BIOLOGICAL RESOURCES ASSESSMENT AND CVMSHCP CONSISTENCY ANALYSIS

DESERT HOT SPRINGS WIND ENERGY REPOWERING PROJECT

CITY OF DESERT HOT SPRINGS & RIVERSIDE COUNTY, CALIFORNIA

LSA

April 2019

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CITY OF DESERT HOT SPRINGS & RIVERSIDE COUNTY, CALIFORNIA

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LSA Project No. DUD1801

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EXECUTIVE SUMMARY

LSA Associates (LSA) was retained by Dudek & Associates to prepare a Biological Resources Assessment (Assessment) and to conduct a Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP) Consistency Analysis (Analysis) for compliance with the California Environmental Quality Act (CEQA). The Assessment and Analysis evaluated the proposed Desert Hot Springs Wind Energy Repowering Project (Project) that lies within the planning boundaries of the CVMSHCP. Specifically, 95 acres of the Project Survey Area lies within the Upper Mission Creek/Big Morongo Canyon Conservation Area while 41 acres lie outside of the Conservation Area. The CVMSHCP provides take coverage for covered species, which include both listed and non-listed species that are adequately conserved by the CVMSHCP. To ensure adequate conservation of covered species, CVMSHCP Conservation Areas provide habitat and other ecological elements. The Project is a covered activity under the CVMSHCP.

The Project lies within CVMSHCP-designated Core Habitat for the desert tortoise (*Gopherus agassizii*) and contains sand source providing blow-sand to Willow Hole and Whitewater Preserves. A pre-construction survey for the desert tortoise will be required prior to any ground-disturbing activities. Because the Project may affect desert tortoise, a streamlined FESA Section 7 consultation in accordance with the CVMSHCP is recommended for potential Project-related effects to the desert tortoise. During construction-related activities, contractors will comply with the mitigation and minimization measures contained in the CVMSHCP protocol. Effects to the Sand Source Essential Ecological Processes are not anticipated to be substantial.

A pre-construction burrowing owl (*Athene cunicularia*) survey shall be conducted using an accepted protocol (as determined by the Coachella Valley Conservation Commission (CVCC) in coordination with the Permittees and the Wildlife Agencies) led by an acceptable biologist.

In modeled Le Conte's thrasher Habitat in MSHCP the Conservation Area, during the nesting season, January 15 - June 15, pre-construction surveys will be conducted.

To avoid impacts to the Palm Springs pocket mouse and its habitat in the Upper Mission Creek/Big Morongo Canyon Conservation Area, flood Control-related construction activities will comply with the CVMSHCP avoidance and minimization measures.

For purposes of overseeing compliance with CVMSHCP requirements and with the Implementing Agreement (IA), a Joint Project Review (JPR) process was completed by the CVCC for Project impacts within the Conservation Area to address potential disturbances to Core Habitat and Essential Ecological Processes. Within the Conservation Area, of the Project's total disturbance is 20 acres.

The Survey Area contains suitable habitat for nesting birds protected by the Migratory Bird Treaty Act (MBTA), the California Fish and Game Code, and the CVMSHCP. It is recommended that vegetation removal be conducted between September 1 and January 15 (outside the general bird nesting season) to avoid impacts to nesting birds. If vegetation cannot be removed outside the bird nesting season, a pre-construction nesting bird survey by a qualified biologist is required prior to vegetation removal.

Based on the previous studies conducted for golden eagle (*Aquila chryseatos*) and general avian use and the current Project design, the Project is not anticipated to have a substantial effect on the species.

A jurisdictional delineation revealed the Survey Area contains seven drainages subject to the jurisdiction of the United States Army Corps of Engineers (USACE) and the California Department of Fish and Wildlife (CDFW). Based on the results of the jurisdictional delineation, the Survey Area contains a total of 1.55 acres of potential USACE non-wetland waters of the U.S. along with 1.96 acres of potential CDFW streambed.

The Project will have 0.23 acres of permanent impacts and 1.05 acres of temporary impacts to potential non-wetland USACE waters of the U.S. and 0.23 acres of permanent impacts and 1.05 acres of temporary impacts to CDFW streambed. The Project will not affect USACE jurisdictional wetlands waters or CDFW riparian habitat.

Agency permits the Project will require include a Federal Clean Water Act (CWA), Section 404 permit authorization from the USACE, a CWA Section 401 Water Quality Certification from the Regional Water Quality Control Board (RWQCB), and a Fish and Game Code Section 1602 Streambed Alteration Agreement from the CDFW.

In order to avoid or minimize indirect effects from development adjacent to or within the Conservation Area, the Project will comply with the CVMSHCP Land Use Adjacency Guidelines.

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INTRODUCTION

LSA Associates (LSA) has prepared this Biological Resources Assessment (Assessment) and conducted a Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP) Consistency Analysis (Analysis) for compliance with the California Environmental Quality Act (CEQA). This Assessment and Analysis evaluates the proposed Desert Hot Springs Wind Energy Repowering Project (Project) located within the boundaries of the City of Desert Hot Springs (City) and portions of Riverside County, California. The Project lies north of Interstate 10, east of State Route 62, and west of Whitewater Canyon between the Whitewater and Painted Hills communities. Specifically, the 136 acre "Survey Area" is depicted on the United States Geological Survey (USGS) *Desert Hot Springs, California* and *Whitewater, California* 7.5-minute topographic quadrangles in Section 6 Township 3 South, Range 7 East and Section 31, Township 2 South, Range 7 East (Figure 1).

PROJECT DESCRIPTION

The Project would include the following primary components:

- Decommissioning of an existing wind energy project consisting of approximately 69 older wind turbines that have been operating since the late 1980's, along with ancillary equipment
- Installation of up to four, new modern wind turbines with a range of approximately 2.0 to 4.2 MW in nameplate capacity per turbine, along with ancillary equipment
- Installation of one new temporary and one new permanent meteorological (Met) tower, each up to 309 feet tall

In addition, the Project would use the following infrastructure located within unincorporated Riverside County

- Use of a portion of Painted Hills Road for Project access (Access Road) which has historically provided and currently provides access to the existing wind energy project
- Interconnection into the nearby, existing Southern California Edison-owned Venwind substation that is located on Assessor Parcel Number 516030014 in unincorporated Riverside County via the existing Southern California Edison-owned 12-kilovolt overhead collection line currently in use by the existing project (Transmission Facilities). Alternatively, the Project could interconnect into Venwind through either a new underground or overhead collection line

Figure 2 shows the Project's site plan.

