species Composition

At all stations, 54.5% of bat passes were classified as high-frequency (HF; e.g., *Myotis* species), and 43.5% of bat passes were classified as low-frequency (LF; e.g. big brown bats, hoary bats, pocketed free-tailed bats, and Mexican free-tailed bats; Tables 2, 3). At ground stations, HF bats were the most commonly recorded species (68.1%), whereas LF bat passes were most commonly recorded at raised stations (90.5% Table 3, Figure 8).

Kaleidoscope Pro identified bat calls for 13 of the 18 species or species groups that potentially occur at the Project (Table 2, Table 6). Big free-tailed bat and western mastiff bat calls were manually identified by a qualified bat biologist (Table 3), while no California leaf-nosed bat calls were identified. The pocketed free-tailed bat is difficult to distinguish from the hoary bat, so these two species were combined into one species group. It is unknown whether western yellow bats occur at the Project.

The hoary bat/pocketed free-tailed bat species group was the main species/species group detected, present on 27% of operational detector-nights. Canyon bats and Mexican free-tailed bats were the second most frequently identified species (21% of detector-nights for each). All other species were detected on less than 10% of detector nights. Western long-eared bats were the least frequently detected species, detected on just one night at M2g (Table 6).

Table 6. The number and percent (in parentheses) of detector-nights that bat species were detected using Kaleidoscope 4.2.0 at the Mesa Wind Energy Repower Project from June 28, 2016 – October 1, 2017.

Common Name	M1g	M1r	M2g	M2r	Total
High-Frequency (> 30 kHz)					
California bat	2 (0)	0 (0)	3 (1)	0 (0)	5 (0)
canyon bat	199 (46)	14 (4)	101 (24)	11 (3)	325 (21)
little brown bat	11 (3)	0 (0)	2 (0)	1 (0)	14 (1)
long-legged myotis	27 (6)	0 (0)	5 (1)	0 (0)	32 (2)
western long-eared bat	2 (0)	0 (0)	1 (0)	1 (0)	4 (0)
western red bat	9 (2)	0 (0)	23 (6)	4 (1)	36 (2)
Yuma bat	2 (0)	0 (0)	2 (0)	0 (0)	4 (0)
Low-Frequency (15 – 30 kHz)					
big brown bat	49 (11)	20 (6)	47 (11)	12 (3)	128 (8)
fringed bat	3 (1)	1 (0)	0 (0)	0 (0)	4 (0)
hoary bat/pocketed free-tailed bat	97 (22)	113 (35)	90 (22)	108 (31)	408 (27)
Mexican free-tailed bat	88 (20)	56 (17)	126 (31)	56 (16)	326 (21)
pallid bat	2 (0)	0 (0)	2 (0)	0 (0)	4 (0)
Townsend's big-eared bat	0 (0)	0 (0)	1 (0)	1 (0)	2 (0)

* The western yellow bat, California leaf-nosed bat, big free-tailed bat, and pocketed free-tailed bat are not included in the Bats of North America 4.2.0 classifier and could therefore not be classified by Kaleidoscope. Western mastiff bats were not included in this table because they were manually vetted.

DISCUSSION

Bat fatalities have been discovered at most wind energy facilities monitored in North America, ranging from 0.0 (Chatfield and Bay 2014) to 40.2 bat fatalities per MW per year (Hein et al. 2013a; Appendix A). In 2012, an estimated 600,000 bats died as a result of interactions with wind turbines in the US (Hayes 2013). Proximate causes of bat fatalities are primarily due to collisions with moving turbine blades (Grodsky et al. 2011; Rollins et al. 2012), but to a limited extent may also be caused by barotrauma (Baerwald et al. 2008). The underlying reasons for why bats come near turbines are still largely unknown (Cryan and Barclay 2009). To date, post-construction monitoring studies of wind energy facilities show that a) migratory tree-roosting species (e.g., eastern red bat, hoary bat, and silver-haired bat [*Lasionycteris noctivagans*]) compose approximately 78% of reported bat fatalities; b) the majority of fatalities occur during the fall migration season (August and September); and c) most fatalities occur on nights with relatively low wind speeds (e.g., less than 6.0 m per second [m/s (19.7 ft/s)]; Arnett et al. 2008, Arnett and Baerwald 2013, Arnett et al. 2013).

It is generally expected that pre-construction bat activity is positively related to post-construction bat fatalities (Kunz et al. 2007b). However, to date, few studies of wind energy facilities that have recorded both bat passes per detector-night and bat fatality rates are available (Appendix A). Given the limited availability of pre- and post-construction data sets, differences in protocols among studies (Ellison 2012), and significant ecological differences between geographically diverse facilities, the relationship between activity and fatalities has not yet been empirically established. In Canada, Baerwald and Barclay (2009) found a significant positive association between pass rates measured at 30 m (98 ft/s) AGL and fatality rates for hoary and silver-haired bats across five sites in southern Alberta.

However, on a continental scale, a similar relationship has proven difficult to establish. The relatively few studies that have estimated both pre-construction activity and post-construction fatalities trend toward a positive association between activity and fatality rates, but they lack statistically significant correlations. Hein et al. (2013a) compiled data from wind projects that included both pre- and post-construction data from the same projects, as well as pre- and post-construction data from facilities within the same regions to assess if pre-construction acoustic activity predicted post-construction fatality rates. Based on data from 12 sites that had both pre- and post-construction data, they did not find a statistically significant relationship ($p=0.07$), although the trend was in the expected direction (i.e., low activity was generally associated with low fatalities and vice-versa). They concluded therefore, that pre-construction acoustic data alone could not currently predict bat fatalities, but acknowledged that the data set was limited and additional data may indicate a stronger relationship. Therefore, the current approach to assessing the risk to bats requires a qualitative analysis of activity levels, spatial and temporal relationships, species composition, and comparison to regional fatality patterns.

Bat activity was low at all stations at the Project, likely due to an absence of features attractive to bats such as open water for drinking and foraging. Activity rates were similar between HF and LF species across all stations. However, approximately 90.5% of bat passes recorded at the raised stations were emitted by LF bats, suggesting a relatively high abundance of species such as hoary bats and Mexican free-tailed bats flying near the rotor-swept zone (Table 3). LF species may become casualties because they fly at higher altitudes. Given that hoary bats and Mexican free-tailed bats are among the most common bat fatalities at many facilities (Arnett et al. 2008; Arnett and Baerwald 2013) and were the most common species documented at the Project, it is likely that these two species would be common fatalities at the Project, although fatality rates are anticipated to be low based on the results of other mortality monitoring studies in southern California (Appendix A).

Overall, acoustic monitoring indicated increased levels of bat activity in both spring and fall. While the activity in spring indicates some risk for spring bat mortality, the timing of increased activity in the fall is consistent with peak mortality periods for most wind energy facilities across the US. Given the seasonal peaks in activity, data suggests that bat fatalities at the Project may occur in spring or fall; however, given bat mortality patterns seen at other facilities across the US, bat mortality will likely be highest during the fall and consist primarily of migrating individuals.

Average bat activity during the FMP at ground detectors was similar between years (3.29 ± 0.61 bat passes per detector-night in 2016, and 4.55 ± 0.76 in 2017; Table 6). These values were lower than the North American median (7.7 bat passes per detector-night) and the Southwestern Region median (10.15; Appendix A). Among the two facilities in California with publicly available pre- and post-construction data, the Alta I Wind Energy facility, located approximately 124 mi (200 km) to the northwest in the Mojave Desert of California, had the most similar level of pre-construction bat activity (4.42 bat passes per detector-night; Appendix A) as the Project. The fatality rate at Alta I was 1.28 fatalities/MW/year (Appendix A). While lacking publicly available pre-construction bat activity data, the Dillion II Wind Energy facility, located approximately 6.0 mi (9.7 km) to the east the Project, had a fatality rate of 2.17 fatalities/MW/year (Appendix A). Given that all of the bat fatality studies in the Pacific Northwest, California, and the Southwestern Regions report fewer than 4.5 bat fatalities/MW/year (Appendix A; Figure 11), it is expected that similar low fatality rates would be recorded at the Project. It is therefore anticipated that the Mesa Wind Project will result in fewer than 5.0 fatalities/MW/year. The pre-construction bat studies completed at the Project will add to the growing body of research regarding the impacts of wind energy development on bats and will provide a valuable comparison to post-construction studies to be completed at Project.

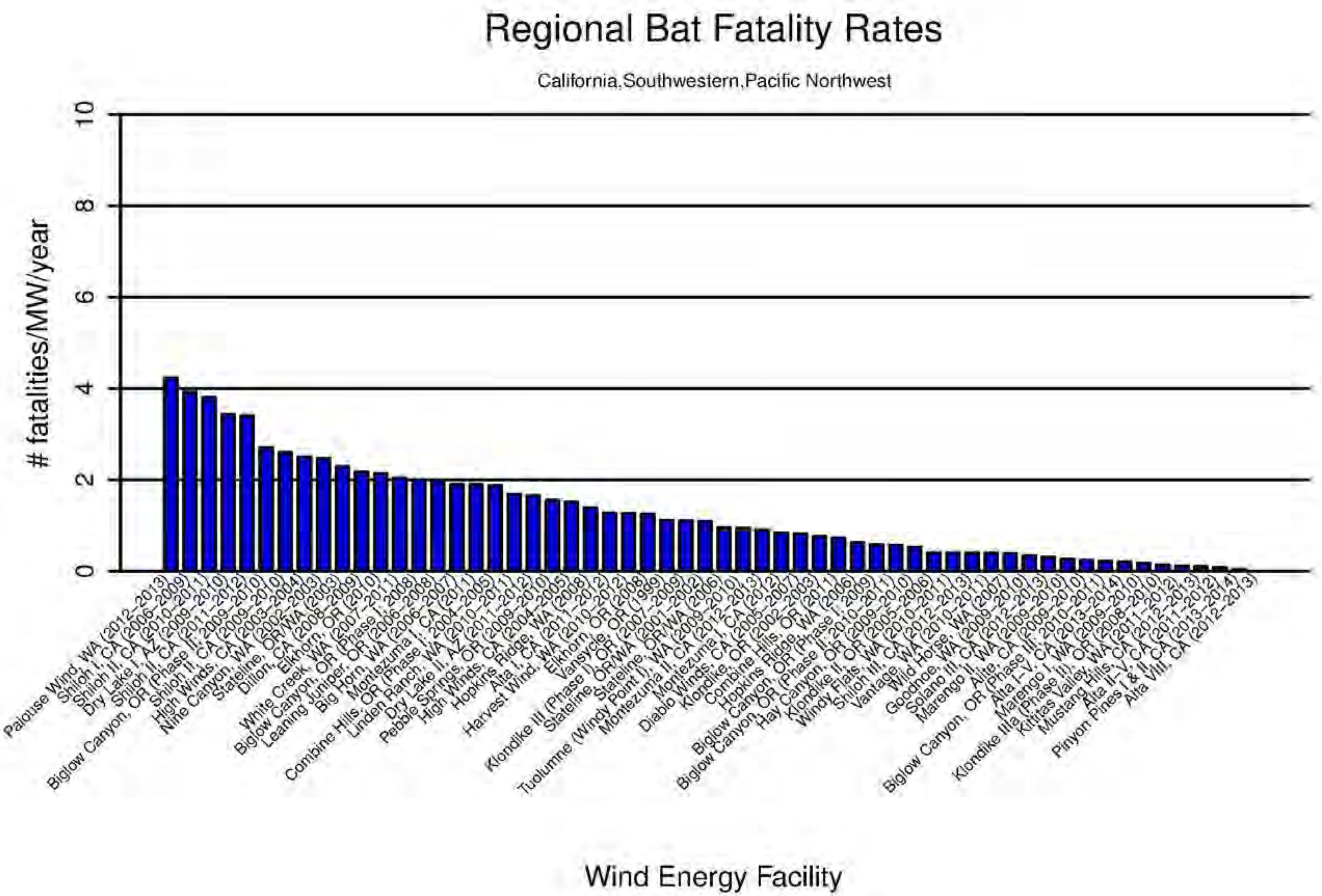

Figure 11. Fatality rates for bats (number of bats per MW per year) from publically-available wind energy facilities in the California, Southwestern, and Pacific Northwest regions of North America.

Figure 9 (*continued*). Fatality rates for bats (number of bats per MW per year) from publically-available wind energy facilities in the California, Southwestern, and Pacific Northwest regions of North America.

Data from the following sources:

Project Name	Fatality reference	Project Name	Fatality reference
Palouse Wind, WA (2012-2013)	Stantec 2013a	Stateline, OR/WA (2006)	Erickson et al. 2007
Shiloh I, CA (2006-2009)	Kerlinger et al. 2009	Tuolumne (Windy Point I), WA (2009-2010)	Enz and Bay 2010
Shiloh II, CA (2010-2011)	Kerlinger et al. 2013a	Montezuma II, CA (2012-2013)	Harvey & Associates 2013
Dry Lake I, AZ (2009-2010)	Thompson et al. 2011	Montezuma I, CA (2012)	ICF International 2013
Shiloh II, CA (2011-2012)	Kerlinger et al. 2013a	Diablo Winds, CA (2005-2007)	WEST 2006, 2008
Biglow Canyon, OR (Phase II; 2009-2010)	Enk et al. 2011b	Klondike, OR (2002-2003)	Johnson et al. 2003
Shiloh II, CA (2009-2010)	Kerlinger et al. 2010	Combine Hills, OR (2011)	Enz et al. 2012
High Winds, CA (2003-2004)	Kerlinger et al. 2006	Hopkins Ridge, WA (2006)	Young et al. 2007
Nine Canyon, WA (2002-2003)	Erickson et al. 2003	Biglow Canyon, OR (Phase I; 2009)	Enk et al. 2010
Stateline, OR/WA (2003)	Erickson et al. 2004	Biglow Canyon, OR (Phase II; 2010-2011)	Enk et al. 2012b
Dillon, CA (2008-2009)	Chatfield et al. 2009	Hay Canyon, OR (2009-2010)	Gritski and Kronner 2010a
Elkhorn, OR (2010)	Enk et al. 2011a	Windy Flats, WA (2010-2011)	Enz et al. 2011
White Creek, WA (2007-2011)	Downes and Gritski 2012b	Klondike II, OR (2005-2006)	NWC and WEST 2007
Biglow Canyon, OR (Phase I; 2008)	Jeffrey et al. 2009b	Shiloh III, CA (2012-2013)	Kerlinger et al. 2013b
Leaning Juniper, OR (2006-2008)	Gritski et al. 2008	Vantage, WA (2010-2011)	Ventus 2012
Montezuma I, CA (2011)	ICF International 2012	Wild Horse, WA (2007)	Erickson et al. 2008
Big Horn, WA (2006-2007)	Kronner et al. 2008	Goodnoe, WA (2009-2010)	URS Corporation 2010a
Combine Hills, OR (Phase I; 2004-2005)	Young et al. 2006	Solano III, CA (2012-2013)	AECOM 2013
Linden Ranch, WA (2010-2011)	Enz and Bay 2011	Marengo II, WA (2009-2010)	URS Corporation 2010c
Dry Lake II, AZ (2011-2012)	Thompson and Bay 2012	Alite, CA (2009-2010)	Chatfield et al. 2010
Pebble Springs, OR (2009-2010)	Gritski and Kronner 2010b	Biglow Canyon, OR (Phase III; 2010-2011)	Enk et al. 2012a
High Winds, CA (2004-2005)	Kerlinger et al. 2006	Alta I-V, CA (2013-2014)	Chatfield et al. 2014
Hopkins Ridge, WA (2008)	Young et al. 2009b	Marengo I, WA (2009-2010)	URS Corporation 2010b
Alta I, CA (2011-2012)	Chatfield et al. 2012	Klondike IIIa (Phase II), OR (2008-2010)	Gritski et al. 2011
Harvest Wind, WA (2010-2012)	Downes and Gritski 2012a	Kittitas Valley, WA (2011-2012)	Stantec Consulting Services 2012
Elkhorn, OR (2008)	Jeffrey et a. 2009a	Mustang Hills, CA (2012-2013)	Chatfield and Bay 2014
Vansycle, OR (1999)	Erickson et al. 2000	Alta II-V, CA (2011-2012)	Chatfield et al. 2012
Klondike III (Phase I), OR (2007-2009)	Gritski et al. 2010	Pinyon Pines I & II, CA (2013-2014)	Chatfield and Russo 2014
Stateline, OR/WA (2001-2002)	Erickson et al. 2004	Alta VIII, CA (2012-2013)	Chatfield and Bay 2014

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Appendix A: North American Fatality Summary Tables

Appendix A1. Wind energy facilities in North America with comparable activity and fatality data for bats, separated by geographic region. Activity estimate given as bat passes per detector-night. Fatality estimate given as the number of fatalities per megawatt (MW) per year.

