Appendix E-6

Bird and Bat Impacts

ENVIRONMENTAL & STATISTICAL CONSULTANTS
415 W. 17th Street, Suite 200, Cheyenne, Wyoming 82001
Phone: 307-634-1756 ◆ www.west-inc.com ◆ Fax: 307-637-6981

TECHNICAL MEMORANDUM

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To: Aarty Joshi, Clearway

From: Wally Erickson, WEST, Inc.

Subject: Bird and Bat Impacts: Victory Pass and Arica Solar Projects

INTRODUCTION

This memorandum provides an assessment of the potential direct and indirect impacts from the Victory Pass and Arica solar projects (collectively, Project sites) on birds and bats, including sensitive species. This assessment is primarily based on data and studies from regional photovoltaic (PV) solar projects. We based most of our assessment using data and metrics from the recent publication by Kosciuch et al. (2020).

PROJECT DESCRIPTIONS

The Project sites are both in unincorporated eastern Riverside County, California. Each project consists of approximately 2,000 acres (ac; 809 hectares [ha]) of Bureau of Land Management-managed land with the Victory Pass Project 265 Megawatt (MW) in size and the Arica Project 200 MW in size. The Projects would disturb approximately 2,745 acres overall (1,355 acres of the Arica site and 1,310 acres of the Victory Pass site and 80 additional acres for the shared gen-tie corridor). The Project sites are situated within Chuckwalla Valley near the community of Desert Center, which is nearly halfway between the cities of Indio and Blythe, north of the Interstate 10 freeway on the Sidewinder Well and Corn Spring 7.5-Minute US Geological Survey topographic quadrangles.

The Project sites are located within the California Desert Conservation Area planning area, and within the southern Desert Tortoise Recovery Unit of the Northern and Eastern Colorado Desert Coordinated Management Plan. The Project sites are not located within any ACECs (Areas of Critical Environmental Concern), but the Chuckwalla ACEC is 400 feet (122 meters) south of the Project sites immediately south of the I-10 and the Gen-tie alignment would cross the ACEC, the Alligator Rock ACEC is almost 1.0 mile (mi; 1.6 kilometers [km]) southwest, the Desert Lily

Preserve ACEC is 4.0 mi (6.4 km) north, and Joshua Tree National Park is 6.0 mi (9.7 km) north of the Project sites.

BIRDS

Direct and indirect impacts to avian species may occur during project operation and maintenance through individual collisions with project facilities and equipment including transmission wires, fencing, array structures, and heavy equipment. Such risks are commonplace with most human development activities. The structures that have been empirically demonstrated to result in elevated collision risk at various types of facilities (e.g., tall buildings, communication towers, wind turbines, or concentrating solar thermal towers) are not present at the Project sites, which consists of low height PV arrays, and a few other structures , including up to 20 transmission poles, will exceed the up to 14 foot (4 meter) height of PV modules. For taller structures, the Project will employ established best management practices, including following the APLIC guidelines and using minimal lighting designed to avoid attracting avian species and limit visual impacts.

While individual impacts to birds may be expected to occur due to collisions with project facilities and equipment, the risk of significant impact to avian populations is minimal. A collection of 13 fatality monitoring studies at PV solar facilities in three bird conservation regions (BCRs) in California and Nevada have documented 669 fatalities, with 54.71% being common songbirds after adjusting carcass counts for detection bias (Kosciuch et al. 2020). The identifiable species that had the highest percentage of bias-adjusted composition across all studies were mourning dove (12.92%), horned lark (11.93%), house finch (8.41%), and western meadowlark (7.78%). Kosciuch et al. (2020) stated those species have populations that number in the millions in the BCRs where the studies took place.

Carcasses of water-associated birds (e.g., herons and egrets) and water obligate birds (e.g., loons and grebes) have been found at PV solar facilities in the Sonoran and Mojave Deserts (SMD) BCR, where the Project sites are located. However, carcasses of water associates and water obligates were primarily found at sites within 60.0 mi (97 km) of the Salton Sea, and the representation of these bird groups in the fatality data decreased or disappeared at sites located away from the Salton Sea.