METHODS

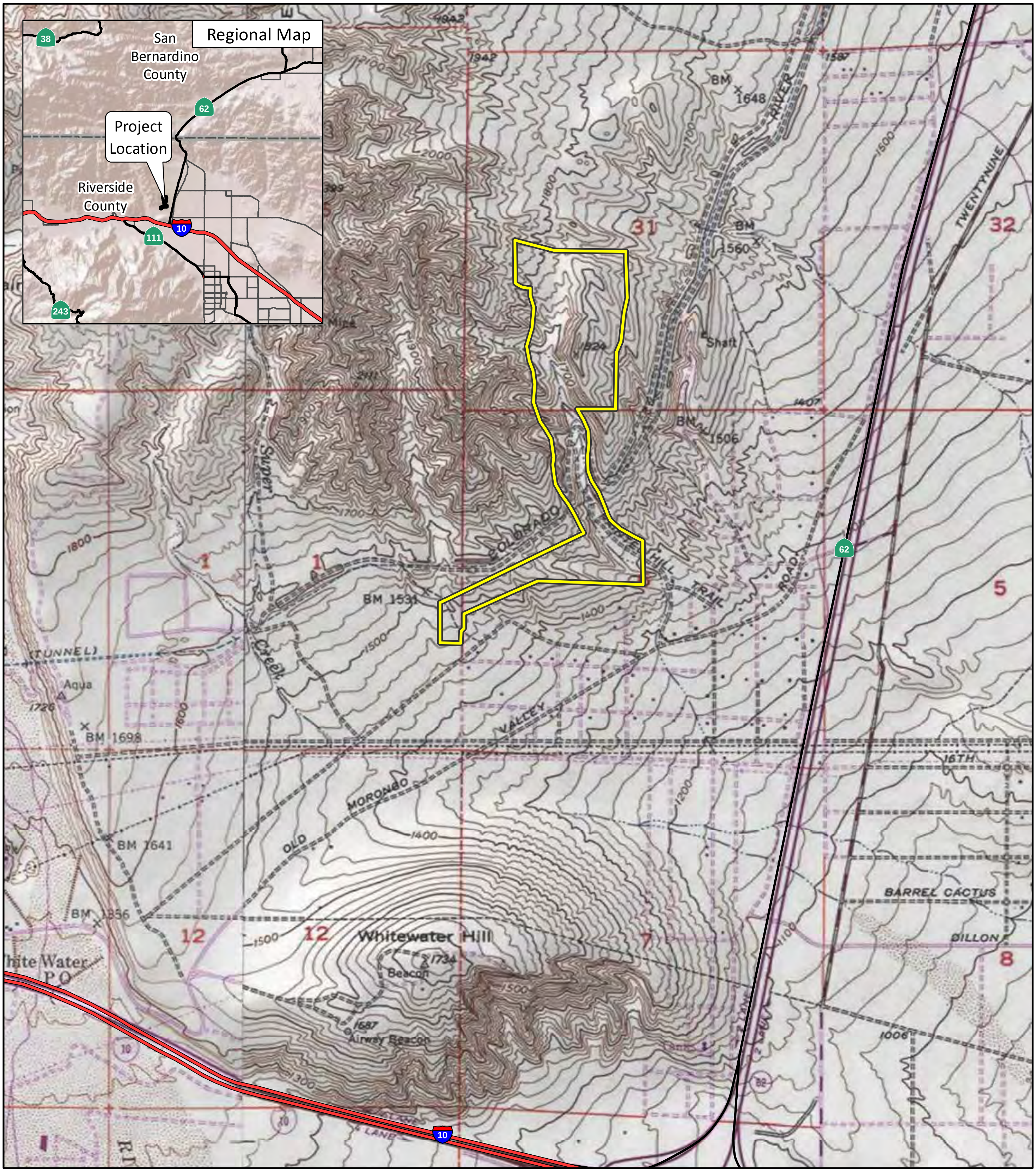
Literature Review

A literature review was conducted to assist in determining the existence or potential occurrence of special-interest plant and animal species within the Survey Area and in the Project vicinity. A records search of the CDFW Natural Diversity Data Base (NDDB) *Rarefind 5* (2018), and California

Native Plant Society's *Online Inventory of Rare and Endangered Plants* (California Native Plant Society [CNPS] v7-18) for the *Desert Hot Springs, California* and *Whitewater, California* USGS 7.5-minute quadrangles and relevant neighboring quadrangles was conducted on May 23, 2017. A review of the Final Recirculated CVMSHCP (CVAG 2007) was also conducted in order to determine CVMSHCP consistency and conservation measures that apply to the proposed Project, and to reference vegetation types within the Survey Area. A Geographic Information System (GIS) software was used to map the Project location, habitat types, land uses, etc. The Survey Area is defined by the Project site and biological resources associated with that area.

Biological Resources Assessment

A general field survey within the Survey Area was conducted by LSA Biologist Jodi Ross-Borrego on March 1, 2018. Weather conditions consisted of clear skies, temperatures ranging from 52 to 66 degrees Fahrenheit, and winds ranging from 7 to 15 miles per hour. The entire Survey Area was surveyed on foot. Notes were taken on general site conditions, vegetation, and suitability of habitat for various special-interest elements. All plant and animal species observed or otherwise detected during this field survey were noted and are listed in Appendix A. Appendix B summarizes the special-interest plant and animal species potentially present within the 136-acre Survey Area.



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LEGEND

Survey Area

FIGURE 1

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Desert Hot Springs Wind Energy Repowering Project

Survey Area Map

SOURCE: USGS 7.5' Quad - White Water (1988); Desert Hot Springs (1978)

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RESULTS

Existing Site Conditions

The Project is generally located north of Interstate 10, east of State Route 62, and west of Whitewater Canyon. The Project falls within the boundaries of the CVMSHCP as discussed in further detail below.

Topography and Soils

The Survey Area is situated on sandy and rocky mountain ridges, and ranges in elevation from approximately 1,400 feet to 2,000 feet above mean sea level.

A mosaic of soils occurs within the Survey Area and is mapped by the Soil Conservation Service (Knecht 1980) as the following types:

- CdC: Carsitas Gravelly Sand, 0 to 9 percent slopes;
- CkB: Carsitas Fine Sand, 0 to 5 percent slopes;
- CnE: Chuckwalla Cobbly Fine Sandy Loam, 9 to 30 percent slopes; and
- LR: Lithic Torripsamments-Rock Outcrop Complex.

Vegetation

Vegetation within the Survey Area is best described as *Larrea tridentata* Shrubland Alliance (Creosote Bush Scrub) (Sawyer et al. 2009). Dominant species include creosote bush, white bur-sage (*Ambrosia dumosa*), and brittle bush (*Encelia farinosa*). Figure 3 shows vegetation and land use, and Figure 4 shows site photographs.

Coachella Valley Multiple Species Habitat Conservation Plan

The CVMSHCP is a comprehensive, multi-jurisdictional habitat conservation plan focusing on conservation of species and their associated habitats in the Coachella Valley region of Riverside County. The overall goal of the CVMSHCP is to maintain and enhance biological diversity and ecosystem processes within the region, while allowing for future economic growth. The CVMSHCP covers 27 sensitive plant and wildlife species (Covered Species) as well as 27 natural communities. Covered Species include both listed and non-listed species that are adequately conserved by the CVMSHCP. The overall provisions for the plan are subdivided according to specific resource conservation goals that have been organized according to geographic areas defined as Conservation Areas. These areas are identified as for sensitive plant, invertebrate, amphibian, reptile, bird, and mammal species, and the following:

> Core Habitat: The areas identified in the Plan for a given species that are composed of a Habitat patch or aggregation of Habitat patches that (1) are of sufficient size to support a self-sustaining population of that species, (2) are not fragmented in a way to cause separation into isolated populations, (3) have functional Essential Ecological Processes, and (4) have effective Biological Corridors and/or Linkages to other habitats, where feasible, to allow gene flow among populations and to promote movement of large predators.

Essential Habitat: Certain lands delineated in the Recovery Plan for Bighorn Sheep in the Peninsular Ranges, California (USFWS 2000).

Other Conserved Habitat: Part of a Conservation Area that does not contain Core Habitat for a given species, but which still has Conservation value. These values may include Essential Ecological Processes, Biological Corridors, Linkages, buffering from edge effects, enhanced species persistence probability in proximate Core Habitat, genetic diversity, recolonization potential, and flexibility in the event of long-term habitat change.

Essential Ecological Process Areas: Processes that maintain specific habitat types and are necessary to sustain the habitat (in a state usable by Covered Species). Essential Ecological Processes may include abiotic hydrological processes (both subsurface and surface), erosion, deposition, blowsand movement, substrate development and soil formation, and disturbance regimes such as flooding and fire; and biotic processes such as reproduction, pollination, dispersal, and migration.