Wind Energy Facility	Bat Activity Estimate	Bat Activity Dates	Fatality Estimate	No. of Turbines	Total MW
Mesa Wind, CA (2016)	3.29	7/30 – 10/1			
Mesa Wind, CA (2017)	4.55	7/30 – 10/1			
Southwest					
Dry Lake I, AZ (2009-2010)	8.8	4/29/10-11/10/10	3.43	30	63
Dry Lake II, AZ (2011-2012)	11.5	5/11/11-10/26/11	1.66	31	65
California					
Shiloh I, CA (2006-2009)			3.92	100	150
Shiloh II, CA (2010-2011)			3.8	75	150
Shiloh II, CA (2011-2012)			3.4	75	150
Shiloh II, CA (2009-2010)			2.6	75	150
High Winds, CA (2003-2004)			2.51	90	162
Dillon, CA (2008-2009)			2.17	45	45
Montezuma I, CA (2011)			1.9	16	36.8
High Winds, CA (2004-2005)			1.52	90	162
Alta I, CA (2011-2012)	4.42[E]	6/26/09 - 10/31/09	1.28	100	150
Montezuma II, CA (2012-2013)			0.91	34	78.2
Montezuma I, CA (2012)			0.84	16	36.8
Diablo Winds, CA (2005-2007)			0.82	31	20.46
Shiloh III, CA (2012-2013)			0.4	50	102.5
Solano III, CA (2012-2013)			0.31	55	128
Alite, CA (2009-2010)			0.24	8	24
Alta I-V, CA (2013-2014)			0.2	290	720 (150 GE, 570 vestas)
Mustang Hills, CA (2012-2013)			0.1	50	150
Alta II-V, CA (2011-2012)	0.78	6/26/09 - 10/31/09	0.08	190	570
Pinyon Pines I & II, CA (2013-2014)			0.04	100	NA
Alta VIII, CA (2012-2013)			0	50	150
Pacific Northwest					
Palouse Wind, WA (2012-2013)			4.23	58	104.4
Biglow Canyon, OR (Phase II; 2009-2010)			2.71	65	150
Nine Canyon, WA (2002-2003)			2.47	37	48.1
Stateline, OR/WA (2003)			2.29	454	299
Elkhorn, OR (2010)			2.14	61	101
White Creek, WA (2007-2011)			2.04	89	204.7
Biglow Canyon, OR (Phase I; 2008)			1.99	76	125.4
Leaning Juniper, OR (2006-2008)			1.98	67	100.5
Big Horn, WA (2006-2007)			1.9	133	199.5
Combine Hills, OR (Phase I; 2004-2005)			1.88	41	41
Linden Ranch, WA (2010-2011)			1.68	25	50
Pebble Springs, OR (2009-2010)			1.55	47	98.7
Hopkins Ridge, WA (2008)			1.39	87	156.6
Harvest Wind, WA (2010-2012)			1.27	43	98.9
Elkhorn, OR (2008)			1.26	61	101
Vansycle, OR (1999)			1.12	38	24.9
Klondike III (Phase I), OR (2007-2009)			1.11	125	223.6

Appendix A1. Wind energy facilities in North America with comparable activity and fatality data for bats, separated by geographic region. Activity estimate given as bat passes per detector-night. Fatality estimate given as the number of fatalities per megawatt (MW) per year.

Wind Energy Facility	Bat Activity Estimate	Bat Activity Dates	Fatality Estimate	No. of Turbines	Total MW
Stateline, OR/WA (2001-2002)			1.09	454	299
Stateline, OR/WA (2006)			0.95	454	299
Tuolumne (Windy Point I), WA (2009-2010)			0.94	62	136.6
Klondike, OR (2002-2003)			0.77	16	24
Combine Hills, OR (2011)			0.73	104	104
Hopkins Ridge, WA (2006)			0.63	83	150
Biglow Canyon, OR (Phase I; 2009)			0.58	76	125.4
Biglow Canyon, OR (Phase II; 2010-2011)			0.57	65	150
Hay Canyon, OR (2009-2010)			0.53	48	100.8
Windy Flats, WA (2010-2011)			0.41	114	262.2
Klondike II, OR (2005-2006)			0.41	50	75
Vantage, WA (2010-2011)			0.4	60	90
Wild Horse, WA (2007)			0.39	127	229
Goodnoe, WA (2009-2010)			0.34	47	94
Marengo II, WA (2009-2010)			0.27	39	70.2
Biglow Canyon, OR (Phase III; 2010-2011)			0.22	76	174.8
Marengo I, WA (2009-2010)			0.17	78	140.4
Klondike IIIa (Phase II), OR (2008-2010)			0.14	51	76.5
Kittitas Valley, WA (2011-2012)			0.12	48	100.8
Southern Plains					
Barton Chapel, TX (2009-2010)			3.06	60	120
Big Smile, OK (2012-2013)			2.9	66	132
Buffalo Gap II, TX (2007-2008)			0.14	155	233
Red Hills, OK (2012-2013)			0.11	82	123
Buffalo Gap I, TX (2006)			0.1	67	134
Midwest					
Cedar Ridge, WI (2009)	9.97[A,B,C,D]	7/16/07-9/30/07	30.61	41	67.6
Blue Sky Green Field, WI (2008; 2009)	7.7[A]	7/24/07-10/29/07	24.57	88	145
Cedar Ridge, WI (2010)	9.97[A,B,C,D]	7/16/07-9/30/07	24.12	41	68
Fowler I, II, III, IN (2011)			20.19	355	600
Fowler I, II, III, IN (2010)			18.96	355	600
Forward Energy Center, WI (2008-2010)	6.97	8/5/08-11/08/08	18.17	86	129
Top Crop I & II, IL (2012-2013)			12.55	200 (68 Phase I, 132 Phase II)	300 (102 Phase I, 198 Phase II)
Rail Splitter, IL (2012-2013)			11.21	67	100.5
Harrow, Ont (2010)			11.13	24 (four 6-turbine facilities)	39.6
Top of Iowa, IA (2004)	35.7	5/26/04-9/24/04	10.27	89	80
Fowler I, IN (2009)			8.09	162	301
Crystal Lake II, IA (2009)			7.42	80	200
Top of Iowa, IA (2003)			7.16	89	80
Kewaunee County, WI (1999-2001)			6.45	31	20.46
Heritage Garden I, MI (2012-2014)			5.9	14	28
Ripley, Ont (2008)			4.67	38	76

Appendix A1. Wind energy facilities in North America with comparable activity and fatality data for bats, separated by geographic region. Activity estimate given as bat passes per detector-night. Fatality estimate given as the number of fatalities per megawatt (MW) per year.

Wind Energy Facility	Bat Activity Estimate	Bat Activity Dates	Fatality Estimate	No. of Turbines	Total MW
Winnebago, IA (2009-2010)			4.54	10	20
Pioneer Prairie II, IA (2011-2012)			4.43	62	102.3
Buffalo Ridge, MN (Phase II; 2001/Lake Benton I)	2.2[B]	6/15/01-9/15/01	4.35	143	107.25
Pioneer Prairie II, IA (2013)			3.83	62	102.3
Buffalo Ridge, MN (Phase III; 2001/Lake Benton II)	2.2[B]	6/15/01-9/15/01	3.71	138	103.5
Crescent Ridge, IL (2005-2006)			3.27	33	49.5
Fowler I, II, III, IN (2012)			2.96	355	600
Elm Creek II, MN (2011-2012)			2.81	62	148.8
Buffalo Ridge II, SD (2011-2012)			2.81	105	210
Buffalo Ridge, MN (Phase III; 1999)			2.72	138	103.5
Buffalo Ridge, MN (Phase II; 1999)			2.59	143	107.25
Moraine II, MN (2009)			2.42	33	49.5
Buffalo Ridge, MN (Phase II; 1998)			2.16	143	107.25
PrairieWinds ND1 (Minot), ND (2010)			2.13	80	115.5
Grand Ridge I, IL (2009-2010)			2.1	66	99
Big Blue, MN (2013)			2.04	18	36
Barton I & II, IA (2010-2011)			1.85	80	160
Fowler III, IN (2009)			1.84	60	99
Buffalo Ridge, MN (Phase III; 2002/Lake Benton II)	1.9[B]	6/15/02-9/15/02	1.81	138	103.5
Buffalo Ridge, MN (Phase II; 2002/Lake Benton I)	1.9[B]	6/15/02-9/15/02	1.64	143	107.25
Rugby, ND (2010-2011)			1.6	71	149
Elm Creek, MN (2009-2010)			1.49	67	100
Wessington Springs, SD (2009)			1.48	34	51
Big Blue, MN (2014)			1.43	18	36
PrairieWinds ND1 (Minot), ND (2011)			1.39	80	115.5
PrairieWinds SD1, SD (2011-2012)			1.23	108	162
NPPD Ainsworth, NE (2006)			1.16	36	20.5
PrairieWinds SD1, SD (2012-2013)			1.05	108	162
Buffalo Ridge, MN (Phase I; 1999)			0.74	73	25
PrairieWinds SD1, SD (2013-2014)			0.52	108	162
Wessington Springs, SD (2010)			0.41	34	51
Buffalo Ridge I, SD (2009-2010)			0.16	24	50.4
	Rocky Mountains				
Summerview, Alb (2006; 2007)	7.65[B]	07/15/06-07-09/30/06-07	11.42	39	70.2
Summerview, Alb (2005-2006)			10.27	39	70.2
Judith Gap, MT (2006-2007)			8.93	90	135
Foote Creek Rim, WY (Phase I; 1999)			3.97	69	41.4
Judith Gap, MT (2009)			3.2	90	135
Milford I, UT (2010-2011)			2.05	58	145
Milford I & II, UT (2011-2012)			1.67	107	160.5 (58.5 Phase I, 102 Phase II)

Appendix A1. Wind energy facilities in North America with comparable activity and fatality data for bats, separated by geographic region. Activity estimate given as bat passes per detector-night. Fatality estimate given as the number of fatalities per megawatt (MW) per year.

Wind Energy Facility	Bat Activity Estimate	Bat Activity Dates	Fatality Estimate	No. of Turbines	Total MW
Foote Creek Rim, WY (Phase I; 2001-2002)	2.2[B,D]	6/15/01-9/1/01	1.57	69	41.4
Foote Creek Rim, WY (Phase I; 2000)	2.2[B,D]	6/15/00-9/1/00	1.05	69	41.4
Southeast					
Buffalo Mountain, TN (2005)			39.7	18	28.98
Buffalo Mountain, TN (2000-2003)	23.7[D]		31.54	3	1.98
Northeast					
Pinnacle, WV (2012)			40.2	23	55.2
Mountaineer, WV (2003)	30.09	7/15/09-10/7/09	31.69	44	66
Mount Storm, WV (2009)			17.53	132	264
Noble Wethersfield, NY (2010)			16.3	84	126
Criterion, MD (2011)	36.67[F]	4/18/10-10/15/10	15.61	28	70
Mount Storm, WV (2010)			15.18	132	264
Locust Ridge, PA (Phase II; 2010)			14.38	51	102
Locust Ridge, PA (Phase II; 2009)			14.11	51	102
Casselman, PA (2008)			12.61	23	34.5
Maple Ridge, NY (2006)			11.21	120	198
Cohocton/Dutch Hills, NY (2010)			10.32	50	125
Wolfe Island, Ont (July-December 2010)			9.5	86	197.8
Cohocton/Dutch Hill, NY (2009)			8.62	50	125
Casselman, PA (2009)			8.6	23	34.5
Noble Bliss, NY (2008)			7.8	67	100
Criterion, MD (2012)			7.62	28	70
Mount Storm, WV (2011)			7.43	132	264
Maple Ridge, NY (2012)	35.2	7/20/08-10/12/08	7.3	195	321.75
Mount Storm, WV (Fall 2008)			6.62	82	164
Maple Ridge, NY (2007)			6.49	195	321.75
Wolfe Island, Ont (July-December 2009)			6.42	86	197.8
Criterion, MD (2013)			5.32	28	70
Maple Ridge, NY (2007-2008)	1.9[C]	8/1/09-09/31/09	4.96	195	321.75
Noble Clinton, NY (2009)			4.5	67	100
Casselman Curtailment, PA (2008)			4.4	23	35.4
Noble Altona, NY (2010)	16.1[C]	8/16/09-09/15/09	4.34	65	97.5
Noble Ellenburg, NY (2009)			3.91	54	80
Noble Bliss, NY (2009)			3.85	67	100
Lempster, NH (2010)			3.57	12	24
Noble Ellenburg, NY (2008)	2.1[C]	8/8/08-09/31/08	3.46	54	80
Noble Clinton, NY (2008)			3.14	67	100
Lempster, NH (2009)	24.6	4/16/12-10/23/12	3.11	12	24
Record Hill, ME (2012)			2.96	22	50.6
Mars Hill, ME (2007)			2.91	28	42
Wolfe Island, Ont (July-December 2011)			2.49	86	197.8
Noble Chateaugay, NY (2010)			2.44	71	106.5
High Sheldon, NY (2010)			2.33	75	112.5
Stetson Mountain II, ME (2012)			2.27	17	25.5
Beech Ridge, WV (2012)			2.03	67	100.5
Munnsville, NY (2008)			1.93	23	34.5
High Sheldon, NY (2011)			1.78	75	112.5
Stetson Mountain II, ME (2010)	28.5; 0.3[G]	7/10/09-10/15/09	1.65	17	25.5
Stetson Mountain I, ME (2009)			1.4	38	57

Appendix A1. Wind energy facilities in North America with comparable activity and fatality data for bats, separated by geographic region. Activity estimate given as bat passes per detector-night. Fatality estimate given as the number of fatalities per megawatt (MW) per year.