In contrast to new wind turbines, sky scrapers, and other tower-like structures, where hundreds of birds have died shortly after the start of operations and sometimes within a single day or night, no large mortality events have been documented at PV solar facilities. Water-associated or water-obligate birds have typically been documented as single individual detections. Under the pattern presented in Kosciuch et al. (2020), while there may be some water-associate and water-obligate bird fatalities at the Projects, numbers are expected to be low. In the following sections, we expand on what is known about direct impacts to birds from PV solar, and use this information to estimate expected impacts from the Project sites.

Regional Bird Fatality Rates

We rely on fatality monitoring studies from regional SMD projects for understanding and predicting fatality impacts for these Project sites. Table 1 includes annual fatality estimates from SMD projects with readily available reports, as well as two additional projects for comparison. Two years of post-construction monitoring data was collected at four of the sites and one year for the remaining two sites. The SMD projects annual fatality rates range from 0.08 to 2.99 birds per MW per year (0.032 to 1.028 birds per ha per year), with a mean of 1.31 birds per MW per year (0.50 birds per ha per year).

Table 1. Adjusted fatality estimates standardized by megawatt (MW) and hectare for solar projects located in the Sonoran and Mojave Deserts, as well as other projects for comparison.

Project Name and Study Year	Study Year	Total MW	Adjusted Fatality Estimate (per MW)	Array Area (Hectares)	Adjusted Fatalities/ Hectare
Sonoran and Mohave Desert					
Silver State South Year 1	2016 – 2017	250.0	0.08	635	0.032
Silver State South Year 2	2018 − 2019	250.0	0.62	635	0.243
Blythe Solar Project Year 1 (WEST 2018a)	2016 − 2017	172.6**	0.20*	681	0.062
Blythe Solar Project Year 2 (WEST 2019a)	2017 − 2018	235.0	2.08	681	0.719
McCoy Solar Project Year 1(WEST 2018b)	2016 − 2017	250.0	0.23	727	0.078
McCoy Solar Project Year 2 (WEST 2019b)	2017 − 2018	250.0	2.99	727	1.028
Desert Sunlight Year 1 (WEST 2017)	2015 − 2016	550.0	1.05	1,206	0.480
Desert Sunlight Year 2 (WEST 2018c)	2016 − 2017	550.0	1.91	1,206	0.874
Seville	2017 – 2018	50.0	2.55		1.000
Longboat	2016 – 2017	50.0	1.36		0.494
Average			**1.31**		**0.501**
Grassland					
California Valley Solar Ranch	2013 – 2014	250.0	9.26		5.170
Great Basin					
Luning	2017 – 2018	50.0	5.72		2.037

*The Blythe MW total was calculated using a weighted approach. The full Project capacity is 235 MW. This is an updated estimate informed by two full years of data.

**Blythe was not fully operational during Year 1 monitoring.

WEST = Western EcoSystems Technology, Inc.

Background Mortality

All carcasses and feather spots are included in the estimates in Table 1, even if cause of death was uncertain. Across these projects, actual cause of death could not be determined for over 90% of the carcasses or feather spots found during standardized monitoring. Collision with panels was determinable in less than 4% of the cases. Over 50% of the carcasses were feather spots. Feather spots could occur from a number of sources including background mortality (i.e., mortality from predation; Erickson et al. 2014).

There are no estimates of background mortality in the desert where the studies conducted searches across the entire year. Fesnock (2017) did present some background fatality estimates for desert environments based on single searches along desert tortoise transects extrapolated to the rest of the year (assumes mortality during the one search in August is the same in other months), and the estimates were 0.024 birds per ac, which is in the range of the lower end of fatality rates from these studies.

Background mortality was estimated at the California Valley Solar Ranch project located in grassland habitat in San Luis Obispo County in central California. At this project, the majority of detections found at the solar project were mourning dove, a prey species. Fatality monitoring was also conducted at reference plots outside of the solar facility. H. T. Harvey and Associates (2015) calculated an adjusted fatality rate of 1.73 birds per area of a tracker unit (i.e., sample unit) in the reference area, which converts to an annual rate of 7.20 birds per MW (based on the approximate MW to tracker unit ratio of the facility). This reference plot estimate was only slightly less than the estimates in the solar fatalities, strongly suggesting some of the mortality in the solar arrays may not be caused by the project. While we do not correct the estimates provided in this memo for background mortality, the estimates reported are likely conservative (overestimate) due to this factor.