Biological Corridors: Wildlife movement area that is constrained by existing development, freeways, or other impediments.

Biological Linkages: Habitat that provides for the occupancy of Covered Species and their movement between larger blocks of habitat over time, potentially over a period of generations. In general, Linkages are large enough to include adequate habitat to support small populations of the species and, thus, do not require that an individual of the species transit the entire Linkage to maintain gene flow between populations. What functions as a Linkage for one species may provide only a Biological Corridor or no value for other species.

Each Conservation Area has specific Conservation Objectives that must be satisfied. Those Conservation Objectives include how the Plan will accomplish the protection of Core Habitat, Essential Ecological Processes, Biological Corridors, and Linkages in the MSHCP Reserve System to ensure that the covered species are adequately conserved. The Conservation Area conservation goals are also designed to ensure the persistence of natural communities. The Project is a covered activity under Section 7.3.1 of the CVMSHCP as follows:

> "New ground disturbance associated with repowering or development of new wind energy facilities shall be treated as a Covered Activity similar to development projects permitted or

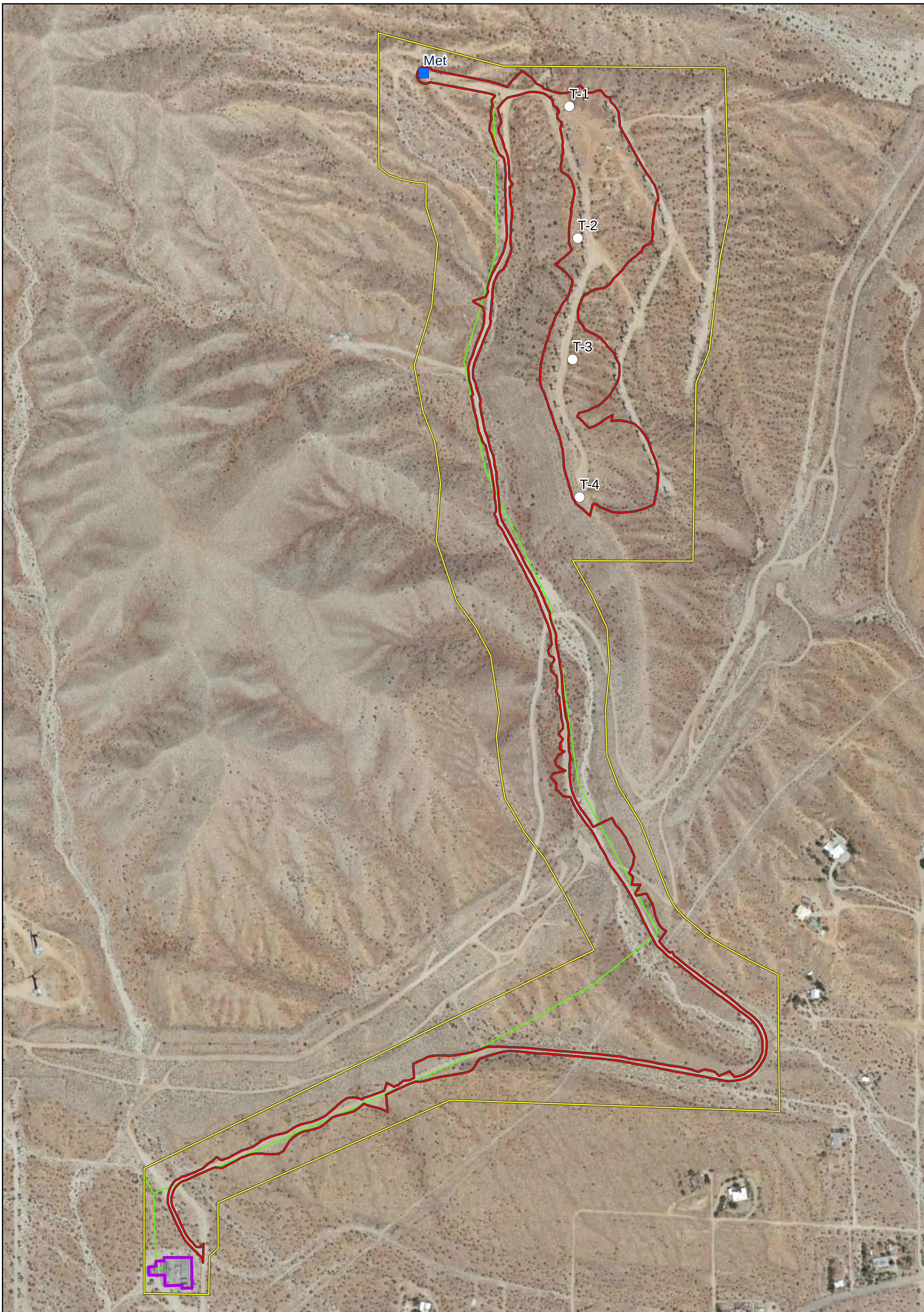

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FIGURE 2

LEGEND

- Desert Hot Springs Survey Area
- Existing Substation
- Existing Overhead Distribution Line

Preliminary Site Plan

- Desert Hot Springs Disturbance Limits
- New Turbine Locations
- New Met Tower Location

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Desert Hot Springs Wind Energy Repowering Project

Preliminary Site Plan

Source: Google Earth, 2017; CVMSHCM (2014)

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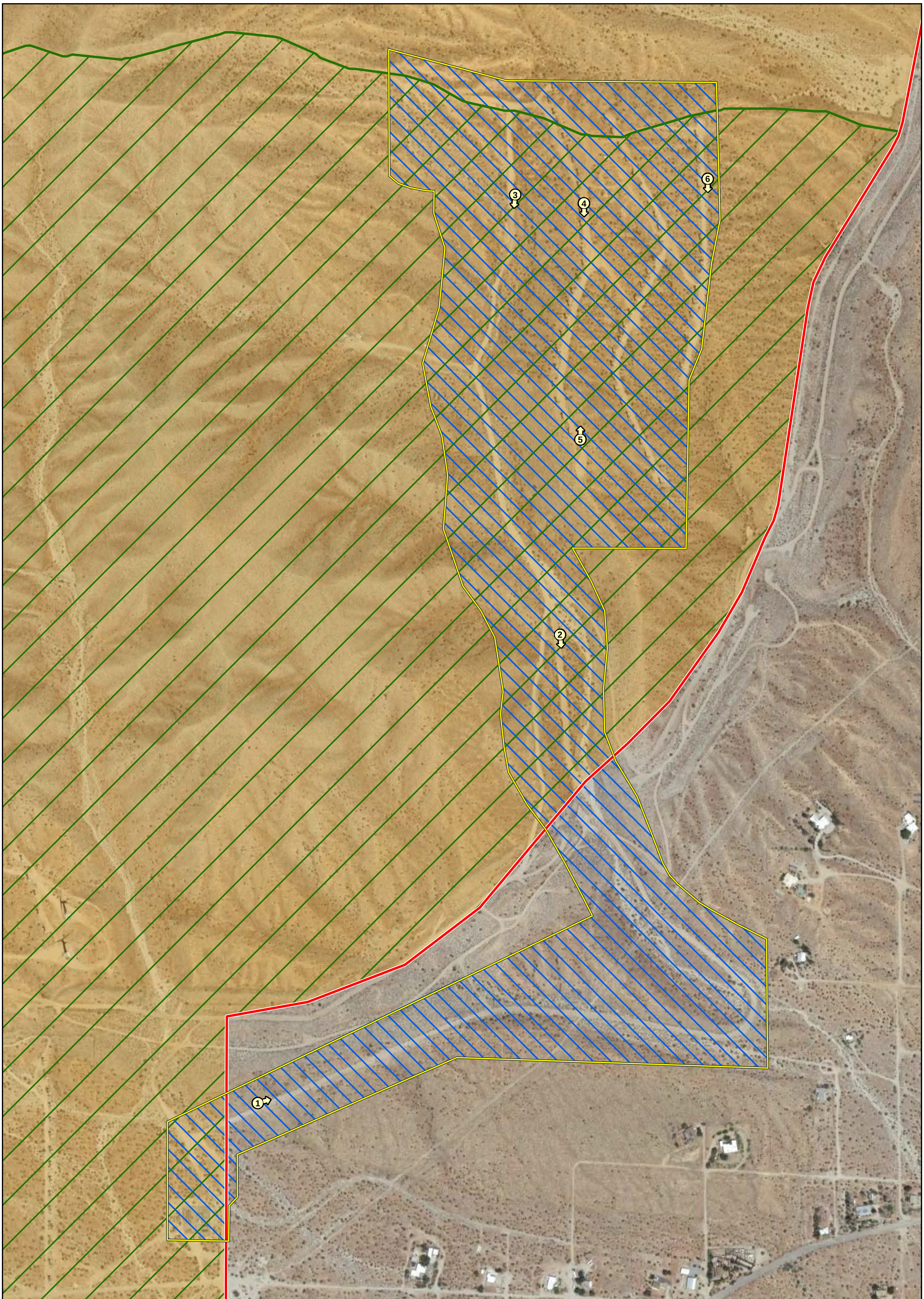