Wind Energy Facility	Bat Activity Estimate	Bat Activity Dates	Fatality Estimate	No. of Turbines	Total MW
Beech Ridge, WV (2013)			0.58	67	100.5
Record Hill, ME (2014)			0.55	22	50.6
Mars Hill, ME (2008)			0.45	28	42
Stetson Mountain I, ME (2011)			0.28	38	57
Stetson Mountain I, ME (2013)			0.18	38	57
Rollins, ME (2012)			0.18	40	60
Kibby, ME (2011)			0.12	44	132

A = Activity rate based on pre-construction monitoring; data for all other activity and fatality rates were collected concurrently

B = Activity rate was averaged across phases and/or years

C = Activity rate based on data collected at various heights; all other activity rates are from ground-based detectors only

D = Activity rate calculated by WEST from data presented in referenced report

E = Average of ground-based detectors at CPC Proper (Phase I) for late summer/fall period only

F = Activity rate based on data collected from ground-based detectors excluding reference stations during the spring, summer and fall seasons

G = The overall activity rate of 28.5 is from reference stations located along forest edges, which may be attractive to bats; the activity rate of 0.3 is from one detector placed on a nacelle

Appendix A1 (*continued*). Wind energy facilities in North America with comparable activity and fatality data for bats. Data from the following sources:

Facility	Activity Estimate	Fatality Estimate	Facility	Activity Estimate	Fatality Estimate
Mesa Wind, CA	This study				
Alite, CA (09-10)		Chatfield et al. 2010	Lempster, NH (09)		
Alta Wind I, CA (11-12)	Solick et al. 2010	Chatfield et al. 2012	Lempster, NH (10)		
Alta Wind I-V, CA (13-14)		Chatfield et al. 2014	Linden Ranch, WA (10-11)		
Alta Wind II-V, CA (11-12)	Solick et al. 2010	Chatfield et al. 2012	Locust Ridge, PA (Phase II; 09)		
Alta VIII, CA (12-13)		Chatfield and Bay 2014	Locust Ridge, PA (Phase II; 10)		
Barton I & II, IA (10-11)		Derby et al. 2011b	Maple Ridge, NY (06)		
Barton Chapel, TX (09-10)		Derby et al. 2011b	Maple Ridge, NY (07)		
Beech Ridge, WV (12)		Tidhar et al. 2013a	Maple Ridge, NY (07-08)		
Beech Ridge, WV (13)		Young et al. 2014a	Maple Ridge, NY (12)		
Big Blue, MN (13)		Fagen Engineering 2014	Marengo I, WA (09-10)		
Big Blue, MN (14)		Fagen Engineering 2015	Marengo II, WA (09-10)		
Big Horn, WA (06-07)		Kronner et al. 2008	Mars Hill, ME (07)		
Big Smile, OK (12-13)		Derby et al. 2013b	Mars Hill, ME (08)		
Biglow Canyon, OR (Phase I; 08)		Jeffrey et al. 2009b	Milford I, UT (10-11)		
Biglow Canyon, OR (Phase I; 09)		Enk et al. 2010	Milford I & II, UT (11-12)		
Biglow Canyon, OR (Phase II; 09-10)		Enk et al. 2011b	Montezuma I, CA (11)		
Biglow Canyon, OR (Phase II; 10-11)		Enk et al. 2012b	Montezuma I, CA (12)		
Biglow Canyon, OR (Phase III; 10-11)		Enk et al. 2012a	Montezuma II, CA (12-13)		
Blue Sky Green Field, WI (08; 09)	Gruver 2008	Gruver et al. 2009	Moraine II, MN (09)		
Buffalo Gap I, TX (06)		Tierney 2007	Mount Storm, WV (Fall 08)		
Buffalo Gap II, TX (07-08)		Tierney 2009	Mount Storm, WV (09)		
Buffalo Mountain, TN (00-03)	Fiedler 2004	Nicholson et al. 2005	Mount Storm, WV (10)		
Buffalo Mountain, TN (05)		Fiedler et al. 2007	Mount Storm, WV (11)		
Buffalo Ridge, MN (Phase I; 99)		Johnson et al. 2000	Mountaineer, WV (03)		
Buffalo Ridge, MN (Phase II; 98)		Johnson et al. 2000	Munnsville, NY (08)		
Buffalo Ridge, MN (Phase II; 99)		Johnson et al. 2000	Mustang Hills, CA (12-13)		
Buffalo Ridge, MN (Phase II; 01/Lake Benton I)	Johnson et al. 2004	Johnson et al. 2004	Nine Canyon, WA (02-03)		
Buffalo Ridge, MN (Phase II; 02/Lake Benton I)	Johnson et al. 2004	Johnson et al. 2004	Noble Altona, NY (10)		
Buffalo Ridge, MN (Phase III; 99)		Johnson et al. 2000	Noble Bliss, NY (08)		
Buffalo Ridge, MN (Phase III; 01/Lake Benton II)	Johnson et al. 2004	Johnson et al. 2004	Noble Bliss, NY (09)		
Buffalo Ridge, MN (Phase III; 02/Lake Benton II)	Johnson et al. 2004	Johnson et al. 2004	Noble Chateaugay, NY (10)		
Buffalo Ridge I, SD (09-10)		Derby et al. 2010d	Noble Clinton, NY (08)		
Buffalo Ridge II, SD (11-12)		Derby et al. 2012a	Noble Clinton, NY (09)		
Casselman, PA (08)		Arnett et al. 2009b	Noble Ellenburg, NY (08)		
Casselman, PA (09)		Arnett et al. 2010	Noble Ellenburg, NY (09)		
Casselman Curtailment, PA (08)		Arnett et al. 2009a	Noble Wethersfield, NY (10)		
Cedar Ridge, WI (09)	BHE Environmental 2008	BHE Environmental 2010	NPPD Ainsworth, NE (06)		
Cedar Ridge, WI (10)	BHE Environmental 2008	BHE Environmental 2011	Palouse Wind, WA (12-13)		
Cohocton/Dutch Hill, NY (09)		Stantec 2010	Pebble Springs, OR (09-10)		Gritski and Kronner 2010b
Cohocton/Dutch Hills, NY (10)		Stantec 2011a	Pinnacle, WV (12)		Hein et al. 2013b
Combine Hills, OR (Phase I; 04-05)		Young et al. 2006	Pinyon Pines I&II, CA (13-14)		Chatfield and Russo 2014

Appendix A1 (*continued*). Wind energy facilities in North America with comparable activity and fatality data for bats. Data from the following sources:

Facility	Activity Estimate	Fatality Estimate	Facility	Activity Estimate	Fatality Estimate
Combine Hills, OR (11)		Enz et al. 2012	Pioneer Prairie I, IA (Phase II; 11-12)		Chodachek et al. 2012
Crescent Ridge, IL (05-06)		Kerlinger et al. 2007	Pioneer Prairie II, IA (13)		Chodachek et al. 2014
Criterion, MD (11)		Young et al. 2012b	PrairieWinds ND1 (Minot), ND (10)		Derby et al. 2011d
Criterion, MD (12)		Young et al. 2013	PrairieWinds ND1 (Minot), ND (11)		Derby et al. 2012d
Criterion, MD (13)		Young et al. 2014b	PrairieWinds SD1 (Crow Lake), SD (11-12)		Derby et al. 2012c
Crystal Lake II, IA (09)		Derby et al. 2010b	PrairieWinds SD1 (Crow Lake), SD (12-13)		Derby et al. 2013a
Diablo Winds, CA (05-07)		WEST 2006, 2008	PrairieWinds SD1, SD (13-14)		Derby et al. 2014
Dillon, CA (08-09)		Chatfield et al. 2009	Rail Splitter, IL (12-13)		Good et al. 2013b
Dry Lake I, AZ (09-10)	Thompson et al. 2011	Thompson et al. 2011	Record Hill, ME (12)	Stantec 2008b	Stantec 2013b
Dry Lake II, AZ (11-12)	Thompson and Bay 2012	Thompson and Bay 2012	Record Hill, ME (14)		Stantec 2015
Elkhorn, OR (08)		Jeffrey et a. 2009a	Red Hills, OK (12-13)		Derby et al. 2013c
Elkhorn, OR (10)		Enk et al. 2011a	Ripley, Ont (08)		Jacques Whitford 2009
Elm Creek, MN (09-10)		Derby et al. 2010e	Rollins, ME (12)		Stantec 2013c
Elm Creek II, MN (11-12)		Derby et al. 2012b	Rugby, ND (10-11)		Derby et al. 2011c
Foote Creek Rim, WY (Phase I; 99)		Young et al. 2003a	Shiloh I, CA (06-09)		Kerlinger et al. 2009
Foote Creek Rim, WY (Phase I; 00)	Gruver 2002	Young et al. 2003a, 2003b	Shiloh II, CA (09-10)		Kerlinger et al. 2010
Foote Creek Rim, WY (Phase I; 01-02)	Gruver 2002	Young et al. 2003a, 2003b	Shiloh II, CA (10-11)		Kerlinger et al. 2013a
Forward Energy Center, WI (08-10)	Watt and Drake 2011	Grodsky and Drake 2011	Shiloh II, CA (11-12)		Kerlinger et al. 2013a
Fowler I, IN (09)		Johnson et al. 2010a	Shiloh III, CA (12-13)		Kerlinger et al. 2013b
Fowler III, IN (09)		Johnson et al. 2010b	Solano III, CA (12-13)		AECOM 2013
Fowler I, II, III, IN (10)		Good et al. 2011	Stateline, OR/WA (01-02)		Erickson et al. 2004
Fowler I, II, III, IN (11)		Good et al. 2012	Stateline, OR/WA (03)		Erickson et al. 2004
Fowler I, II, III, IN (12)		Good et al. 2013a	Stateline, OR/WA (06)		Erickson et al. 2007
Goodnoe, WA (09-10)		URS Corporation 2010a	Stetson Mountain I, ME (09)	Stantec 2009c	Stantec 2009c
Grand Ridge I, IL (09-10)		Derby et al. 2010a	Stetson Mountain I, ME (11)		Normandeau Associates 2011
Harrow, Ont (10)		NRSI 2011	Stetson Mountain I, ME (13)		Stantec 2014
Harvest Wind, WA (10-12)		Downes and Gritski 2012a	Stetson Mountain II, ME (10)		Normandeau Associates 2010
Hay Canyon, OR (09-10)		Gritski and Kronner 2010a	Stetson Mountain II, ME (12)		Stantec 2013d
Heritage Garden I, MI (12-14)		Kerlinger et al. 2014	Summerview, Alb (05-06)		Brown and Hamilton 2006
High Sheldon, NY (10)		Tidhar et al. 2012a	Summerview, Alb (06; 07)	Baerwald 2008	Baerwald 2008
High Sheldon, NY (11)		Tidhar et al. 2012b	Top Crop I & II, IL (12-13)		Good et al. 2013c
High Winds, CA (03-04)		Kerlinger et al. 2006	Top of Iowa, IA (03)		Jain 2005b
High Winds, CA (04-05)		Kerlinger et al. 2006	Top of Iowa, IA (04)	Jain 2005b	Jain 2005b
Hopkins Ridge, WA (06)		Young et al. 2007	Tuolumne (Windy Point I), WA (09-10)		Enz and Bay 2010
Hopkins Ridge, WA (08)		Young et al. 2009b	Vansycle, OR (99)		Erickson et al. 2000
Judith Gap, MT (06-07)		TRC 2008	Vantage, WA (10-11)		Ventus 2012
Judith Gap, MT (09)		Poulton and Erickson 2010	Wessington Springs, SD (09)		Derby et al. 2010c
Kewaunee County, WI (99-01)		Howe et al. 2002	Wessington Springs, SD (10)		Derby et al. 2011a
Kibby, ME (11)		Stantec 2012a	White Creek, WA (07-11)		Downes and Gritski 2012b
Kittitas Valley, WA (11-12)		Stantec Consulting Services 2012	Wild Horse, WA (07)		Erickson et al. 2008
Klondike, OR (02-03)		Johnson et al. 2003	Windy Flats, WA (10-11)		Enz et al. 2011
Klondike II, OR (05-06)		NWC and WEST 2007	Winnebago, IA (09-10)		Derby et al. 2010g
Klondike III (Phase I), OR (07-09)		Gritski et al. 2010	Wolfe Island, Ont (July-December 09)		Stantec Ltd. 2010
Klondike IIIa (Phase II), OR (08-10)		Gritski et al. 2011	Wolfe Island, Ont (July-December 10)		Stantec Ltd. 2011
Leaning Juniper, OR (06-08)		Gritski et al. 2008	Wolfe Island, Ont (July-December 11)		Stantec Ltd. 2012

Appendix A2. Bat fatality estimates for North American wind-energy facilities.

Project	Bat Fatalities (Bats/MW/Year)	Predominant Landcover Type	Citation
Alite, CA (2009-2010)	0.24	Shrub/scrub & grassland	Chatfield et al. 2010
Alta I, CA (2011-2012)	1.28	Woodland, grassland, shrubland	Chatfield et al. 2012
Alta I-V, CA (2013-2014)	0.2	NA	Chatfield et al. 2014
Alta II-V, CA (2011-2012)	0.08	Desert scrub	Chatfield et al. 2012
Alta VIII, CA (2012-2013)	0	Grassland and riparian	Chatfield and Bay 2014
Barton I & II, IA (2010-2011)	1.85	Agriculture	Derby et al. 2011b
Barton Chapel, TX (2009-2010)	3.06	Agriculture/forest	WEST 2011
Beech Ridge, WV (2012)	2.03	Forest	Tidhar et al. 2013a
Beech Ridge, WV (2013)	0.58	Forest	Young et al. 2014a
Big Blue, MN (2013)	2.04	Agriculture	Fagen Engineering 2014
Big Blue, MN (2014)	1.43	Agriculture	Fagen Engineering 2015
Big Horn, WA (2006-2007)	1.9	Agriculture/grassland	Kronner et al. 2008
Big Smile, OK (2012-2013)	2.9	Grassland, agriculture	Derby et al. 2013b
Biglow Canyon, OR (Phase I; 2008)	1.99	Agriculture/grassland	Jeffrey et al. 2009b
Biglow Canyon, OR (Phase I; 2009)	0.58	Agriculture/grassland	Enk et al. 2010
Biglow Canyon, OR (Phase II; 2009-2010)	2.71	Agriculture	Enk et al. 2011b
Biglow Canyon, OR (Phase II; 2010-2011)	0.57	Grassland/shrub-steppe, agriculture	Enk et al. 2012b
Biglow Canyon, OR (Phase III; 2010-2011)	0.22	Grassland/shrub-steppe, agriculture	Enk et al. 2012a
Blue Sky Green Field, WI (2008; 2009)	24.57	Agriculture	Gruver et al. 2009
Buffalo Gap I, TX (2006)	0.1	Grassland	Tierney 2007
Buffalo Gap II, TX (2007-2008)	0.14	Forest	Tierney 2009
Buffalo Mountain, TN (2000-2003)	31.54	Forest	Nicholson et al. 2005
Buffalo Mountain, TN (2005)	39.7	Forest	Fiedler et al. 2007
Buffalo Ridge, MN (Phase I; 1999)	0.74	Agriculture	Johnson et al. 2000
Buffalo Ridge, MN (Phase II; 1998)	2.16	Agriculture	Johnson et al. 2000
Buffalo Ridge, MN (Phase II; 1999)	2.59	Agriculture	Johnson et al. 2000
Buffalo Ridge, MN (Phase II; 2001/Lake Benton I)	4.35	Agriculture	Johnson et al. 2004
Buffalo Ridge, MN (Phase II; 2002/Lake Benton I)	1.64	Agriculture	Johnson et al. 2004
Buffalo Ridge, MN (Phase III; 1999)	2.72	Agriculture	Johnson et al. 2000
Buffalo Ridge, MN (Phase III; 2001/Lake Benton II)	3.71	Agriculture	Johnson et al. 2004
Buffalo Ridge, MN (Phase III; 2002/Lake Benton II)	1.81	Agriculture	Johnson et al. 2004
Buffalo Ridge I, SD (2009-2010)	0.16	Agriculture/grassland	Derby et al. 2010d

Appendix A2. Bat fatality estimates for North American wind-energy facilities.