Species/Group Composition

Based on the studies in Kosciuch et al. (2020), the species detected most commonly in the solar arrays of these public data sets included mourning dove, western meadowlark, and horned lark. These three species, along with house finch, also composed the highest proportion of detections across these studies. Mourning dove, western meadowlark, and horned lark share several traits including they are primarily ground dwelling, inhabit landscapes with low-growing vegetation, and have large populations in the US. Mourning dove and house finch share a trait in that they associate with anthropogenic structures. According to the Partners in Flight (PIF) Bird Population Database (PIF 2020), there is an estimated eight million or more mourning doves, western meadowlarks, horned larks, and house finch in the two BCRs represented by the data above. The species occurring in most site-years and/or were the highest proportion of the fatality estimates, are abundant in the regions where the studies occurred and share behavioral traits (move at or near ground level or associate with anthropogenic structures).

In general, fewer detections were recorded during the breeding season than during the migration season (Kosciuch et al. 2020). This suggests regional populations may be less impacted by the Project sites when compared with migratory populations.

Passerines (55.0%) and doves/pigeons (17.0%), on average, are the most common detections (Kosciuch et al. 2020, Table 1, page 8). Raptors are very uncommon detections (less than 1.0%). Water associated (6.3%) and water obligate species (7.8%) each compose less than 10% of the detections. Water-associated birds have been more commonly found in projects in the desert and those closest to the Salton Sea (Kosciuch et al. 2020). Water-associated bird detections have been more common at Desert Sunlight Solar Project and some of the Imperial County projects.

While the cause of this pattern is not well understood, these sites are closer to the Salton Sea, and this has been suggested as a possible factor in increasing risk.

General Transmission Line Impacts

Birds may also collide with the overhead lines, including the shared Gen-tie transmission line. While few nocturnal migrant passerines have been found in the solar arrays, more have been found underneath the gen-tie lines at the solar projects. The Gen-tie is approximately three mi (five km) long. Based on studies of the gen-ties associated with Blythe, McCoy and Desert Sunlight Solar projects, it is estimated approximately 60 birds per km per year may collide with the lines. Several authors have suggested that clustering or co-locating linear obstacles can reduce collision risk due to the increased visibility and that birds need to complete only one ascent and descent flight to cross the co-located obstacles (APLIC 1994; Bevanger 1994; Thompson 1978). APLIC (2012), states that this is a common sense approach for reducing bird collision risk and the general consensus among industry experts supports this assumption and this approach, although few studies have attempted to evaluate the effectiveness of this measure in terms of the bird collision risk.

Predicted Mortality for Victory Pass and Arica Solar Projects

We base predicted level of mortality at the Project sites using the average and range of SMD fatality estimates found in Table 1. The annual rates range from 0.08 to 2.99 birds per MW per year (0.032 to 1.028 birds per ha per year), with a mean of 1.31 birds per MW per year (0.44 birds per ha per year).

Using these average values, we would predict approximately 261 bird fatalities in the solar arrays at Arica, and 346 bird fatalities at Victory Pass Project (Table 2). We would also predict an additional 300 birds (60 x 5 km) along the gen-tie in an average year.

Table 2. Predicted fatalities for the Victory Pass and Arica Solar Projects and the associated transmission line

roject	Project Size	Mean Fatality Prediction (Fatalities/MW/year)	Total Annual Fatality Prediction
Victory Pass – Solar arrays	265 MW	1.31	346
Arica – Solar arrays	200 MW	1.31	261
Transmission line	5 km	60/km	300

MW = megawatt; KM = kilometer.

SENSITIVE BIRD SPECIES

Carcass detections were obtained from Kosciuch et al. (2020). The data originate from seven sites and 10 total site-years where each report is considered a site-year. Six of the sites are located in desert habitats, and one of the sites is located in agricultural lands south of the Salton Sea. These data are limited to studies and reports available at the time of the publication submittal, and only include data from standardized monitoring studies that met accepted criteria (e.g., appropriate fatality estimates available, at least a full year of monitoring, available at time of analysis). In addition, we reviewed datasets that have information on carcass detections at PV

solar projects in BCR 33. These data include additional observations of sensitive species (e.g., five burrowing owl detections). Although there may be additional data that we currently have not reviewed, we believe the data discussed in this memo contains a large majority of the data available and is representative of sensitive species fatalities at PV solar sites in the desert southwest.