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FIGURE 3

LEGEND

Desert Hot Springs Survey Area

Photo Points

Vegetation

Larrea tridentata Shrubland Alliance

CVMSHCP

Upper Mission Creek/Big Morongo Canyon Conservation Area

Ecological Processes

Sand Source

Core Habitat

Desert Tortoise

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Source: Google Earth, 2017; CVMSHCM (2014)

Desert Hot Springs Wind Energy Repowering Project

Vegetation, Land Use, and Photograph Key Location Map

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Photo 1 - View of access road as seen facing east.

Photo 2 - view of access road as seen facing southeast.

Photo 3 - View of access road as seen facing south

Photo 4 - View of Project area as seen facing south.

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FIGURE 4
Sheet 1 of 2

Desert Hot Springs Wind Energy Repower Project
Site Photographs

approved by Local Permittees. Within each Permittee's jurisdiction, existing wind turbines may be replaced with new turbines. If old turbines are removed and the former impact area is restored to a natural condition, an equal new area may be disturbed without counting toward the calculation of net disturbance."

CVMSHCP Upper Mission Creek/Big Morongo Conservation Area

The Project and Survey Area both lie entirely within the boundaries of the CVMSHCP. 95 acres of the Survey Area lie within the Upper Mission Creek/Big Morongo Canyon Conservation Area (Conservation Area) while 41 acres of the Survey Area that includes a portion of both the Access Road and Transmission Facilities lie outside of the Conservation Area. (Figure 2). Table A below summarizes the Project's total disturbances within the Conservation Area.

Table A: Total Project Disturbance Within the Conservation Area

Conservation Area	Permanent Impacts (acres)
Upper Mission Creek/Big Morongo Canyon Conservation Area	20 ac

Core habitat and Essential Ecological Processes are discussed below as they pertain to the Project:

Core Habitat. Core habitat for the desert tortoise (*Gopherus agassizii*) lies within the Survey Area. The population of desert tortoise within the Conservation Area is considered to be connected to a larger viable population stretching southwest into the Whitewater Canyon Conservation Area and eastward through the Little San Bernardino Mountains into the Joshua Tree National Park Conservation Area.

The CVMSHCP conservation objective for Core Habitat within this Conservation Area includes conservation of at least 2,271 acres of Core Habitat for desert tortoise in the Desert Hot Springs portion of the area and at least 7,936 acres in the unincorporated portion of Riverside County. Individual tortoises shall be protected within the area when allowed development occurs.

Per the CVMSHCP, because the Survey Area contains potentially suitable habitat for the desert tortoise, a pre-construction survey for this species will be required prior to any ground-disturbing activities. Because the Project may affect desert tortoise, a streamlined FESA Section 7 consultation in accordance with the CVMSHCP is recommended for potential Project-related effects to the desert tortoise. During construction-related activities, contractors will comply with the mitigation and minimization measures contained in the CVMSHCP protocol.

Essential Ecological Processes. Sand source that provides blow-sand to the Willow Hole Preserve and, to some extent, to the Whitewater Floodplain Preserve is present within the Survey Area. The CVMSHCP conservation objective for sand source within this Conservation Area includes conservation of at least 141 acres of the sand source areas in the Desert Hot Springs portion of the

Conservation Area and at least 6,488 acres in the unincorporated portion of Riverside County subject to natural erosion processes.

The Project will essentially avoid impacts to sand source within the Survey Area with the removal of approximately 69 existing turbines, which will create a net increase in sand source and provide additional blow-sand to the Willow Hole and Whitewater Floodplain Preserves.

Land Use Adjacency Guidelines. A portion of both the Access Road and Transmission Facilities lie outside of but adjacent to the Conservation Area. The purpose of Land Use Adjacency Guidelines is to avoid or minimize indirect effects from development adjacent to or within Conservation Areas. Adjacent means sharing a common boundary with any parcel in a Conservation Area. Such indirect effects are commonly referred to as edge effects and may include noise, lighting, drainage, intrusion by people, and the introduction of non-native plants and/or non-native predators such as dogs and cats. The following Land Use Adjacency Guidelines shall be implemented during the Project design within the Conservation Area to minimize edge effects:

- *Drainage.* Proposed development adjacent to or within a Conservation Area shall incorporate plans to ensure that the quantity and quality of runoff discharged to the adjacent Conservation Area is not altered adversely compared with existing conditions. Storm water systems shall be designed to prevent the release of toxins, chemicals, petroleum products, exotic plant materials, or other elements that might degrade or harm biological resources or ecosystem processes within the adjacent Conservation Area.
- *Toxics.* Land uses proposed adjacent to or within a Conservation Area that use chemicals or that generate bioproducts, such as manure, that are potentially toxic or may adversely affect wildlife and plant species, habitat, or water quality shall incorporate measures to ensure that application of such substances does not result in any discharge to the adjacent Conservation Area.
- *Lighting.* For proposed development adjacent to or within a Conservation Area, lighting shall be shielded and directed toward the developed area. Landscape shielding or other appropriate methods shall be incorporated in Project designs to minimize the effects of lighting adjacent to or within the adjacent Conservation Area in accordance with the guidelines to be included in the Implementation Manual.
- *Noise.* Proposed development adjacent to or within a Conservation Area that generates noise in excess of 75 dBA L_{eq} hourly shall incorporate setbacks, berms, or walls as appropriate to minimize the effects of noise on the adjacent Conservation Area in accordance with the guidelines to be included in the Implementation Manual.
- *Invasive Species.* Invasive, non-native plant species shall not be incorporated in the landscape for land uses adjacent to or within a Conservation Area. Landscape treatments within or adjacent to a Conservation Area shall incorporate native plant materials to the maximum extent feasible; recommended native species are listed in Table 4-112 (Appendix C). The plants listed in Table 4-113 (Appendix C) shall not be used within or adjacent to a Conservation Area.