Project	Bat Fatalities (Bats/MW/Year)	Predominant Landcover Type	Citation
Buffalo Ridge II, SD (2011-2012)	2.81	Agriculture, grassland	Derby et al. 2012a
Casselman, PA (2008)	12.61	Forest	Arnett et al. 2009b
Casselman, PA (2009)	8.6	Forest, pasture, grassland	Arnett et al. 2010
Casselman Curtailment, PA (2008)	4.4	Forest	Arnett et al. 2009a
Cedar Ridge, WI (2009)	30.61	Agriculture	BHE Environmental 2010
Cedar Ridge, WI (2010)	24.12	Agriculture	BHE Environmental 2011
Cohocton/Dutch Hill, NY (2009)	8.62	Agriculture/forest	Stantec 2010
Cohocton/Dutch Hills, NY (2010)	10.32	Agriculture, forest	Stantec 2011a
Combine Hills, OR (Phase I; 2004-2005)	1.88	Agriculture/grassland	Young et al. 2006
Combine Hills, OR (2011)	0.73	Grassland/shrub-steppe, agriculture	Enz et al. 2012
Crescent Ridge, IL (2005-2006)	3.27	Agriculture	Kerlinger et al. 2007
Criterion, MD (2011)	15.61	Forest, agriculture	Young et al. 2012b
Criterion, MD (2012)	7.62	Forest, agriculture	Young et al. 2013
Criterion, MD (2013)	5.32	Forest, agriculture	Young et al. 2014b
Crystal Lake II, IA (2009)	7.42	Agriculture	Derby et al. 2010b
Diablo Winds, CA (2005-2007)	0.82	NA	WEST 2006, 2008
Dillon, CA (2008-2009)	2.17	Desert	Chatfield et al. 2009
Dry Lake I, AZ (2009-2010)	3.43	Desert grassland/forested	Thompson et al. 2011
Dry Lake II, AZ (2011-2012)	1.66	Desert grassland/forested	Thompson and Bay 2012
Elkhorn, OR (2008)	1.26	Shrub/scrub & agriculture	Jeffrey et al. 2009a
Elkhorn, OR (2010)	2.14	Shrub/scrub & agriculture	Enk et al. 2011a
Elm Creek, MN (2009-2010)	1.49	Agriculture	Derby et al. 2010e
Elm Creek II, MN (2011-2012)	2.81	Agriculture, grassland	Derby et al. 2012b
Foote Creek Rim, WY (Phase I; 1999)	3.97	Grassland	Young et al. 2003a
Foote Creek Rim, WY (Phase I; 2000)	1.05	Grassland	Young et al. 2003a
Foote Creek Rim, WY (Phase I; 2001-2002)	1.57	Grassland	Young et al. 2003a
Forward Energy Center, WI (2008-2010)	18.17	Agriculture	Grodsky and Drake 2011
Fowler I, IN (2009)	8.09	Agriculture	Johnson et al. 2010a
Fowler I, II, III, IN (2010)	18.96	Agriculture	Good et al. 2011
Fowler I, II, III, IN (2011)	20.19	Agriculture	Good et al. 2012
Fowler I, II, III, IN (2012)	2.96	Agriculture	Good et al. 2013a
Fowler III, IN (2009)	1.84	Agriculture	Johnson et al. 2010b
Goodnoe, WA (2009-2010)	0.34	Grassland and shrub-steppe	URS Corporation 2010a
Grand Ridge I, IL (2009-2010)	2.1	Agriculture	Derby et al. 2010a
Harrow, Ont (2010)	11.13	Agriculture	Natural Resource Solutions Inc. (NRSI) 2011

Appendix A2. Bat fatality estimates for North American wind-energy facilities.

Project	Bat Fatalities (Bats/MW/Year)	Predominant Landcover Type	Citation
Harvest Wind, WA (2010-2012)	1.27	Grassland/shrub-steppe	Downes and Gritski 2012a
Hay Canyon, OR (2009-2010)	0.53	Agriculture	Gritski and Kronner 2010a
Heritage Garden I, MI (2012-2014)	5.9	Agriculture	Kerlinger et al. 2014
High Sheldon, NY (2010)	2.33	Agriculture	Tidhar et al. 2012a
High Sheldon, NY (2011)	1.78	Agriculture	Tidhar et al. 2012b
High Winds, CA (2003-2004)	2.51	Agriculture/grassland	Kerlinger et al. 2006
High Winds, CA (2004-2005)	1.52	Agriculture/grassland	Kerlinger et al. 2006
Hopkins Ridge, WA (2006)	0.63	Agriculture/grassland	Young et al. 2007
Hopkins Ridge, WA (2008)	1.39	Agriculture/grassland	Young et al. 2009b
Judith Gap, MT (2006-2007)	8.93	Agriculture/grassland	TRC 2008
Judith Gap, MT (2009)	3.2	Agriculture/grassland	Poulton and Erickson 2010
Kewaunee County, WI (1999-2001)	6.45	Agriculture	Howe et al. 2002
Kibby, ME (2011)	0.12	Forest; commercial forest	Stantec 2012a
Kittitas Valley, WA (2011-2012)	0.12	Sagebrush-steppe, grassland	Stantec Consulting Services 2012
Klondike, OR (2002-2003)	0.77	Agriculture/grassland	Johnson et al. 2003
Klondike II, OR (2005-2006)	0.41	Agriculture/grassland	NWC and WEST 2007
Klondike III (Phase I), OR (2007-2009)	1.11	Agriculture/grassland	Gritski et al. 2010
Klondike IIIa (Phase II), OR (2008-2010)	0.14	Grassland/shrub-steppe and agriculture	Gritski et al. 2011
Leaning Juniper, OR (2006-2008)	1.98	Agriculture	Gritski et al. 2008
Lempster, NH (2009)	3.11	Grasslands/forest/rocky embankments	Tidhar et al. 2010
Lempster, NH (2010)	3.57	Grasslands/forest/rocky embankments	Tidhar et al. 2011
Linden Ranch, WA (2010-2011)	1.68	Grassland/shrub-steppe, agriculture	Enz and Bay 2011
Locust Ridge, PA (Phase II; 2009)	14.11	Grassland	Arnett et al. 2011
Locust Ridge, PA (Phase II; 2010)	14.38	Grassland	Arnett et al. 2011
Maple Ridge, NY (2006)	11.21	Agriculture/forested	Jain et al. 2007
Maple Ridge, NY (2007)	6.49	Agriculture/forested	Jain et al. 2009a
Maple Ridge, NY (2007-2008)	4.96	Agriculture/forested	Jain et al. 2009b
Maple Ridge, NY (2012)	7.3	Agriculture/forested	Tidhar et al. 2013b
Marengo I, WA (2009-2010)	0.17	Agriculture	URS Corporation 2010b
Marengo II, WA (2009-2010)	0.27	Agriculture	URS Corporation 2010c
Mars Hill, ME (2007)	2.91	Forest	Stantec 2008a
Mars Hill, ME (2008)	0.45	Forest	Stantec 2009a
Milford I, UT (2010-2011)	2.05	Desert shrub	Stantec 2011b
Milford I & II, UT (2011-2012)	1.67	Desert shrub	Stantec 2012b
Montezuma I, CA (2011)	1.9	Agriculture and grasslands	ICF International 2012
Montezuma I, CA (2012)	0.84	Agriculture and grasslands	ICF International 2013

Appendix A2. Bat fatality estimates for North American wind-energy facilities.

Project	Bat Fatalities (Bats/MW/Year)	Predominant Landcover Type	Citation
Montezuma II, CA (2012-2013)	0.91	Agriculture	Harvey & Associates 2013
Moraine II, MN (2009)	2.42	Agriculture/grassland	Derby et al. 2010f
Mount Storm, WV (Fall 2008)	6.62	Forest	Young et al. 2009c
Mount Storm, WV (2009)	17.53	Forest	Young et al. 2009a, 2010b
Mount Storm, WV (2010)	15.18	Forest	Young et al. 2010a, 2011b
Mount Storm, WV (2011)	7.43	Forest	Young et al. 2011a, 2012a
Mountaineer, WV (2003)	31.69	Forest	Kerns and Kerlinger 2004
Munnsville, NY (2008)	1.93	Agriculture/forest	Stantec 2009b
Mustang Hills, CA (2012-2013)	0.1	Grasslands and Riparian	Chatfield and Bay 2014
Nine Canyon, WA (2002-2003)	2.47	Agriculture/grassland	Erickson et al. 2003
Noble Altona, NY (2010)	4.34	Forest	Jain et al. 2011a
Noble Bliss, NY (2008)	7.8	Agriculture/forest	Jain et al. 2009c
Noble Bliss, NY (2009)	3.85	Agriculture/forest	Jain et al. 2010c
Noble Chateaugay, NY (2010)	2.44	Agriculture	Jain et al. 2011b
Noble Clinton, NY (2008)	3.14	Agriculture/forest	Jain et al. 2009d
Noble Clinton, NY (2009)	4.5	Agriculture/forest	Jain et al. 2010a
Noble Ellenburg, NY (2008)	3.46	Agriculture/forest	Jain et al. 2009e
Noble Ellenburg, NY (2009)	3.91	Agriculture/forest	Jain et al. 2010b
Noble Wethersfield, NY (2010)	16.3	Agriculture	Jain et al. 2011c
NPPD Ainsworth, NE (2006)	1.16	Agriculture/grassland	Derby et al. 2007
Palouse Wind, WA (2012-2013)	4.23	Agriculture and grasslands	Stantec 2013a
Pebble Springs, OR (2009-2010)	1.55	Grassland	Gritski and Kronner 2010b
Pinnacle, WV (2012)	40.2	Forest	Hein et al. 2013b
Pinyon Pines I & II, CA (2013-2014)	0.04	NA	Chatfield and Russo 2014
Pioneer Prairie II, IA (2011-2012)	4.43	Agriculture, grassland	Chodachek et al. 2012
Pioneer Prairie II, IA (2013)	3.83	Agriculture	Chodachek et al. 2014
PrairieWinds ND1 (Minot), ND (2010)	2.13	Agriculture	Derby et al. 2011d
PrairieWinds ND1 (Minot), ND (2011)	1.39	Agriculture, grassland	Derby et al. 2012d
PrairieWinds SD1, SD (2011-2012)	1.23	Grassland	Derby et al. 2012c
PrairieWinds SD1, SD (2012-2013)	1.05	Grassland	Derby et al. 2013a
PrairieWinds SD1, SD (2013-2014)	0.52	Grassland	Derby et al. 2014
Rail Splitter, IL (2012-2013)	11.21	Agriculture	Good et al. 2013b
Record Hill, ME (2012)	2.96	Forest	Stantec 2013b
Record Hill, ME (2014)	0.55	Forest	Stantec 2015
Red Hills, OK (2012-2013)	0.11	Grassland	Derby et al. 2013c
Ripley, Ont (2008)	4.67	Agriculture	Jacques Whitford 2009

Appendix A2. Bat fatality estimates for North American wind-energy facilities.

Project	Bat Fatalities (Bats/MW/Year)	Predominant Landcover Type	Citation
Rollins, ME (2012)	0.18	Forest	Stantec 2013c
Rugby, ND (2010-2011)	1.6	Agriculture	Derby et al. 2011c
Shiloh I, CA (2006-2009)	3.92	Agriculture/grassland	Kerlinger et al. 2009
Shiloh II, CA (2009-2010)	2.6	Agriculture	Kerlinger et al. 2010, 2013a
Shiloh II, CA (2010-2011)	3.8	Agriculture	Kerlinger et al. 2013a
Shiloh II, CA (2011-2012)	3.4	Agriculture	Kerlinger et al. 2013a
Shiloh III, CA (2012-2013)	0.4	NA	Kerlinger et al. 2013b
Solano III, CA (2012-2013)	0.31	NA	AECOM 2013
Stateline, OR/WA (2001-2002)	1.09	Agriculture/grassland	Erickson et al. 2004
Stateline, OR/WA (2003)	2.29	Agriculture/grassland	Erickson et al. 2004
Stateline, OR/WA (2006)	0.95	Agriculture/grassland	Erickson et al. 2007
Stetson Mountain I, ME (2009)	1.4	Forest	Stantec 2009c
Stetson Mountain I, ME (2011)	0.28	Forest	Normandeau Associates 2011
Stetson Mountain I, ME (2013)	0.18	Forest	Stantec 2014
Stetson Mountain II, ME (2010)	1.65	Forest	Normandeau Associates 2010
Stetson Mountain II, ME (2012)	2.27	Forest	Stantec 2013d
Summerview, Alb (2005-2006)	10.27	Agriculture	Brown and Hamilton 2006
Summerview, Alb (2006; 2007)	11.42	Agriculture/grassland	Baerwald 2008
Top Crop I & II, IL (2012-2013)	12.55	Agriculture	Good et al. 2013c
Top of Iowa, IA (2003)	7.16	Agriculture	Jain 2005b
Top of Iowa, IA (2004)	10.27	Agriculture	Jain 2005b
Tuolumne (Windy Point I), WA (2009-2010)	0.94	Grassland/shrub-steppe, agriculture and forest	Enz and Bay 2010
Vansycle, OR (1999)	1.12	Agriculture/grassland	Erickson et al. 2000
Vantage, WA (2010-2011)	0.4	Shrub-steppe, grassland	Ventus Environmental Solutions 2012
Wessington Springs, SD (2009)	1.48	Grassland	Derby et al. 2010c
Wessington Springs, SD (2010)	0.41	Grassland	Derby et al. 2011a
White Creek, WA (2007-2011)	2.04	Grassland/shrub-steppe, agriculture	Downes and Gritski 2012b
Wild Horse, WA (2007)	0.39	Grassland	Erickson et al. 2008
Windy Flats, WA (2010-2011)	0.41	Grassland/shrub-steppe, agriculture	Enz et al. 2011
Winnebago, IA (2009-2010)	4.54	Agriculture/grassland	Derby et al. 2010g
Wolfe Island, Ont (July-December 2009)	6.42	Grassland	Stantec Ltd. 2010
Wolfe Island, Ont (July-December 2010)	9.5	Grassland	Stantec Ltd. 2011
Wolfe Island, Ont (July-December 2011)	2.49	Grassland	Stantec Ltd. 2012

APPENDIX C-8

2019 Golden Eagle Nesting Survey Report

Mesa Wind Project

Golden Eagle Nesting Surveys

Aspen Environmental/ Brookfield Renewable

2019 Report

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ABOUT BLOOM BIOLOGICAL, INC,

For more than 45 years, Bloom Biological, Inc. (BBI) has provided biological consulting services for large and small clients. Our resume of services includes raptor and endangered species research, biological monitoring, impact assessment, permitting, conservation planning, and geospatial analysis. Our innovative approach has provided solutions to complex problems for clients and projects throughout a range of industries including alternative energy, residential development and the public sector. Collectively, the management and staff of BBI hold permits or memoranda of understanding for participating in the conservation and recovery of more than a dozen endangered or threatened species, as well as a number of other special-status species, in California and the western United States. Over the years, BBI has established an impeccable relationship with the resource agencies, project proponents, and environmental organizations by skillfully balancing the needs and objectives of land planning, resource conservation, and the public interest. In addition to our work in California and the western United States, BBI biologists have worked in Alaska, Central and South America, Europe, Southern Asia, and the western Pacific. BBI is a certified small business enterprise (SBE) and women's business enterprise (WBE).