No bird species listed as California threatened or endangered species or US Fish and Wildlife Service threatened or endangered species were found during the monitoring years of the solar arrays and fence of the desert projects listed in Table 1. Five sensitive species that could occur at the Victory Pass and Arica Projects have been detected as fatalities in the arrays at desert sites including loggerhead shrike (four), yellow-breasted chat (two), long-eared owl (one), yellow warbler (one), and yellow-headed blackbird (one). Seven detections of yellow warblers have been reported during surveys of the gen-tie lines. We are also aware of five detections of burrowing owls at a project in an agricultural setting in Imperial Valley, which is discussed more fully below.

No other sensitive bird species has been detected as fatalities during the standardize monitoring of sites in this region (see Appendices in Arica and Victory Pass), including Golden eagle, Short-eared owl, Redhead, Ferruginous hawk, Swainson's hawk, Costa's hummingbird, Vaux's swift, Mountain plover, Black tern, Northern harrier, Western yellow-billed cuckoo, Gilded flicker, Black swift, Willow flycatcher, Southwestern willow flycatcher, Prairie falcon, American peregrine falcon, Sandhill crane,Gila woodpecker, Elf owl, Long-billed curlew, Lucy's warbler, American white pelican, Black-tailed gnatcatcher, Vesper sparrow, Purple martin, Vermilion flycatcher, Ridgway's (Yuma) clapper rail[1], Bank swallow, Sonora Yellow warbler, Lawrence's goldfinch, Bendire's thrasher, Crissal thrasher, Le Conte's thrasher, Arizona Bell's vireo, and Least Bell's vireo.

Table 3. Special status species that could occur at the Projects and were found at fatalities and associated infrastructure during the standardized surveys at desert projects along with associated population sizes.

Species	arrays	Fence	Gen-tie	CA	BCR 33	US/CAN
loggerhead shrike	2	2	0	190,000	190,000	990,000
yellow-breasted chat	1	1	0	240,000	130,000	15,000,000
long-eared owl	0	1	0	2,000	0	38,000
yellow warbler	1	0	7	550,000	300,000	93,000,000
yellow-headed blackbird	1	0	0	530,000	540,000	11,000,000
Subtotal	**5**	**4**	**7**			

Gen-tie = general transmission line; CA = California; BCR = Birds Conservation Region; CAN = Canada.

[1] Two Ridgway's rail fatalities have been discovered incidentally at PV solar projects (USFWS 2016). One detection occurred at Desert Sunlight, and was discovered along a project road during construction. The other detection was found along the perimeter fence at SolarGen2 facility in Imperial County.

Loggerhead Shrike

Four loggerhead shrike detections occurred at PV solar sites in the desert habitats with two found within the arrays and two along the facility fences. Three of the four detections occurred in the winter (December and January) and one in the spring (March). Loggerhead shrikes are year-round residents of the desert southwest. Birds from the northern plains and other northern latitudes will migrate south in the winter. The estimated loggerhead shrike population sizes are 160,000 individuals in BCR 33, 410,000 individuals in California, and 4,600,000 in the US and Canada (PIF 2020).

Long-eared Owl

One long-eared owl detection occurred at a PV solar site in the desert in June. Long-eared owls are a rare breeder in California and BCR 33 with breeding population sizes of 2,000 in California and 38,000 in the US and Canada (PIF 2020).

Yellow-breasted Chat

Two yellow-breasted chat detections occurred, one at each of two desert PV solar projects. One was located along facility fence, and one in the PV solar arrays; both occurred during fall migration. Yellow-breasted chats are considered a migrant at the Project sites. There are an estimated 130,000 individuals in BCR 33, 550,000 in California, and 15,000,000 in the US and Canada (PIF 2020).

Yellow Warbler

One yellow warbler occurred at the PV solar arrays at a desert site, but the suspected cause of death was an overhead collector line. Yellow warblers are considered a migrant to the Project sites. There are an estimated 300,000 in BCR 33, 550,000 in California, and 93,000,000 in the US and Canada (PIF 2020). There were four yellow warblers found during gen-tie searches at the projects in our database.

Yellow-headed Blackbird

One yellow-headed blackbird detection occurred in the PV solar arrays at a desert project. Yellow-headed blackbirds are considered a migrant to the Project sites. There are an estimated 540,000 individuals in BCR 33, 530,000 in California, and 11,000,000 in the US and Canada (PIF 2020).