Special-Status Species

This section discusses special-status species observed or potentially occurring within the limits of the Survey Area. Legal protection for special-interest species varies widely, from the comprehensive protection extended to listed threatened/endangered species, to no legal interest at present. The CDFW, U.S. Fish and Wildlife Service (USFWS), local agencies, and special-interest groups such as the CNPS, publish watch lists of declining species. Species on watch lists can be included as part of the special-interest species assessment. Species that are candidates for State and/or Federal listing and species on watch lists are included in the special-interest species list. Inclusion of species described in the special-interest species analysis is based on the following criteria:

- Direct observation of the species or its sign in the Survey Area or immediate vicinity during previous biological studies;
- Sighting by other qualified observers;
- Record reported by the CNDDB, published by the CDFW;
- Presence or location information for specific species provided by private groups (e.g., CNPS); and/or
- Survey Area lies within known distribution of a given species and contains appropriate habitat

The special-interest species analysis revealed 43 special-interest species with the potential to occur within the limits of the Survey Area. Appendix B lists these species with a data summary and determination of the likelihood of each species occurring on the Survey Area.

Threatened/Endangered Species

The following 12 federally/State listed species, candidates for listing, and two California fully protected species were identified as potentially present (Appendix B) in the Project vicinity:

1. Coachella Valley milkvetch (*Astragalus lentiginosus* var. *coachellae* [CVMV]): Federally listed endangered and CVMSHCP covered species.
2. Triple-ribbed milk vetch (*Astragalus tricarinatus*): Federally listed endangered and CVMSHCP covered species.
3. Slender-horned spineflower (*Dodecahema leptoceras*): Federally and State-listed endangered.
4. Casey's June beetle (*Dinacoma caseyi*): Federally listed endangered.
5. California red-legged frog (*Rana draytonii*): Federally listed threatened.
6. Sierra Madre yellow-legged frog (*Rana muscosa*): Federally and State-listed endangered.
7. Desert tortoise (*Gopherus agassizii*): Federally and State-listed threatened, and CVMSHCP covered species.
8. Coachella Valley fringe-toed lizard (*Uma inornata* [CVFTL]): Federally listed threatened, State-listed endangered, and CVMSHCP covered species.
9. Golden eagle (*Aquila chrysaetos*): California fully protected species.

10. Least Bell's vireo (*Vireo bellii pusillus*): Federally and State-listed endangered and CVMSHCP covered species.
11. Peninsular Bighorn sheep (*Ovis canadensis nelsonii*) (peninsular Distinct Population Segment): Federally listed endangered and State-listed threatened, California fully protected species, and CVMSHCP covered species.

12. Desert bighorn sheep (*Ovis canadensis nelson*) (excluding peninsular Distinct Population Segment), California fully protected species.

Habitat within the Survey Area is considered unsuitable for the slender-horned spineflower, Casey's June beetle, California red-legged frog, Sierra Madre yellow-legged frog, Coachella Valley fringe-toed lizard, Least Bell's vireo, and desert bighorn sheep. The Survey Area provides moderate quality habitat for desert tortoise, low-quality habitat for Coachella Valley milkvetch and triple-ribbed milkvetch, and low quality habitat for the desert bighorn sheep. Additionally, low-quality foraging habitat for the golden eagle is present within the Survey Area.

Non-Listed Special-Interest Species

Of the 33 other non-listed special-interest species identified and discussed in Appendix B, nine are considered absent based on lack of suitable habitat, 18 are considered to have a low probability of occurrence, and six species are considered to have a moderate probability for occurrence. The following non-listed special-interest species have a moderate probability to occur within the Survey Area:

- Desert beardtongue (*Penstemon pseudospectabilis* ssp. *pseudospectabilis*);
- Orangethroat whiptail (*Aspidoscelis hyperythra*);
- Burrowing owl (*Athene cunicularia*);
- Prairie falcon (*Falco mexicanus*);
- Loggerhead shrike (Lanius ludovicianus);
- Le Conte's thrasher (*Toxostoma lecontei*); and
- Palm Springs pocket mouse (*Perognathus longimembris bangsii*)

Nesting bird species, including special-interest species identified in Appendix B, with potential to occur (i.e., prairie falcon, burrowing owl, and loggerhead shrike) are protected by California Fish and Game Code Sections 3503, 3503.5, and 3800, and by the Migratory Bird Treaty Act (MBTA) (16 USC 703–711). These laws regulate the take, possession, or destruction of the nest or eggs of any migratory bird or bird of prey. However, the USFWS has recently determined that the MBTA should apply only to "…affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their eggs" and will not be applied to incidental take of migratory birds pursuant to otherwise lawful activities.

Avian Use Studies

In order to comply with USFWS survey recommendations, golden eagle occupancy and productivity surveys were conducted in 2011 within a 10-nautical mile spatial buffer of the Project (Appendix D).

Six golden eagle nests, comprising three territories, were documented with core nesting areas within the Painted Hills spatial buffer, two (Little San Bernardino Mountains – W and San Jacinto Mountains - NE) were documented to be active for the 2011 breeding season, one of which (San Jacinto Mountains - NE) produced a total of two young. Additionally during additional surveys, three golden eagles, an American kestrel (*Falco sparverius sparverius*), 13 bighorn sheep (*Ovis canadensis*), 35 common ravens (*Corvus corax*), four great horned owls (*Bubo virginianus*), two peregrine falcons (*Falco peregrinus*), three prairie falcons (*Falco mexicanus*), 13 red-tailed hawks (*Buteo jamaicensis*), seven Swainson's hawks (*Buteo swainsoni*), a turkey vulture (*Cathartes aura*), and an unidentified falcon (*Falco* sp.) were observed comprising a total of 83 unique wildlife documentations (Wildlife Research Institute, Inc. 2012; see Appendix D).

An Avian Use memo was prepared by CH2M Hill (Appendix E) for a similarly proposed project within the Survey Area. The study analyzed multiple surveys conducted at various wind turbine facilities within the vicinity of the San Gorgonio Pass. The report concluded the location of the project in a mid-elevation area, its proximity to recently studied sites with estimated low avian risks, the siting of wind turbines away from open water and riparian vegetation, and the use of tubular monopole tower design that eliminates perching attractants associated with lattice structures and guy wires, constitutes a project designed to avoid impacts to avian species (CH2M Hill, 2011; see Appendix E). The current Project description proposes tubular monopole towers and a large reduction in the number of proposed turbines which would reduce risks to avian species by reducing the total rotor-swept area, reducing rotor speeds, and increasing turbine spacing included on the site.

Critical Habitat

The Survey Area does not lie within any federally designated critical habitat.

Jurisdictional Waters

The U.S. Army Corps of Engineers (USACE) regulates discharges of dredged or fill material into waters of the United States. These waters include wetlands and non-wetland bodies of water that meet specific criteria, including a direct or indirect connection to interstate commerce. The USACE regulatory jurisdiction pursuant to Section 404 of the Federal Clean Water Act (CWA) is founded on a connection, or nexus, between the water body in question and interstate commerce. This connection may be direct (through a tributary system linking a stream channel with traditional navigable waters used in interstate or foreign commerce), or it may be indirect (through a nexus identified in the USACE regulations). In order to be considered a jurisdictional wetland under Section 404, an area must possess three wetland characteristics, each with its unique set of mandatory wetland criteria: hydrophytic vegetation, hydric soils, and wetland hydrology.

The CDFW, under Sections 1600 through 1616 of the California Fish and Game Code, regulates alterations to lakes, rivers, and streams (defined by the presence of a channel bed and banks, and at least an intermittent flow of water) where fish or wildlife resources may be adversely affected.