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Appendices

1.0 Introduction

In April 2019, Peter Bloom, Ph.D. participated in several meetings about the approach to obtaining the necessary permits for the Mesa Wind Project (Project) with Aspen Environmental, Brookfield Renewable Energy, Bureau of Land Management (BLM) and the US Fish and Wildlife service (USFWS). Bloom Biological, Inc. (BBI) completed the original surveys for Brookfield Renewables in 2013 and 2014. These included Golden Eagle nest surveys, bird use count surveys, and small bird count surveys.

BBI was subsequently contracted by Aspen Environmental to conduct the 2019 Golden Eagle (*Aquila chrysaetos*) nest surveys for the Project. The survey was requested by the USFWS and BLM to update existing data from Golden Eagle nest surveys conducted historically in the area and provide necessary information to evaluate potential impacts from the Project on nesting eagles. The objectives of the survey were to determine for all areas within 10 miles of the Project: (1) the occupancy of historically documented Golden Eagle nesting territories and nest sites, and (2) Conduct new surveys in apparent high-quality Golden eagle nesting habitat within the Survey Area. These objectives were accomplished through aerial (helicopter-based) surveys conducted according to a work plan developed in cooperation with the USFWS.

This report provides a complete description of the approach and findings of the 2019 survey effort and provides current information about all known historic and current Golden Eagle nests and nesting territories within 10 miles of the proposed Project.

1.1 Project Description

The Mesa Wind Project Site is comprised of approximately 401 acres (162 hectares) located in the vicinity of White Water in unincorporated Riverside County, California (see Figure 1, Exhibit 1). On the Public Land Survey System, the Project Site is in all or portions of sections 27, 33, 34, and 35 of Township 02S, Range 03E and Section 4 of Township 03S, Range 03E of the US Geological Survey's (USGS) 7.5-minute White Water quadrangle.

Topography on the site is highly varied and characterized by steep hills and sharply defined drainages as expected within the foothills of the San Bernardino Mountains. Elevations on the site vary from approximately 1,770 feet above mean sea level near the Project Site's southwestern corner to 3,300 feet above mean sea level along the northern edge.

The Survey Area includes the San Bernardino Mountains (and the southern slope of Mt. San Gorgonio) in much of the northwest, the Morongo Valley and Little San Bernardino Mountains to the northeast, and the San Jacinto Mountains, including Mt. San Jacinto proper, in the south (Exhibit 1). BBI used the recommended ten-mile buffer and Golden Eagle survey methodologies recommended for alternative energy projects (Pagel et al. 2010).

The presence of all or part of Southern California's two tallest peaks provides a high degree of terrain and habitat variability, with elevations ranging from 500 to nearly 11,000 feet above mean sea level, and vegetation associations representing desert, Mediterranean coastal, and high elevation pine, spruce and fir forests. Significant portions of the Study Area are located on federal lands, including the Bureau of Land Management, San Bernardino National Forest as well as the San Gorgonio Wilderness and San Jacinto Wilderness.

Figure 1. Project Site Location

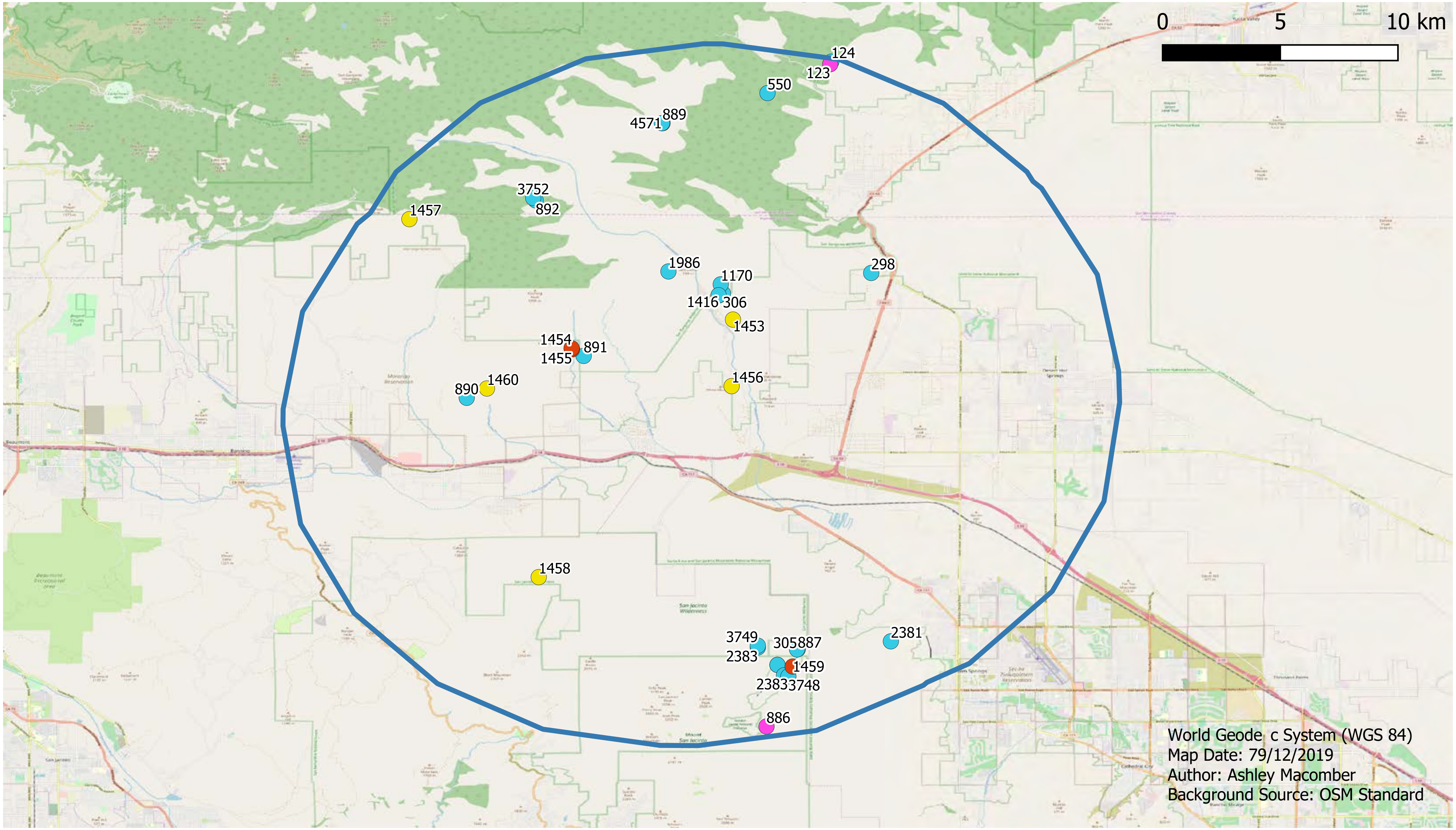
1.2 Results from Previous Golden Eagle Nest Surveys in Project Vicinity

Golden Eagle nest surveys have been conducted previously within portions of the Survey Area and surrounding vicinity by BBI for the Project in 2013 and 2014 as well as surveys conducted by other parties for various reasons. Prior to conducting the surveys described in this report, BBI and Mesa Wind obtained GIS coordinates of eagle nests within and near the Survey Area from the USFWS and compiled additional information about previously documented eagle nest and territory locations from Golden Eagle nest surveys.

During the Golden Eagle nest surveys in 2013, the San Jacinto Mountains and other southern portions of the Survey Area were not surveyed. In the northern portion of the Survey Area, five Golden Eagle nests, constituting as many as four territories, were detected during BBI's 2013 surveys. Two nests were within 100 feet of each other, reflecting the fact that Golden Eagle pairs often build upon two nests in the same season and eventually use only one nest for the season's nesting attempt. None of the nests were determined to have been successful in 2013.

All the nests were in the San Bernardino Mountains, except for a Red-tailed Hawk nest which was in the Little San Bernardino Mountains.

Due to flight restrictions in 2013, which prevented a complete survey of the study area, a conclusion about the complete status of the Golden Eagle nesting population in the Study Area for the Mesa Wind Project could not be drawn.



MESA_10_mile_buffer
Active GOEA Nests*
New GOEA Nests (Inactive)*
New Potential GOEA Nests (other species)*
Confirmed Historical GOEA Nests (Inactive)*

* see Table 1 for further information

Golden Eagle Nest Survey Results 2019

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1.2 Golden Eagle Natural History

The Golden Eagle is found throughout most of the north Temperate Zone. In North America, it ranges from arctic Canada and Alaska south through the western United States to central Mexico. Northern populations are migratory; however, most populations south of Canada are residents or short-distant migrants.

Kochert et al. (2002) provided a thorough description of the natural history of the Golden Eagle, noting that the species is found in a variety of habitats located in a wide range of latitudes throughout the Northern Hemisphere. In North America, Golden Eagles are most common in the western half of the continent near open spaces that provide habitat for foraging, and generally with cliffs present for nesting sites. While northern populations of the species are migratory, often making trips of thousands of miles to the wintering grounds; southern populations (including those in southern California) tend to be resident year-round once they become territorial adults, but have been documented making shorter-distance forays off-territory, in some cases into neighboring states or Mexico (Braham et al. 2015, Tracey et al. 2017).

While Golden Eagles can kill large prey such as cranes, wild ungulates, and domestic livestock, they primarily subsist on rabbits, hares, ground squirrels, and prairie dogs (Bloom and Hawks 1982, Olendorff 1976). The main prey for Golden Eagles in the Survey Area are small mammals such as black-tailed jack rabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), and round-tailed ground squirrel (*Spermophilus tereticaudus*). Golden Eagles typically reach sexual maturity, form territories and begin nesting at four years of age. Pairs are generally thought to stay within the limits of their territory, which can measure well over 20 square kilometers and may contain as many as 14 nests (Bloom pers. obs.). The pair maintains and repairs one or more of these nests as part of its courtship. Over the course of a decade several of these nests will be used and will produce young, while others may only receive occasional fresh sticks. Most alternate nests are important in the successful reproduction of a pair of eagles. Kochert et al. (2002) also noted that the nesting season is prolonged, extending more than 6 months from the time the 1-3 eggs are laid until the young reach independence. A typical Golden Eagle raises an average of only 1 young per year and up to 15 young over its lifetime. Pairs commonly refrain from laying eggs in some years, particularly when prey is scarce. The number of young that Golden Eagles produce each year depends on a combination of weather and prey conditions. In the desert environs of the Project area, prey abundance can vary greatly in accordance with precipitation, and breeding may occur relatively rarely during periods of drought and more frequently during periods with above normal precipitation.

1.3 Regulatory Status of Golden Eagle

Regulatory protections for Golden Eagles include thorough surveys to determine the status of Golden Eagles for projects occurring within their range and habitat. The intent is to determine the extent of potential direct, indirect and cumulative effects projects may have on eagles, avoid and or minimize these effects, assess the potential for incidental take during project operation, and monitor eagle populations. These measures are predominantly driven by the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c).

The Bald and Golden Eagle Protection Act, enacted in 1940, and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" eagles, including their parts, nests, or eggs. The Act provides criminal penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

For purposes of the guidelines, "disturb" means: "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."

In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death or nest abandonment.

2.0 Methods

Surveys were conducted in accordance with guidelines set forth in the Interim Golden Eagle Inventory and Monitoring Protocol (Pagel et al. 2010) and the Eagle Conservation Plan Guidance, Module 1 - Land-based Wind Energy Version 2 (USFWS 2013), and per Project-specific recommendations received from USFWS during a June telephone consultation. Prior to beginning surveys, a study plan was prepared by the BBI team and approved by Aspen Environmental, Brookfield Renewable Energy and the USFWS. All parties agreed that surveys would be conducted with a focus on determining territory occupancy by Golden Eagles, rather than final productivity. It was decided that known historical nest sites would be visited while surveying adjacent habitat if time allowed. An area of critical Big Horn Sheep lambing habitat was not surveyed due to flight restrictions during lambing season.

Based on the agreed upon study plan, three aerial surveys were conducted by helicopter in suitable nesting habitat within the Survey Area during the latter part of the 2019 breeding season. An 8-hour aerial survey focused north of I-10 Freeway was conducted on 10 June 2019, by BBI biologist Peter H. Bloom, Ph.D. (lead observer) and Marla Steele, Ph.D. (assistant observer). A second, 5-hour aerial survey was conducted on 11 June 2019 by Dr. Bloom and Dr. Steele, focused on Golden Eagle nesting habitat south of the I-10 Freeway. A third, 7-hour aerial survey was conducted on 21 June 2019 by Dr. Bloom and Kerry Ross with a focus on the Mount San Jacinto area south of the I-10. All surveys were conducted in fair weather conditions. The second flight on 11 June was suspended when wind conditions became adverse.

It was discovered during the third aerial survey that several historical nest sites were near the Palm Springs Aerial Tram (Tram). For safety reasons, the nests could not be surveyed by helicopter. BBI obtained access to conduct ground surveys from the Tram management but were advised against conducting ground surveys due to a 100-year record level rainstorm making the terrain difficult to traverse. Instead, biologist Kerry Ross was privately escorted by Tram staff on 8 July in a Tram car, allowing the car to move slowly and stop periodically to survey the area accurately.

Aerial surveys were conducted in a Bell Long Ranger helicopter, owned and operated by a pilot experienced in conducting aerial Golden Eagle nest surveys. The biologists conducted an aerial examination of appropriate nesting habitat throughout the Survey Area. During aerial surveys, BBI biologists searched potential nesting substrates for large stick nests of Golden Eagles and other raptors on cliff faces, and transmission towers.

GPS units (one primary and one backup) were used to mark locations of nest sites. The following information was recorded for each raptor or Common Raven nest found during surveys:

- Name of observer(s)
- Date/Time/Weather conditions
- Location (GPS coordinates)
- Nest status (active, inactive, or unknown)
- Nest contents
- Nest condition
- Nest substrate

- Nest description (or other indications of breeding behavior)
- Other pertinent descriptive information

Eagle nests were photographed, except when they were clearly inactive or when conditions (e.g., wind) prevented a photograph from being captured safely.