Burrowing Owl

All five detections of burrowing owls occurred at a PV solar project sited on agricultural lands in Imperial County with no detections of burrowing owls at any of the projects located in desert habitats. These detections occurred in December and January and consisted solely of feather spots with no evidence of cause of death. Western EcoSystems Technology, Inc. (WEST) is also aware of a burrowing owl fatality observed during clearance surveys of a desert habitat project. In this case, a red-tailed hawk was observed predating the burrowing owl. WEST is also aware of three additional burrowing owl detections at another Imperial County PV solar facility also located

in an agricultural environment. Again, cause of death was not determinable. Two of the carcasses were detected in January and one in August. In one case, the head was missing, which could suggest predation as a possible cause of death as there are other documented predation events of owls where the head has been removed (Raguso 2016, Clark 2017). However, our ability to infer the cause of death is limited, as we do not know when the head was removed. Both of these Imperial County sites had a high number of active burrows identified during pre-construction surveys (48 and 55, Heritage Environmental Consultants 2012a, 2012b) indicating the species was present in the area prior to development.

Burrowing owls are considered year-round residents in the desert southwest. Birds from the northern latitudes will also migrate south to the desert southwest and into Mexico. The estimated burrowing owl population sizes in BCR 33 is 190,000 as well as, coincidentally, in California (PIF 2020). There are an estimated 990,000 burrowing owls in the US and Canada (PIF 2020).

INDIRECT IMPACTS TO BIRDS

Construction of the Project will result in direct impacts to habitat that could lead to indirect impacts on local avian species, such as displacement within the Project area. Although these impacts are difficult to predict, revegetation of the Project area can, over time, change the avian and wildlife species composition using these habitats. Published literature is currently pretty limited. Visser et al. (2019) measured bird abundance and diversity at a PV array facility in shrub habitats in South Africa, and found that bird diversity and density were higher outside of the facility and that generalist species and those that use grassland habitat were found inside the facility compared to the shrub community birds outside the facility. Singha et al. (2018) discusses site restoration best management practices using a central California grassland case study suggesting direct and indirect impacts on habitat are affected by site restoration success. DeVault et al. (2013) demonstrated that solar photovoltaic facilities could potentially alter bird communities. Five solar facilities at airport locations across the U.S. were sampled and bird diversity and relative abundance metrics were measured. Species diversity was lower at photovoltaic array sites than in adjacent grasslands (37 vs. 46 species, respectively). In contrast, bird densities at the same photovoltaic array sites were more than twice those of adjacent grasslands. Observations during the study suggested that shade and the provision of perches increased bird use of the photovoltaic array sites. However, the results were species specific, with some small songbird species (e.g., American Robin [Turdus migratorius]) more abundant at photovoltaic facilities compared with adjacent grasslands, but corvids and raptors were less abundant in the solar arrays. Similarly, raptor abundance was higher pre-construction compared with post-construction of a utility-scale solar energy facility in south-central California, suggesting avoidance of the facility. In comparison, ravens and icterids increased in abundance during construction.

BATS

Although there has been an increase in the understanding of the spatial and temporal patterns of bat fatalities as well as the species that occurred as fatalities, risk factors that drive fatality patterns at solar facilities have not been fully investigated. Solar energy development is a relatively new

anthropogenic feature on the landscape for bats to encounter, and responses are not well studied. Bats are susceptible to collisions with moving structures such as wind turbines (Arnett et al. 2008, Rydell et al. 2016, Roemer et al. 2017), but infrequently collide with stationary structures (Van Gelder 1956, Crawford 1981). Bat mortality could also occur if individuals became trapped in other infrastructure.

Bat roosts occur in the vicinity of the Project site in the McCoy Mountains approximately 20 miles east, Eagles Nest Mine within the Little Maria Mountains approximately 20 miles northeast, and Paymaster Mine within the Pinto Mountains approximately 30 miles. No active bat roosts were documented on the Project site during any of the surveys to date.

Bat carcasses were rarely detected at those utility-scale PV solar energy facilities that have been monitored. One canyon bat was found in the solar arrays, and one incidentally discovered unidentified *Myotis* was found on the ground near the O&M building during the two years of standardized fatality monitoring surveys at the McCoy Project. No bats were found during the monitoring years at Desert Sunlight, Blythe, Silver State South, Seville, Longboat, Luning, or California Valley Solar Ranch. It is anticipated very few bat fatalities will occur during the life of the project based on the absent to very low bat fatalities discovered at regional projects.

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