The Regional Water Quality Control Board (RWQCB) is responsible for the administration of Section 401 of the CWA. Typically, the areas subject to jurisdiction of the RWQCB coincide with those of the USACE (i.e., waters of the U.S., including any wetlands). The RWQCB may also assert authority over "waters of the State" under waste discharge requirements pursuant to the Porter-Cologne Act.

Appendix F contains the detailed results of the jurisdictional delineation and assessment of jurisdictional waters prepared for this Project. Based on the results of the wetlands delineation/ jurisdictional assessment, a total of 1.55 acres of potential USACE non-wetland waters of the U.S. and 1.96 acres of potential CDFW streambed occur within the Survey Area. Appendix F, Figure 2 shows the hydrologic features within the proposed Survey Area. Table B shows permanent and temporary impacts to potential jurisdictional waters of the U.S. and CDFW streambed.

Table B: Potential Jurisdictional Features within the Survey Area

Feature	Length (linear feet)	Potential Waters of the United States (acres)		Potential CDFW Jurisdictional Streambed (acres)
		Non-Wetland	Wetland	
1	38	0.00	0.00	0.004
2	350	0.00	0.00	0.03
3	21	0.00	0.00	0.00
4	59	0.003	0.00	0.01
5	3,293	1.46	0.00	1.49
6	73	0.00	0.00	0.01
7	546	0.09	0.00	0.03
8	280	0.00	0.00	0.29
Total	**4,660**	**1.55**	**0.00**	**1.96**

The Project will have 0.23 acres of permanent impacts and 1.05 acres of temporary impacts to potential non-wetland USACE waters of the U.S. and 0.23 acres of permanent impacts and 1.05 acres of temporary impacts to CDFW streambed. The proposed Project will not affect USACE jurisdictional wetlands waters or CDFW riparian habitat.

Project effects to jurisdictional waters will require a CWA Section 404 permit from the USACE, a Section 401 Water Quality Certification from the RWQCB, and a Fish and Game Code Section 1602 Streambed Alteration Agreement from the CDFW.

The Project is expected to be authorized under two USACE Nationwide Permits (NWPs): NWP 3 for repair and rehabilitation to the access road and NWP 51 for impacts associated with the wind turbines. NWPs are designed for projects with minimal adverse effects on the aquatic environment. NWP 3 authorizes the repair, rehabilitation, or replacement of any previously authorized, currently serviceable structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3, such as roads similar to those that currently exist within the Project. NWP 51 authorizes discharges of dredged or fill material into non-tidal waters of the U.S. for the construction, expansion, or modification of land-based renewable energy production facilities, such as the Project. For projects in non-tidal waters, the discharge cannot cause the loss of greater than 0.50 acre of waters of the U.S.

Compensatory mitigation will be required to offset the loss of jurisdictional waters and will be at a minimum 1:1 mitigation ratio. Mitigation for effects to non-wetland waters "waters of the U.S. and State" will be consistent with the USACE Compensatory Mitigation for Losses of Aquatic Resources (USACE 2008), also known as the USACE Compensatory Mitigation Rule. The final determination of what is jurisdictional, what permits will be required, and whether mitigation will be required for such impacts ultimately is subject to the discretion of the agencies (i.e., USACE, CDFW, and RWQCB) during the Federal and State regulatory processes.

IMPACTS AND RECOMMENDATIONS

Following is a discussion of potential disturbances and recommendations for avoidance, minimization, and mitigation measures per applicable local, State, and Federal policy.

Threatened and Endangered Species

Desert Tortoise

A pre-construction survey for this species will be required prior to any ground-disturbing activities. The desert tortoise Covered Species under the CVMSHCP. Any impacts to this species will be covered through participation in the CVMSHCP, whose 10(a) take permit covers any impacts to the species.During construction-related activities, contractors will comply with the mitigation and minimization measures contained in the CVMSHCP protocol.

Personnel conducting activities in the Conservation Area shall be instructed to be alert for the presence of desert tortoise. If a tortoise is spotted, activities adjacent to the tortoise's location will be halted and the tortoise will be allowed to move away from the activity area. If the tortoise is not moving, it will be relocated by an acceptable biologist to nearby suitable habitat and placed in the shade of a shrub. To the maximum extent feasible, activities will avoid the period between February 15 and October 31.

Desert bighorn sheep

Additionally, because the proposed project area lies along the southern most range boundary for Desert bighorn sheep, a California fully protected species and provides low quality habitat for the species, the proposed project is not anticipated to have adverse effects on the Peninsular bighorn sheep. Adherence with the CVMSHCP Land use Adjaceny Guidelines will offset potential indirect impacts to the bighorn sheep.

Golden Eagle

Based on the previous studies conducted for golden eagle, including very low mortality in this area and general avian use and the Project design, (including fewer turbines with more space between turbines), the Project is not anticipated to have a significant effect on golden eagles. Due to removal of numerous existing turbines and their replacement with fewer new turbines, avian impacts are expected to be reduced from existing conditions.

The Project Applicant has volunteered three years of post-construction monitoring and has prepared a Bird and Bat Conservation Strategy Plan which includes eagle use surveys. No significant impacts are anticipated but, if a golden eagle were found to be present during the post construction monitoring, the Applicant will mitigate for impacts to golden eagle, notify US Fish and Wildlife Service, and coordinate mitigation and permitting requirements.

Non-Listed Special-Interest Species

The 32 special-interest species identified in Appendix B as having a low to high probability of occurrence in the Survey Area have limited population distribution in Southern California and development is further reducing their ranges and numbers. These species have no official State or Federal protection status, but they merit consideration under CEQA. The Project is not anticipated to have a substantial effect on these non-listed special-interest species.

In addition, to ensure compliance with California Fish and Game Code, and to avoid potential impacts to nesting birds, it is recommended that the vegetation removal activities be conducted outside the general bird nesting season (January 15 through August 31). If vegetation cannot be removed outside the bird nesting season, a pre-construction nesting bird survey by a qualified biologist is required prior to vegetation removal.

Burrowing Owl

A pre-construction burrowing owl survey would be required in the Conservation Area, using an accepted protocol (as determined by the CVCC in coordination with the permittees and the wildlife agencies). Prior to construction, a qualified biologist will survey the construction area including a 500-foot buffer, or to the edge of the property if less than 500 feet, for burrows that could be used by burrowing owl. If a burrow is located, the biologist will determine whether an owl is present in the burrow. If the burrow is determined to be occupied, the burrow will be flagged and a 160-foot buffer during the non-breeding season or a 250-foot buffer during the breeding season or a buffer to the edge of the property boundary if less than 500 feet will be established around the burrow. The buffer will be staked and flagged. No development activities will be permitted within the buffer until the young are no longer dependent on the burrow.

Le Conte's thrasher

In modeled Le Conte's thrasher Habitat in the Conservation Area, during the nesting season, January 15 - June 15, prior to the start of construction activities, surveys will be conducted by an Acceptable Biologist on the construction site and within 500 feet of the construction site, or to the property boundary if less than 500 feet. If nesting Le Conte's thrashers are found, a 500 foot buffer, or to the property boundary if less than 500 feet, will be established around the nest site. The buffer will be staked and flagged. No construction will be permitted within the buffer during the breeding season of January 15 - June 15 or until the young have fledged.

Palm Springs pocket mouse

To avoid impacts to the Palm Springs pocket mouse and its habitat in the Upper Mission Creek/Big Morongo Canyon and Willow Hole Conservation Areas, Flood Control-related construction activities will comply with the following avoidance and minimization measures.