3.0 Nest Status and Territory Determination

2.1.1 Nest Status

A nest was considered *active* if any of the following three conditions was met: (1) fresh sticks or nest material had been added during the current nesting season, (2) the nest was found to contain eggs or young (dead or alive), or (3) an adult was observed on the nest in an incubating (or brooding) posture. Nests without any of these signs were considered *inactive*. Some nests were recently inactive and in good condition, while others appeared ancient and perhaps unused for decades. A *failed* nest was an active nest that was determined not to have successfully fledged young. A successful nest would have been one whose young reached at least 52 days (7 weeks) of age.

When determining the status of nests, the newness (fresh sticks) of nest sticks can often be determined by their color and condition if they were recently collected from live plants and trees, however bleaching by the desert sun can sometimes make new sticks appear old quickly. The placement, compaction or lack of compaction of sticks can be a more accurate determination of the newness, such as the fresh sticks seen on the top of a recently active Golden Eagle nest compared with the compacted old sticks in the inactive nest.

Determining the activity status of nests during the breeding season is often unequivocal because in some instances there will be an adult eagle incubating eggs or brooding nestlings and/or visible eggs or nestlings. However, nest status can often be inferred, even if a nest is visited outside of the actual nesting period (e.g., prior to egg laying or after fledging). Under these circumstances, more emphasis is placed on the condition of the nest and presence or absence of sign. Prior to egg laying an active Golden Eagle nest will be relatively level on top, will have visibly newer sticks several inches thick arranged on the top of the nest, may have fresh greenery, and may have fresh feathers. Other factors considered include the nearby presence or absence of adult and/or fledgling eagles, active nearby perch sites with fresh sign and active alternative nests within proximity to the nest in question.

2.1.2 Nest Species

Biologists determined the species that occupied active nests by observing eggs, chicks, or adults tending to the nest. When no occupants were observed, the nest species was assigned based on the nest site characteristics, including the size of the nest and nest sticks, the volume and height of the whitewash (excrement), and the presence or absence of anthropogenic material. These distinctions were based upon the experience of the surveying biologists, which collectively included the entry into, and inspection of thousands of California raptor nests of numerous raptor species, including Golden Eagle and the three raptor species most likely to usurp Golden Eagle nests in this region: Red-tailed Hawk (*Buteo jamaicensis*), Prairie Falcon (*Falco mexicanus*) and Great Horned Owls (*Bubo virginianus*).

In the Survey Area, Red-tailed Hawks and Golden Eagles are the only raptors that build large nests constructed of sticks. Common Ravens (*Corvus corax*) are non-raptors that also construct reasonably large stick nests in this region. Of these three species, Red-tailed Hawk and Common Raven nests are generally the most abundant by a large factor. Fortunately, there are often predictable cues that can be used to differentiate among the nests of these species, beyond the direct observation of adults, young or eggs in the nest:

- Ravens tend to have the smallest nests of the three species, followed by Red-tailed Hawks and finally, Golden Eagles, which may build nests that over a period of years can reach sizes of 15 feet tall and 8 feet thick.
- Though Red-tailed Hawk and Common Raven nests are sometimes difficult to distinguish from one another, Common Ravens are unique in that they often bring trash to their nest sites situated near civilization, and their nests tend to be very tightly structured.

Golden Eagle and Red-tailed Hawk nests can also be difficult to separate from each other without ample experience. The two species often use each other's nests for reproduction, though Red-tailed Hawks more commonly usurp Golden Eagle nests than the other way around. This may be because Golden Eagles often have more alternate nests than do Red-tailed Hawks and because the larger Golden Eagle nests tend to survive longer. Newly created, first year Golden Eagle nests are typically 6-10 inches thick and as small as 4 feet wide and may overlap in size with Red-tailed Hawk nests. At the other end of the size spectrum, Golden Eagles may build large tower nests that over time can accumulate nesting material and exceed 15 feet in thickness and 4 - 6 feet wide.

We considered nests greater than 5 feet wide and 3 feet thick to be in a size range definitive of eagle nests. The size of the sticks, both in diameter and length also provides clues as to what species carried them and added them to the nest, with eagle nests containing much larger sticks than Red-tailed Hawks would generally bring to their nests.

Regardless of current occupant, all nest sites were classified subjectively according to the possibility that they have ever been or may in the future be used by eagles. The likelihood that any nest was in fact an "*Eagle Nest*" was categorized as follows:

- **Yes**: The nest has been documented as occupied by eagles in the current or a preceding survey, or is consistent in form with a nest constructed and used by eagles without ambiguity; or
- **Possibly**: the nest has never been documented as occupied by eagles; the form of the nest suggests it could have been constructed or used by another species or by an eagle, but warrants future evaluation for use by eagles; or
- **No**: the nest has never been documented as occupied by eagles, and the form indicates it is unlikely to have been constructed or used by eagles and does not warrant future evaluation for use by eagles.

2.1.3 Eagle Territory Occupancy

An eagle nesting territory was designated as occupied if an active nest occupied by eagles was discovered, or if a pair of adult eagles was observed displaying territorial behavior in the territory. The locations of two Golden Eagle nesting territories are displayed in Table 1. Each territory contains one or more previously documented Golden Eagle nests. The delineation of these territories is based mainly on the spacing of alternate nest sites. A cluster of nests close together, but isolated from other eagle nests would generally be defined as one territory, along with the surrounding areas which may be used for foraging. Based on the monitoring of hundreds of golden eagle nests in California over the past 45 years, alternate nest locations in the same territory may be separated by two or more miles, on one extreme. On the other hand, active nests belonging to two distinct territories may be separated by as little as 0.5 miles (P. Bloom, pers. obs.). The number of territories in an area, such as the Survey Area for this study, is relatively fixed, and based largely on nesting habitat availability and foraging habitat quality, and the proportion of territories that are occupied can vary widely among years, and one pair of eagles may occupy different territories or groups of nests in different years.

3.0 Results and Discussion

3.1 Survey results

3.1.1 Aerial Surveys – June 10, 11, 21, 2019

Nests belonging to 14-16 distinct Golden Eagle cliff nest territories within the 10-mile radius study area were examined during aerial surveys on 10, 11, 21 June. One territory located near Morongo Valley exhibited evidence (fresh nest material and significant excrement) of a successful Golden Eagle nesting attempt. Another old Golden Eagle nest located in Whitewater Canyon contained two, 6-week old Red-tailed Hawk chicks on the brink of fledging. One other nest and territory with equivocal results might have been built on by either a Golden Eagle or a Red-tailed Hawk but without entering the nest, will remain unknown. Other cliff nest observations included the nests from four Common Ravens and two Red-tailed Hawks. The third aerial survey was focused on surveying all known territories within the San Jacinto mountains. An additional territory contained fresh nest material and excrement. One juvenile Bald Eagle was observed in flight over the west slope of Mount San Jacinto. No Golden eagles were observed.

3.1.2 Ground Survey - July 8, 2019

A ground survey was conducted on 8 July. A BBI biologist was escorted on a private tram ride to view nests that were not surveyed during the aerial surveys due to their proximity to the Palm Spring Tram. Three nests were noted, all on the southern side of the tram route. Two nests were located close together one on top of the other with the top nest being 8-10 feet tall. Both nests appeared strong but due to the location of the nests it was not possible to conclude if they had any fresh material. The lower of the two "nests" is largely due to sticks falling from above and its actual validity as a nest remains equivocal until more years of nesting data on that cliff are collected. No Golden Eagles were observed during surveys from the Tram.

3.2 Status of Eagle Nesting Territories in Survey Area

A complete list of known Golden Eagle territories and nest locations in the Survey Area is provided with information about the status of each nest observed (Table 2). In addition to surveying all known Golden Eagle territories within the Survey Area during each round of surveys, additional areas with suitable habitat were checked opportunistically. Photographs of active eagle nests can be found in Appendix A.

No Golden Eagles were observed during surveys within the Survey Area, but at least two active Golden Eagle nests were confirmed, one of which near Morongo Valley appeared (based upon excrement and fresh nesting material) to have fledged young in 2019 (nest ID 123). Another historic nest site exhibited a small amount of nest building but apparently laid no eggs.

3.3 Conclusions

The year 2019 was a relatively poor year for eagle nest occupancy within the Survey Area and throughout much of coastal Southern California. We examined 14 to 16 Golden Eagle nest territories and their associated nests. Two territories contained active Golden Eagle nests, and of those, only one appears to have fledged an unknown number of young. An active nest was found in a third territory built on by either Golden Eagles or Red-tailed Hawks and is therefore considered undetermined (Nest ID 2381). A nearby traditionally active nest territory located to the west just outside of the Mesa Wind 10-mile radius fledged three chicks in 2019 (Bloom pers. obs). Two Red-tailed Hawk nests within the Survey Area each contained two young. One Common Raven nest still had unfledged young in the nest.

Table 1. Summary of 2018 Golden Eagle Territory Occupancy and Nest Status

The following table lists nests of Golden Eagles assessed during aerial and ground surveys conducted by BBI during 2019 Golden Eagle nest surveys for the Mesa Wind Project. Individual eagle nests are listed with the following information: (1) the BBI nest identification number ("Nest ID"), (2) date of observation, (3) the status of the nest active, inactive, (5) contents of the nest, and (6) species determined for the nest. All nest locations are displayed in Exhibit 1.

Nest ID	Date	Status	Contents	Species	Distance to Project (miles)
123	6/10/2019	Active with Fledged Young	Empty	Golden Eagle	9.7
124	6/10/2019	Inactive	Empty	Golden Eagle	10
306	6/10/2019	Inactive	Empty	Golden Eagle	3.2
550	6/10/2019	Inactive	Empty	Golden Eagle	9.5
888	6/10/2019	Inactive	Empty	Golden Eagle	3.2
4751	6/10/2019	Inactive	Empty	Golden Eagle	8.53
889	6/10/2019	Inactive	Empty	Golden Eagle	8.53
890	6/10/2019	Inactive	Empty	Golden Eagle	6.43
891	6/10/2019	Inactive	Empty	Golden Eagle	3.57
1416	6/10/2019	Inactive	Empty	Golden Eagle	3.2
1453	6/10/2019	Inactive / RTHA	Empty	Golden Eagle	5.18
1455	6/10/2019	Inactive	Empty	Golden Eagle	4.83
1986	6/10/2019	Inactive	Empty	Golden Eagle	4.04
892	6/10/2019	Inactive	Empty	Golden Eagle	7.8
3752	6/10/2019	Inactive	Empty	Golden Eagle	7.7
305	6/21/2019	Inactive	Empty	Golden Eagle	8.46
859	6/21/2019	Inactive	Empty	Golden Eagle	8.76
860	6/21/2019	Inactive	Empty	Golden Eagle	8.75
887	6/21/2019	Inactive	Empty	Golden Eagle	7.8
298	6/11/2019	Inactive	Empty	Golden Eagle	5.6
886	6/21/2019	Active	Empty	Golden Eagle	9.89
2382	6/21/2019	Inactive	Empty	Golden Eagle	7.64
2383	6/21/2019	Not Seen	Empty	Golden Eagle	8.87
3748	7/8/2019	Inactive	Empty	Golden Eagle	8.44
3749	6/21/2019	Inactive	Empty	Golden Eagle	7.45
1459	7/8/2019	Inactive	Empty	Golden eagle	8.37
2381	6/11/2019	Active	Empty	Golden Eagle/ Red-tailed Hawk	9.08

Table 2. Summary of Other nest status

Nest ID	Date	Status	Contents	Species	Distance to Project (miles approx.)
1170	6/10/2019	Inactive	Raven nest with four chicks	Common Raven	3.55
1456	6/10/2019	Inactive	Empty	Common Raven	1
1457	6/10/2019	Inactive	Empty	Common Raven	9.5
1458	6/21/2019	Inactive	Empty	Common Raven	8.47

1460	6/10/2019	Inactive	Empty	Common Raven	6.43
1454	6/10/2019	Active	2 RTHA chicks	Red-tailed Hawk	3.34
4571	6/10/2019	Active	2 RTHA chicks	Red-tailed Hawk	8.49

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APPENDIX A. GOLDEN EAGLE NEST PHOTOS

Figure 2. Nest ID 123

Active GOEA nest, Big Morongo, June 10, 2019

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Figure 3. Nest ID 886

Active GOEA nest , Fresh excrement above and below, June 21, 2019

Figure 4. Nest ID 2381

Active GOEA or RTHA nest, June 11, 2019

APPENDIX B. OTHER NEST PHOTOS

Figure 5. Nest ID 4571

Active RTHA nest, 2, 7-week old chicks, June 10, 2019

Figure 6. Nest ID 1454

Old GOEA nest, 2-Red-tailed hawk chicks, June 10, 2019

APPENDIX C-9

2020 Eagle Collision Risk Modeling Report

Eagle Collision Risk Modeling for the Mesa Wind Energy Project Riverside County, California

Technical Memorandum

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December 21, 2020

WEST Inc.

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INTRODUCTION

Aspen Environmental Group (Aspen) requested that Western Ecosystems Technology, Inc. (WEST) conduct an analysis to provide predictions of annual golden eagle (*Aquila chrysaetos*) fatalities at the Mesa Wind Energy Project (Project). The existing Bureau of Land Management (BLM)-permitted 30-megawatt Project (existing BLM-permitted Project), which Brookfield Renewable Energy Partners, L.P. (Brookfield) is proposing to repower (proposed repower Project), is located within the San Gorgonio Wind Resource Area in Riverside County, California. The existing project will be decommissioned in the first quarter of 2021 under existing permits. As such, this technical memorandum has been developed to describe the modeling efforts that have been conducted for the Project.

Aspen requested that WEST use the Bayesian collision risk model developed by the USFWS (USFWS 2013) to predict golden eagle (*Aquila chrysaetos*) fatalities for the Project under a range of different scenarios and assumptions. The following information was considered when calculating predicted eagle fatalities at the Project using the Bayesian collision risk model: 1) the number of eagle risk minutes, defined as the number of minutes eagles were flying within 800 meters (m; 2,625 feet [ft]) of observers and below 200 m (656 ft) above ground level (AGL) during the surveys; 2) an estimate of annual hours that eagles were at risk; and 3) the number of proposed turbines and rotor radius of the turbines (USFWS 2013).

Aspen requested that WEST review the golden eagle fatality prediction provided by Dr. Shawn Smallwood contained in the comment letter from Adams Broadwell Joseph & Cardozo dated June 19, 2020. Specifically, on p. 20, it states:

Golden eagles have been killed by wind turbines in California at rates varying from about 0.05 to 0.13 deaths/MW/year. Golden eagle fatality rates are well known in the APWRA, but they have been harder to come by for other projects because much of the reporting has been kept from the public, and the US Fish and Wildlife Service has been unwilling to share data on wind turbine-caused eagle mortality with the public. Based on what I have learned from various wind projects in California, and based on my own experience in the APWRA [Altamont Pass Wind Resource Area]*, I predict 1.5 to 4 golden eagle fatalities per year would be caused by the proposed project. This toll would sum to 45 to 120 golden eagle fatalities after 30 years.*

METHODS

The USFWS has developed a Bayesian approach to predict the annual eagle fatality rate for wind energy facilities. This approach uses statistical models to define the relationship between eagle exposure, collision rate, and fatalities, and to account for uncertainty (Table 1; USFWS 2013). The exposure rate, expansion factor, and the collision rate are explain in detail below.

Table 1. Variables used in the Bayesian ccollision risk model.