- Clearing: For construction that would involve disturbance to Palm Springs pocket mouse habitat, activity should be phased to the extent feasible and practicable so that suitable habitat islands are no farther than 300 feet apart at any given time to allow pocket mice to disperse between habitat patches across non-suitable habitat (i.e., unvegetated and/or compacted soils). Prior to project construction, a biological monitor familiar with this species should assist construction crews in planning access routes to avoid impacts to occupied habitat as much as feasible (i.e., placement of preferred routes on project plans and incorporation of methods to avoid as much suitable habitat/soil disturbance as possible). Furthermore, during construction activities, the biological monitor will ensure that connected, naturally vegetated areas with sandy soils and typical native vegetation remain intact to the extent feasible and practicable. Finally, construction that involves clearing of habitat should be avoided during the peak breeding season (approximately March to May), and activity should be limited as much as possible during the rest of the breeding season (January to February and June to August).

- Revegetation: Clearing of native vegetation (e.g., creosote, rabbitbrush, burrobush, cheesebush) should be followed by revegetation, including natural reestablishment and other means, resulting in habitat types of equal or superior biological value for Palm Springs pocket mouse.

- Trapping/Holding: All trapping activity should be conducted in accordance with accepted protocols and by a qualified biologist who possesses a Memorandum of Understanding with CDFG for live-trapping of heteromyid species in Southern California.

- Translocation: Should translocation between distinct population groups be necessary, as determined through the Adaptive Management and Monitoring Program, activity should be conducted by a qualified biologist who possesses a Memorandum of Understanding with CDFG for live-trapping of heteromyid species in Southern California. Trapping and subsequent translocation activity should be conducted in accordance with accepted protocols. Translocation programs should be coordinated by or conducted by the CVCC and/or RMOC to determine the appropriate trapping, holding, marking, and handling methods and potential translocation sites.

Avian Use Studies

Based on the previous studies conducted for golden eagle and general avian use and the Project design, the Project is not anticipated to have a significant effect. Due to removal of numerous existing turbines and their replacement with fewer new turbines, avian impacts are expected to be reduced from existing conditions.

The Project Applicant has volunteered three years of post-construction monitoring and has prepared a Bird and Bat Conservation Strategy Plan which includes eagle use surveys. No significant impacts are anticipated but, if a golden eagle were found to be present during the post construction monitoring, the Applicant will mitigate for impacts to golden eagle, notify US Fish and Wildlife Service, and coordinate mitigation and permitting requirements.

Jurisdictional Waters

Project effects to jurisdictional waters will require a CWA Section 404 authorization from the USACE, a Section 401 Water Quality Certification from the RWQCB, and a Fish and Game Code Section 1602 Streambed Alteration Agreement from the CDFW.

The Project is expected to be authorized under two USACE Nationwide Permits (NWPs): NWP 3 for repair and rehabilitation to the access road and NWP 51 for impacts associated with the wind turbines. NWPs are designed for projects with minimal adverse effects on the aquatic environment. NWP 3 authorizes the repair, rehabilitation, or replacement of any previously authorized, currently serviceable structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3, such as roads similar to those that currently exist within the Project. NWP 51 authorizes discharges of dredged or fill material into non-tidal waters of the U.S. for the construction, expansion, or modification of land-based renewable energy production facilities, such as the Project. For projects in non-tidal waters, the discharge cannot cause the loss of greater than 0.50 acre of waters of the U.S.

Fluvial Sand Transport

Activities, including O&M of facilities and construction, in fluvial sand transport areas in the Upper Mission Creek/Big Morongo Canyon Conservation Area will be conducted in a manner to maintain the fluvial sand transport capacity of the system.

Land Use Adjacency Guidelines

The following Land Use Adjacency Guidelines shall be considered by the City of Desert Hot Springs for the Project to minimize edge effects and shall be implemented where applicable.

Habitat Fragmentation and Wildlife Movement

Wildlife movement and habitat fragmentation are important issues in assessing effects to wildlife. Habitat fragmentation occurs when a proposed action results in a single, unified habitat area being divided into two or more areas such that the division isolates the two new areas from each other. Isolation of habitat occurs when wildlife cannot move freely from one portion of the habitat to another or from one habitat type to another. An example is the fragmentation of habitats within and around "checkerboard" residential development. Habitat fragmentation can also occur when a portion of one or more habitats is converted into another habitat, as when scrub habitats are converted into annual grassland habitat because of frequent burning.

Local wildlife movement may be temporarily disrupted during the vegetation removal and construction processes, but this effect would be localized and short term. Therefore, it is not considered significant.

Local Policies and Ordinances

With participation in the CVMSHCP, the Project would not conflict with any local policies or ordinances.

Coachella Valley Multiple Species Habitat Conservation Plan

The majority of the Project lies within the Upper Mission Creek/Big Morongo Canyon Conservation Area of the CVMSHCP. The Project is subject to the requirements of the CVMSHCP. Based on the recommendations outlined above, the Project is consistent with the CVMSHCP.

For purposes of overseeing compliance with CVMSHCP requirements and with the Implementing Agreement (IA), JPR process has been completed by the CVCC for Project impacts within the Upper Mission Creek/Big Morongo Canyon Conservation Area to address 20 acres of total Project disturbance within the Conservation Area.

CUMULATIVE IMPACTS

According to Section 15130 of the *CEQA Guidelines*, "cumulative impacts" refers to incremental effects of an individual project when viewed in connection with the effects of past projects, current projects, and probable future projects. Due to the relatively small Project impact combined with the removal of the numerous old turbines and thorough compliance with the CVMSHCP, effects are considered to be beneficial and not adverse on either a Project-specific or cumulative basis.

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APPENDIX A

PLANT AND ANIMAL SPECIES OBSERVED

Scientific Name	Common Name
PINOPHYTA	**GYMNOSPERMS**
Ephedraceae	**Ephedra family**
Ephedra californica	California jointfir
MAGNOLIOPHYTA: MAGNOLIOPSIDA	**DICOT FLOWERING PLANTS**
Asteraceae	**Sunflower family**
Encelia farinosa	Brittlebush
Stephanomeria exigua	Small wreath-plant
Boraginaceae	**Borage family**
Amsinckia tessellata	Bristly fiddleneck
Cactaceae	**Cactus family**
Cylindropuntia ramosissima	Diamond cholla
Echinocereus engelmannii	Hedgehog cactus
Ferocactus cylindraceus	California barrel cactus
Opuntia basilaris	Beavertail prickleypear
Euphorbiaceae	**Spurge family**
Euphorbia albomarginata	Rattlesnake weed
Lamiaceae	**Mint family**
Salvia columbariae	Chia
Loasaceae	**Loasa family**
Petalonyx thurberi ssp. *thurberi*	Thurber's sandpaper plant
Polygonaceae	**Buckwheat family**
Eriogonum fasciculatum	California buckwheat
Eriogonum inflatum	Desert trumpet
Zygophyllaceace	**Caltrop family**
Larrea tridentata	Creosote bush
Poaceae	**Grass family**
*Schismus barbatus**	Common Mediterranean grass

REPTILIA	**REPTILES**
Crotaphytidae	**Collared and Leopard Lizards**
Uta stansburiana	Common side-blotched lizard

Scientific Name	Common Name
AVES	**BIRDS**
Cathartidae	**American Vultures**
Cathartes aura	Turkey vulture
Corvidae	**Crows and Ravens**
Corvus corax	Common raven
Fringillidae	**Finches**
Carpodacus mexicanus	House finch

MAMMALIA	MAMMALS
Leporidae	**Rabbits and Hares**
Lepus californicus deserticola	Black-tailed jackrabbit