Symbol	Name	Description (units)
F	Eagle fatalities	Annual eagle fatalities from turbine collisions
λ	Exposure rate	Eagle-minutes flying within the facility (in proximity to turbine hazards) per hour x cubic kilometer (km^3)
ε	Expansion factor	Product of daylight hours and total hazardous area (hours·km^3)
C	Collision rate	The rate of an eagle colliding with a turbine per exposure
k	Eagle risk minutes	Number of minutes that eagles were observed flying within 800 meters (m; 2,625 feet [ft]) and below 200 m (656 ft) during point-counts surveys
δ	Turbine hazardous area	Total area within one rotor radius of a turbine (km^3)
n	Number of trials	The product of survey hours and survey area (hours·km^3)
T	Daylight Hours	Total hours of daylight (hours)
n_{tur}	Number of turbines	Number of turbines proposed at the project
p_i	Visibility correction	Proportion of survey site visible during trial *i*

Exposure Rate

Exposure rate (λ) is defined as the expected number of eagle risk minutes per survey hour per cubic kilometer (hr·km^3). The prior distribution developed by the USFWS for exposure rate is derived from data from a range of projects under USFWS review and the projects from Whitfield (2009). The prior distribution is intended to model exposure rates for any wind energy facility. The USFWS defines the prior distribution for exposure rate as:

$\lambda_{prior} \sim Gamma(\alpha, \beta)$, with shape parameter α = 0.97 and rate parameter β = 0.55.

Data collected during point-count surveys are used to update the prior distribution to estimate the parameters for the posterior distribution. By assuming the eagle risk minutes follow a Poisson distribution with rate parameter λ, the posterior distribution for exposure rate is:

$$\lambda_{posterior} \sim Gamma\left(\alpha + \sum_{i=1}^{n} k_i\, , \beta + \sum_{i=1}^{n} p_i\right),$$

where $\sum_{i=1}^{n} k_i$ is the total observed eagle risk minutes across *n* trials and p_i is the proportion of survey site visible during trial *i*. The number of trials, *n*, is the number of hr·km^3 that are conducted during the point count surveys. Values of p_i less than one indicate trials where the entire survey plot is not visible due to topographic constraints. In this way, the parameter p_i acts as a adjustment for the proportion of the plot that is visible.

For this analysis, the exposure rate was estimated for the existing BLM-permitted and proposed repower Project areas defined as a minimum convex polygon around the Project's hazardous area (Figure 1), with the hazardous area determined by a buffer of the rotor radius around turbines (USFWS 2016). The number of eagle risk minutes and survey effort was determined using data collected at point-count survey locations that were within or overlapped the Project area.

Expansion Factor

The expansion factor (ε) is used to scale the per unit fatality rate (eagle fatalities per hour·km^3) to the daylight operation hours (τ) in one year and total hazardous area (km^3) within the Project. The expansion factor is calculated as:

$$\varepsilon = (\tau - \gamma)\sum_{i=1}^{n}\delta_i,$$

where n is the number of turbines, δ is the circular area (3-D hazardous area) centered at the base of a turbine having radius equal to the rotor-swept radius of the proposed turbines and a height of 200 m, and γ is the number of hours that eagles are at risk for the Project.

Collision Rate Prior Distribution

The collision rate, C, is the rate of an eagle colliding with a turbine per exposure in the hazardous area, where all collisions are considered to be fatal. The prior distribution presented by USFWS is estimated using results taken from the Whitfield (2009) study of avoidance rates. The Beta distribution is intended to model collision rates across all sites considered for prediction of annual eagle fatalities. The USFWS collision rate prior distribution is defined as:

$C_{prior} \sim Beta(\upsilon, \upsilon')$, where parameters v = 2.31 and v' = 369.69.

Predicted Annual Fatalities

The distribution of predicted annual fatalities is estimated as the product of the expansion factor, the exposure rate posterior distribution, and the collision rate distribution:

$$F = \lambda \cdot \varepsilon \cdot C.$$

The posterior distribution of estimated annual fatalities is used to obtain the 80^{th} credible percentile of annual fatalities. Credible intervals (i.e., Bayesian confidence intervals) are calculated using a simulation of 10,000 Monte Carlo draws from the posterior distribution of eagle exposure and the collision rate distribution (Manly 1991). The product of each of these draws, with the expansion factor, is used to estimate the distribution of possible fatality at the proposed Project. The upper 80^{th} percentile of this distribution is recommended by the USWFS as a conservative estimate of take for a proposed project (USFWS 2013).

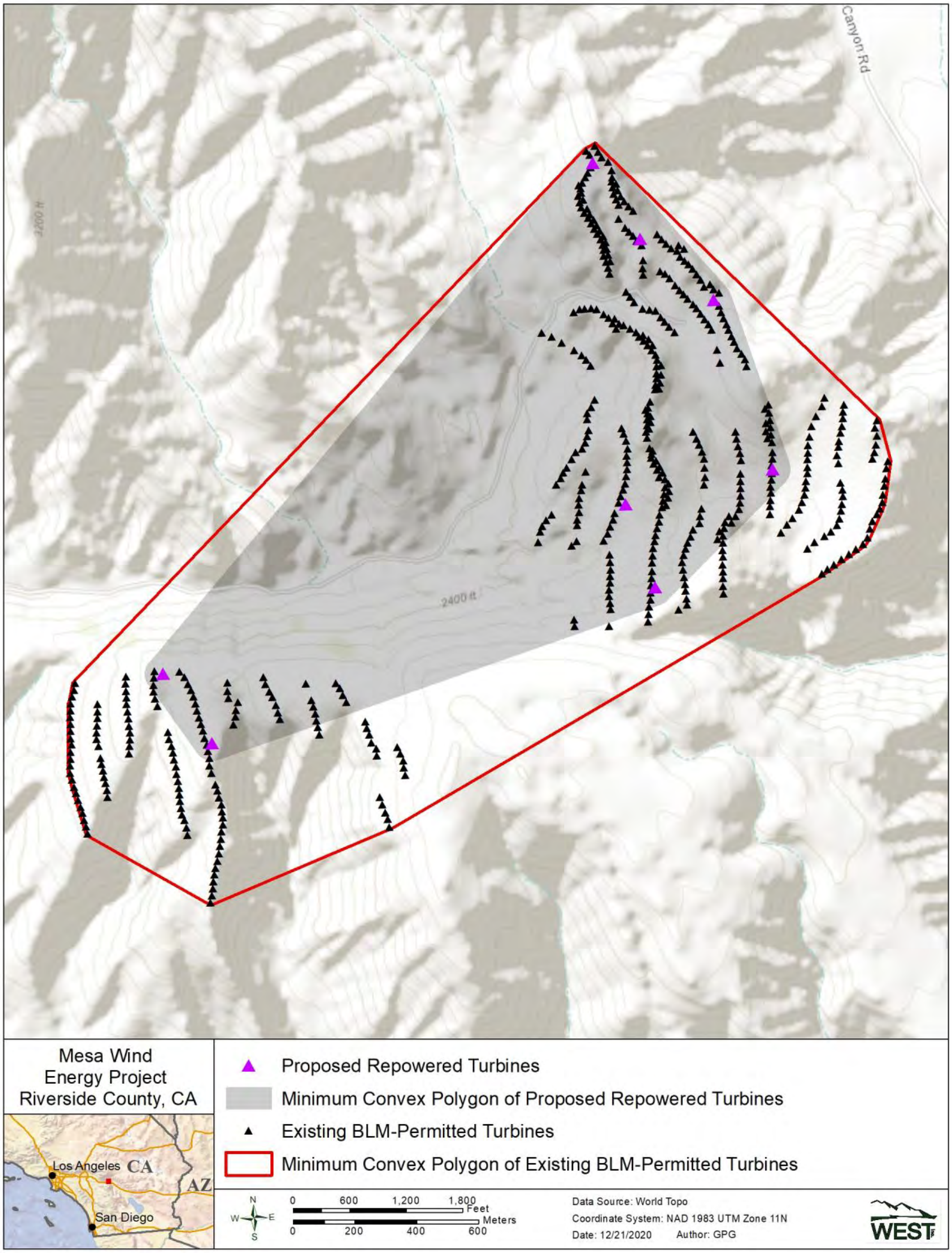

Figure 1 - Study Area (a minimum convex polygon), point count survey locations, and turbines at the existing BLM-permitted and proposed repowered Mesa Wind Energy Project.

The exposure rate was estimated using data collected during point-count surveys conducted at the Project from September 17, 2012 to August 30, 2013 (Bloom 2013) and from November 13, 2015 to November 7, 2016 (WEST 2017). A total of 1,519 and 318 survey hours were conducted at three point count locations in 2012-2013 and 2015-2016, respectively. During point-count surveys conducted in 2012-2013, 75 golden eagle risk minutes were observed and 3 golden eagle risk minutes were observed during point-count surveys conducted from 2015-2016. Wind turbines were operating during both survey periods.

WEST ran the Bayesian collision risk model under several different scenarios to provide a range of possible golden eagle fatality predictions. The goal of running the model under different scenarios was to provide a range of fatality predictions to give a general sense of what the USFWS could produce. Two years of point-count survey data were collected at the Project, and fatality predictions were developed utilizing each year of data separately as well as a fatality prediction that includes the two years of Project specific point-count survey data.

RESULTS

Exposure Rate

The exposure rates for golden eagles were estimated accounting for the proportion of the plot visible (94% assumed in Bloom 2013). During Fall 2012, eagle risk minutes were collected within the lower and upper limits of the rotor swept area (35 to 135 m) and an adjustment was made in the analysis to account for the smaller survey area (Table 2). Due to unequal survey effort by season, separate posterior distributions were developed for the exposure rate for each season: spring (February 1 to April 15), summer (April 16 to September 14), fall (September 15 to December 15), and winter (December 16 to January 31; Tables 2, 3, and 4). In addition, the exposure rate prior distribution was used to predict take (see Exposure Rate methods section).

Table 2. Estimated exposure rate (λ) for golden eagles developed using point-count surveys conducted from September 17, 2012 to August 30, 2013 at the Mesa Wind Energy Project. This analysis assumes a survey plot radius of 800 meters and a proportion of the plot visible of 0.94

Variable	Spring	Summer	Fall	Winter
Survey hours	628	120	735	36
Survey plot height (meters)	200	200	100	200
Eagle Risk Minutes	14	2	57	2
Eagle flight minutes (α'; Eagle Risk Minutes + α)	14.97	2.97	57.97	2.97
Effort (β'; survey hours x cubic kilometer of area surveyed+β)	237.93	45.91	139.56	14.16
Mean exposure rate	0.06	0.06	0.42	0.21

Table 3. Estimated exposure rate (λ) for golden eagles developed using point-count surveys conducted from November 13, 2015 to November 7, 2016 at the Mesa Wind Energy Project. This analysis assumes a survey plot radius of 800 meters, a survey plot height of 200 meters, and a proportion of the plot visible of 0.94

Variable	Spring	Summer	Fall	Winter
Survey hours	66	126	84	42
Eagle Risk Minutes	0	0	0	3
Eagle flight minutes (α'; Eagle Risk Minutes + α)	0.97	0.97	0.97	3.97
Effort (β'; survey hours x cubic kilometer of area surveyed+β)	27.09	51.22	34.33	17.44
Mean exposure rate	0.04	0.02	0.03	0.23

Table 4. Estimated exposure rate (λ) for golden eagles developed using point-count surveys conducted from September 17, 2012 to August 30, 2013 and November 13, 2015 to November 7, 2016 at the Mesa Wind Energy Project. This analysis assumes a survey plot radius of 800 meters, a survey plot height of 200 meters for all seasons except fall where a plot height of 100 and 200 meters is assumed, and a proportion of the plot visible of 0.94

Variable	Spring	Summer	Fall	Winter
Survey hours	694	246	819	78
Eagle Risk Minutes	14	2	57	5
Eagle flight minutes (α'; Eagle Risk Minutes + α)	14.97	2.97	57.97	5.97
Effort (β'; survey hours x cubic kilometer of area surveyed+β)	262.88	93.54	171.22	30.04
Mean exposure rate	0.06	0.03	0.34	0.20

Expansion Factor

The expansion factor was calculated for the existing BLM-permitted Project assuming 460 turbines with a 7.5 m rotor radius and for the proposed repowered Project assuming 8 turbines with a 58.5 m rotor radius. Eagles were assumed to be at risk during all daylight hours, determined using sunrise and sunset times for each season. The expansion factor was 21.43, 51.58, 24.83, and 11.92 hours·km^3 for spring, summer, fall, and winter, respectively for the existing BLM-permitted Project (Table 5a) and 14.97, 36.02, 17.34, and 8.33 hours·km^3 for spring, summer, fall, and winter, respectively for the proposed repowered Project (Table 5b).

Table 5a. Expansion factors (ε) for the existing BLM-permitted Mesa Wind Energy Project. This analysis assumes 460 turbines with a rotor radius of 7.5 meters. The hazardous volume for the project was 0.016 km^3.

Variable	Spring	Summer	Fall	Winter
Annual hours eagles are at risk	870	2,094	1,008	484
Overall Expansion Factor	14.14	34.04	16.39	7.87

Table 5b. Expansion factors (ε) for the currently proposed turbine layout at the repowered Mesa Wind Energy Project. This analysis assumes eight turbines with a rotor radius of 58.5 meters. The hazardous volume for the project was 0.017 km^3.

Variable	Spring	Summer	Fall	Winter
Annual hours eagles are at risk	870	2,094	1,008	484
Overall Expansion Factor	14.97	36.02	17.34	8.33

Collision Rate Distribution

The collision rate prior distribution was used for this analysis as outlined in the Collision Rate Prior Distribution methods section. We did not update the collision rate distribution as standardized post-construction fatality monitoring has not been conducted at the Project and the turbine specifications of the new turbines will differ from the old turbines

Fatality Prediction

The annual fatality predictions for golden eagles for the existing BLM-permitted Project are presented in Table 6a and the fatality predictions for the proposed repowered Project are presented in Table 6b. For the existing BLM-permitted Project, the predicted annual golden eagle take range from 0.02 (80^{th} credible interval = 0.03; using the 2015-2016 data) to 0.07 (80^{th} credible interval = 0.09; using the 2012-2013 data). A fatality prediction without site-specific eagle use data was also evaluated (exposure rate and collision rate prior distributions) and the annual predicted take was 0.74 (80^{th} credible interval = 1.12). The predicted annual golden eagle fatality rates for the proposed repower Project ranged between 0.03 fatalities per year (80^{th} credible interval = 0.04; using the 2015-2016 data) and 0.07 (80^{th} credible interval = 0.09). The fatality prediction without site-specific data was 0.78 fatalities per year (80^{th} credible interval = 1.20; exposure rate and collision rate prior distributions).

Table 6a. Annual fatality predictions for the existing BLM-permitted turbine layout at the Mesa Wind Energy Project.

Variable	2012-2013 data	2015-2016 data	All data
Mean	0.07	0.02	0.05
80^{th} Credible Level	0.09	0.03	0.07

Table 6b. Annual fatality predictions for the proposed repower turbine layout at the Mesa Wind Energy Project.

Variable	2012-2013 data	2015-2016 data	All data
Mean	0.07	0.03	0.06
80^{th} Credible Level	0.09	0.04	0.07

DISCUSSION

Using survey data collected at the Project, the predicted take for the existing BLM-permitted Project at the 80^{th} credible level for the annual predicted number of fatalities ranged from 0.03 (using the 2015-2016 data) to 0.09 (using the 2012-2013 data). Combing datasets, the 80^{th} credible level for the annual predicted number of fatalities is 0.07. The predicted take for the proposed repower Project at the 80^{th} credible level ranged from 0.04 (using the 2015-2016 data) to 0.09 (using the 2012-2013 data). Combing datasets, the 80^{th} credible level for the annual predicted number of fatalities is 0.07.

In his comments, Dr. Smallwood predicted that the number of golden eagle fatalities per year at the Project would range from 1.5 to 4 using data from California and the APWRA. However, he did not provide data or references to support the range of annual predicted golden eagle fatalities. Without supporting data, WEST, or any other reviewer, cannot evaluate whether the data Dr. Smallwood used to develop his fatality prediction is appropriate for the Project. Avian use and fatality risk can vary among wind resource areas in California, and San Gorgonio has been shown to have lower fatalities than wind projects in the Tehachapi wind resource area or the APWRA (Anderson et al. 2005, Lovich et al. 2015). Thus, understanding the underlying data used to form the fatality prediction is essential to evaluating the applicability of the prediction to the Project.

WEST evaluated the permitted level of golden eagle take at wind energy projects in California to compare the annual predicted take at the Projects to other wind energy facilities. There are currently four permits that authorize the take of golden eagles in California with three of four facilities permitted for less than one golden eagle fatality per year (Table 7). The highest predicted annual take (2.3 fatalities per year) is at the Solano Wind Project in Solano County, California (Table 7). The predicted permitted take at the proposed repower Project ranging from 0.05 to 0.14 at the 80th credible interval is lower than any of the other wind energy projects with permitted eagle take in California.

Table 7. Wind Projects in California and Permitted Golden Eagle Take.

Project Name	County, State	Permit Length (years)	Date Permit was Issued	Annual Predicted Take
Alta East	Kern County, California	5	December 16, 2016	0.5
Ocotillo	Imperial County, California	5	March 29, 2019	0.3
Solano	Solano County, California	5	September 2019	2.3
Shiloh IV	Solano County, California	5	July 2014	0.89

WEST also evaluated the potential for micrositing based on eagle flight path data collected during the avian use surveys. Eagle flight path data can be used to make inferences of areas of higher use and consequently higher collision risk. WEST examined flight paths collected 2012 – 2013 and 2015 – 2016 for indicators of concentrated use at potential eagle features. The flight paths from 2012 – 2013 were widely distributed with limited indication of a concentrating feature that could be used for micrositing. The golden eagle flight paths from 2015 – 2016 were too sparse to draw inference about use patterns. Flight paths are one type of data that can be used to inform micrositing and other analytical methods such as analysis terrain and weather drivers of risk not completed for this Project. Thus, there might be some potential for micrositing; however, the eagle flight path data does not reveal patterns indicative of clear concentrating features.

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APPENDIX C-10

Access Route Biological Survey Report

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PROJECT MEMORANDUM
MESA/ALTA MESA DELIVERY ACCESS ROUTE

Date: January 13, 2021
To: Berk Gursoy and Jonathan Kirby
From: Vida Strong and Scott White
Subject: Biological Survey Results for Proposed Access Route

Introduction

Brookfield Renewable Energy (Brookfield) retained Aspen Environmental Group (Aspen) to conduct a biological survey of the proposed Mesa/Alta Mesa Delivery Access Route (project) along Rockview Drive, located in the community accessed from Haugen-Lehmann Way in the San Gorgonio Pass in Riverside County, California (Figure 1, Attachment 1).

Project Description

The survey area is approximately 4.6 acres and contains a portion of Rockview Drive, starting at the intersection of Cottonwood Avenue and Rockview Drive, and ending at Pomander Place road. It consists of the roadway right-of-way which primarily includes an existing dirt road with vegetation along its margins. The project would widen Rockview Drive to a width of 16 feet by removing vegetation along the pre-existing road margins. The survey area is shown on the White Water USGS 7.5-minute Quad (USGS 1951). The elevation ranges from 1,580 to 1,594 feet above mean sea level. With the exception of Cottonwood Canyon Wash to the east and natural open space to the west, all lands surrounding the survey area are predominantly open space land reserved for housing with few developed land plots. Representative photos of the survey area are provided in Attachment 2.

Survey Methodology

Aspen biologist Jacob Aragon completed the biological survey on January 4, 2021. Prior to conducting the survey, Mr. Aragon reviewed the California Natural Diversity Database (CNDDB) to search for all known occurrences of special-status plant and wildlife species from the survey area (CDFW 2021). There are no desert tortoise records within the survey area and the nearest desert tortoise record is 1.6 miles to the northeast. There are recorded occurrences of burrowing owls in the vicinity of the survey area and the nearest record is 0.43 miles to the east. There are very few special-status plant records within 1.5 miles of the survey area. Although a focused special-status plant survey was not conducted, Mr. Aragon assessed habitat for special-status plants such as yellow hairy sand verbena (*Abronia villosa* var. *aurita*), Parry's spineflower (*Chorizanthe parryi* var. *parryi*), white bracted spineflower (*Chorizanthe xanti* var. *leucotheca*) which are known from within about 3 miles of the survey area.

The field assessment consisted of reconnaissance-level biological surveys for special-status wildlife and plants and was conducted by walking linear along the vegetation margins on each side of the road. The field survey specifically targeted Mojave Desert tortoise sign (e.g., live tortoises, scat, burrows, carcasses, courtship rings, drinking depressions, tracks, or other indication of current or previous tortoise occurrence), burrowing owl sign (e.g., live owls, pellets, burrows, feathers, or other indication at burrows), and general special-status wildlife and plant species (CBOC 1993, CDFW 2018, USFW 2019). The assessment occurred outside the active season for desert tortoise, outside the breeding season for burrowing owl, and outside the flowering season. All plant and wildlife species identified were recorded in field notes. Plants of uncertain identity were collected and identified later using keys, descriptions, and illustrations in Baldwin et al. (2012) and other regional references.

Results

No desert tortoise, burrowing owl, or other special-status wildlife and plant species were observed during the survey. Vegetation and habitat within the survey area can be described and named based on alliance level nomenclature in A Manual of California Vegetation (Sawyer et al. 2009) and Holland (1986) and are as follows:

Brittle bush scrub (*Encelia farinosa* Shrubland Alliance). This vegetation community is characterized by a dominance of brittle bush (*Encelia farinosa*). The brittle bush forms a dense nearly monotypic stand of shrubs with very little diversity. Burrobrush (*Ambrosia Salsola*), creosote bush (*Larrea tridentata*), and silver cholla (*Cylindropuntia echinocarpa*) are present in very low numbers. Brittle bush scrub is present in areas that appear to have been disturbed in the past. This vegetation best matches the descriptions of Riversidean desert scrub (Holland 1986).

Developed/Ruderal. The remainder of the survey area are occupied by unpaved dirt roads and immediate roadside vegetation. These areas are primarily unvegetated but there are some ruderal species present, including brome grasses (*Bromus* spp.) and schismus grass (*Schismus barbatus*). These areas do not match published vegetation descriptions.

In addition, there was moderate to heavy trash and dump sites progressing when travelling eastward. All wildlife and plant species observed during the surveys are listed in Attachment 3.

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Attachment 1 – Figures

Figure 1

Delivery Route Survey Area

Attachment 2 – Photo Exhibit


Photo 1: Intersection of Cottonwood Rd and Rockview Dr, facing east.


Photo 2: Brittlebush scrub vegetation through-out site, Rockview Dr. facing northeast.


Photo 3: North vegetation margin along Rockview Dr., facing east.


Photo 4: South vegetation margin and developed land plot along Rockview Dr., facing west.


Photo 5: Rockview Dr. facing west near eastern-most land plot.


Photo 6: Intersection of Pomander Pl. and Rockview Dr., facing west.

Attachment 3 – Species Observed

Latin Name	Common Name
VASCULAR PLANTS	
Dicotyledons	
EPHEDRACEAE	EPHEDRA FAMILY
Ephedra nevadensis	Nevada ephedra, desert tea
ASTERACEAE	ASTER FAMILY
Ambrosia salsola	Common burrobrush, cheesebush
Bebbia juncea var. *aspera*	Sweetbush
Encelia farinosa	Brittlebush
Ericameria paniculata	Black-banded rabbitbrush, punctate rabbitbrush
BRASSICACEAE	MUSTARD FAMILY
* *Brassica tournefortii*	Sahara mustard, wild turnip
CACTACEAE	CACTUS FAMILY
Cylindropuntia echinocarpa	Silver cholla
Opuntia basilaris var. *basilaris*	Beavertail cactus
CLEOMACEAE	SPIDERFLOWER FAMILY
Peritoma arborea	Bladderpod
ZYGOPHYLLACEAE	CALTROP FAMILY
Larrea tridentata	Creosote bush
Monocotyledons	
AGAVACEAE	CENTURY PLANT FAMILY, AGAVE FAMILY
Yucca schidigera	Mojave yucca
POACEAE	GRASS FAMILY
* *Bromus* sp.	Unid. annual brome grass
* *Schismus* sp.	Mediterranean grass
VERTEBRATE ANIMALS	
REPTILIA	REPTILES
IGUANIDAE	IGUANID LIZARDS
Uta stansburiana	Side-blotched lizard
AVES	BIRDS
CATHARTIDAE	VULTURES
Cathartes aura	Turkey vulture
ACCIPITRIDAE	HAWKS, EAGLES, HARRIERS
Buteo jamaicensis	Red-tailed hawk
PHASIANIDAE	GROUSE AND QUAIL
Callipepla californica	California quail
COLUMBIDAE	PIGEONS AND DOVES
Zenaida macroura	Mourning dove
TYRANNIDAE	TYRANT FLYCATCHERS
Sayornis saya	Say's phoebe
Tyrannus verticalis	Western kingbird
CORVIDAE	CROWS AND JAYS
Corvus corax	Common raven
TROGLODYTIDAE	WRENS
Thryomanes bewickii	Bewick's wren
MUSCICAPIDAE	THRUSHES AND ALLIES
Polioptila caerula	Blue-gray gnatcatcher
MIMIDAE	MOCKINGBIRDS AND THRASHERS

Latin Name	Common Name
Toxostoma redivivum	California thrasher
EMBERIZIDAE	SPARROWS, WARBLERS, TANAGERS
Zonotrichia leucophrys	White-crowned sparrow
FRINGILLIDAE	FINCHES
Haemorhous mexicanus	House finch
MAMMALIA	MAMMALS
LEPORIDAE	HARES AND RABBITS
Lepus californicus deserticola	Black-tailed jackrabbit
Sylvilagus sp.	Cottontail
CANIDAE	FOXES, WOLVES AND COYOTES
Canis familiaris	Domestic dog

Species introduced to California are indicated by an asterisk. This list includes only species observed on the site. Invertebrate species observed throughout the site were not included in this list. Other species may have been overlooked or unidentifiable due to season (amphibians are active during rains, reptiles during summer, some birds (and bats) migrate out of the area for summer or winter, some mammals hibernate, many plants are identifiable only in spring). Plants were identified using keys, descriptions, and illustrations in Baldwin et al (2012). Plant taxonomy and nomenclature generally follow Baldwin et al. (2012). Wildlife taxonomy and nomenclature generally follow Stebbins (2003) for amphibians and reptiles, AOU (1998) for birds, and Wilson and Ruff (1999) for mammals.

APPENDIX D

Noise Level Calculations

Mesa Wind Repower, Noise Level Calculations

Model Description: Composite Noise Level Calc, Various Distances, No Shielding
Model Approach and Cite: FTA, 2018: Transit Noise and Vibration Impact Assessment Guidelines. Section 7.1, Construction Noise Assessmen
Use Factors: FHWA, 2006: Roadway Construction Noise Model, User's Guide. Table 1 (Actual measured Lmax)

	Loudest Equipment	Lmax (dBA)	Acoustic Use Factor (%)	Leq(h) (dBA)	Individ SPL(h)	Refc (ft)	Leq(h) at Refc (dBA)	_Equivalent Leq(h) at __ (ft) 50 (dBA)
Example: Single Source	Single >>>>>>>>>>>>>>					3.281	109.0	85.3
	Theoretical Maximum Level (total apparent SPL)	109	100	109	7.9E+10			

Construction Activity	Equipment	Lmax @ 50 ft (dBA)	Acoustic Use Factor (%)	Leq(h) (dBA)	Refc (ft) 50 / Receptor (ft)	Leq at Recept (dBA)		Composite at Receptor Leq(h) (dBA)
								80.2
Site Prep, Removing Legacy Towers, Transport	Excavator	81	40	77.0	100	71.0	1.3E+07	
	Grader	85	40	81.0	100	75.0	3.2E+07	
	Crane	81	20	74.0	100	68.0	6.3E+06	
	Mounted Impact Hammer	90	20	83.0	100	77.0	5.0E+07	
	Dump Truck	76	40	72.0	100	66.0	4.0E+06	
								Composite at Receptor Leq(h) (dBA)
								80.5
WTG Foundation and Assembly	Backhoe	78	40	74.0	100	68.0	6.3E+06	
	Compactor	83	20	76.0	100	70.0	1.0E+07	
	Dozer	82	40	78.0	100	72.0	1.6E+07	
	Excavator	81	40	77.0	100	71.0	1.3E+07	
	Loader	79	40	75.0	100	69.0	7.9E+06	
	Telescopic Forklift (Man Lift)	75	20	68.0	100	62.0	1.6E+06	
	Crane	81	20	74.0	100	68.0	6.3E+06	
	Mounted Impact Hammer	90	20	83.0	100	77.0	5.0E+07	
	Flat Bed Truck	74	40	70.0	100	64.0	2.5E+06	

								Composite at Receptor Leq(h) (dBA)
								78.9
Electrical Construction and Underground	Bore/Auger Drill Rig	84	20	77.0	100	71.0	1.3E+07	
	Backhoe	78	40	74.0	100	68.0	6.3E+06	
	Compactor	83	20	76.0	100	70.0	1.0E+07	
	Excavator	81	40	77.0	100	71.0	1.3E+07	
	Roller	80	20	73.0	100	67.0	5.0E+06	
	Telescopic Forklift (Man Lift)	75	20	68.0	100	62.0	1.6E+06	
	Crane	81	20	74.0	100	68.0	6.3E+06	
	Generator	81	50	78.0	100	72.0	1.6E+07	
	Concrete Mixer Truck	79	40	75.0	100	69.0	7.9E+06	

<u>**Proposed Action**</u>	<u>**Equipment**</u>	**Lmax @ 50 ft (dBA)**	**Use Factor (%)**	**Leq(h) (dBA)**	**Receptor (ft)**	**Leq at Recept (dBA)**
Multi Source Operation	WTG SPL 109 dBA (~85 dBA @ 50 ft equiv)	85.3	100	85.3	2,500	51.3
	WTG SPL 109 dBA (~85 dBA @ 50 ft equiv)	85.3	100	85.3	2,650	50.8
<u>**Alternative C**</u>						
Single Source Operation	WTG SPL 109 dBA (~85 dBA @ 50 ft equiv)	85.3	100	85.3	4,400	46.4