APPENDIX B

SPECIAL-STATUS SPECIES SUMMARY

Special-Status Species Summary

Species	Status	Habitat and Distribution	Activity Period	Occurrence Probability
Plants				
Abronia villosa var. *aurita* **Chaparral sand-verbena**	US: – CA: 1B	Sandy areas (generally flats and benches along washes) in chaparral and coastal sage scrub, and improbably in desert dunes or other sandy areas, below 1,600 meters (5,300 feet) elevation. In California, reported from Riverside, San Diego, Imperial, Los Angeles, and Ventura Counties. Believed extirpated from Orange County. Also reported from Arizona and Mexico (Baja California). Plants reported from desert communities are likely misidentified.	Blooms mostly March through August (annual or perennial herb)	**Low.** Marginally suitable habitat (sandy areas) is present within the Survey Area.
Aloysia wrightii **Wright's beebrush**	US: – CA: 4.3	Rocky, often carbonate soils, in Joshua tree woodland, or Pinyon and juniper woodland in 900 to 1,600 (1,968 to 5,250 feet) meters elevation.	Blooms April through October (perennial evergreen shrub)	**Absent.** No suitable habitat (rocky sites, carbonate soil in Joshua tree woodland, or Pinyon and juniper woodland) is present within the Survey Area.
Astragalus lentiginosus var. *coachellae* **Coachella Valley milk-vetch**	US: FE CA: 1B CVMSHCP: C	Sandy areas, typically in coarse sands in active sand fields, adjacent to dunes, along roadsides in dune areas, or along the margins of sandy washes, in Sonoran Desert scrub at 60 to 655 meters (200 to 2,150 feet) elevation. Known only from Riverside County in the Coachella Valley between Cabazon and Indio, and in the Chuckwalla Valley northeast of Desert Center.	Blooms February through May (annual or perennial herb)	**Low.** Marginally suitable habitat (sandy areas along the margins of washes) is present within the Survey Area.
Astragalus tricarinatus **Triple-ribbed milk-vetch**	US: FE CA: 1B CVMSHCP: C	Metamorphic rock outcrops weathering into gravelly soil in semi-desert chaparral, or (probably as waifs) at the edges of boulder-strewn desert washes and adjacent slopes in rocky incised canyons in Joshua tree woodland and Sonoran Desert scrub; known from west edge of desert at 450 to 1,200 meters (1,500 to 3,900 feet) elevation in Riverside and extreme southern San Bernardino Counties.	Blooms February through May (perennial herb)	**Low**. Marginally suitable habitat (boulder-strewn desert washes) is present within the Survey Area.
Chorizanthe parryi var. *parryi* **Parry's spineflower**	US: – CA: 1B	Sandy or rocky soils in chaparral, coastal scrub, oak woodlands, and grassland at 40 to 1,705 meters (100 to 5,600 feet) elevation. Known only from Los Angeles, Riverside, and San Bernardino Counties.	Blooms April through June (annual herb)	**Absent.** No suitable habitat (chaparral, coastal scrub, oak woodlands, or grassland) is present within the Survey Area.

Special-Status Species Summary

Species	Status	Habitat and Distribution	Activity Period	Occurrence Probability
Chorizanthe xanti var. *leucotheca* **White-bracted spineflower**	US: – CA: 1B	Sandy to gravelly places in Mojave desert scrub, pinyon and juniper woodland, or coastal scrub in the Transverse and Peninsular Ranges and desert edge foothills at 300 to 1,200 meters (980 to 3,900 feet) elevation in coastal southern California and adjacent desert areas. Known only from Los Angeles, Riverside, San Bernardino, and San Diego Counties, California.	Blooms April through June (annual herb)	**Low.** Potentially suitable habitat (sandy to gravelly places in desert scrub) is present within the Survey Area.
Dodecahema leptoceras **Slender-horned spineflower**	US: FE CA: SE/1B	Occurs in sandy cobbly riverbed alluvium in alluvial fan sage scrub (usually late seral stage), on floodplain terraces and benches that receive infrequent overbank deposits from generally large washes or rivers, where it is most often found in shallow silty depressions dominated by leather spineflower (*Lastarriaea coriacea*) and other native annual species, and is often associated with cryptogamic soil crusts composed of bryophytes, algae and/or lichens. Occurs at 200 to 760 meters (600 to 2,500 feet) elevation. Known only from Los Angeles, Riverside, and San Bernardino Counties.	Blooms April through June (annual herb)	**Absent.** The Survey Area is outside of the species' known geographic range.
Eriastrum harwoodii **Harwood's eriastrum**	US: – CA: 1B	Desert dunes, 125 to 915 meters (410 to 3002 feet)	Blooms March through June (annual herb)	**Low.** Marginally suitable habitat (desert dunes) is present within the Survey Area from 200 to 1,000 feet elevation.
Eschscholzia androuxii **Joshua Tree poppy**	US: – CA: 4.3	Desert washes, flats, and slopes; sandy, gravelly, and/or rocky areas in Joshua tree woodland or Mojavean desert scrub at elevations of 585 to 1,685 meters (1,919 to 5,528 feet).	Blooms February through May (June) (perennial herb)	**Low.** Marginally suitable habitat (desert washes) is present within the Survey Area.
Euphorbia misera **Cliff spurge**	US: – CA: 2B	Rocky sites within coastal bluff scrub, coastal sage scrub, and Mojavean desert scrub at 10 to 500 meters (30 to 1,600 feet) elevation. In California, known only from the Channel Islands, coastal Orange and San Diego Counties, and Riverside County deserts. Also occurs in Mexico.	Blooms December through August (perennial herb)	**Low.** Marginally suitable habitat (rocky sites within desert scrub) is present within the Survey Area.

Special-Status Species Summary

Species	Status	Habitat and Distribution	Activity Period	Occurrence Probability
Imperata brevifolia **California satintail**	US: – CA: 2B	Springs, meadows, streambanks, moist canyons, canals, alkaline sinks, and similar wet areas below 1,220 meters (4,000 feet) elevation. Known from Butte, Fresno, Imperial, Inyo, Kern, Lake, Los Angeles, Orange, Riverside, San Bernardino, Tehama, Tulare, and Ventura Counties, though many collections are old and the populations likely extirpated. Also occurs in other areas of the western U.S. and Mexico.	Blooms September through May (perennial grass)	**Absent.** No suitable habitat (Springs, meadows, streambanks, moist canyons, canals, and alkaline sinks below 4,000 feet) is present within the Survey Area.
Mentzelia tricuspis **Spinyhair blazing star**	US: – CA: 2B	Sandy or gravelly slopes and washes at 150 to 1,280 meters (500 to 4,200 feet) elevation in desert scrub. In California, known from Inyo, Riverside, San Bernardino, and San Diego Counties. Also occurs in Arizona, Nevada, and Utah.	Blooms March through May (annual herb)	**Low.** Marginally suitable habitat (sandy slopes, washes) is present within the Survey Area.
Muhlenbergia californica **California muhly**	US: – CA: 4.3	Mesic, seeps and streambanks in chaparral, coastal scrub, lower montane coniferous forest, meadows and seeps, at elevations of 100 to 2,000 meters (328 to 6562 feet).	Blooms June through September (perennial rhizomatous herb)	**Absent.** No suitable habitat (mesic, seeps and streambanks in chaparral, coastal scrub, lower montane coniferous forest) is present within the Survey Area.
Nemacaulis denudata var. *gracilis* **Slender cottonheads**	US: – CA: 2B	Coastal or desert dunes, sandy mesquite hummocks, or similar sandy sites at -50 to 400 (560) meters (-160 to 1,300 [1,800] feet) elevation. Known from Imperial, Riverside, San Bernardino, and San Diego Counties in California, and from Arizona and Mexico.	Blooms mostly late March to mid-May (annual herb)	**Low.** Marginally suitable habitat (sandy sites) is present within the Survey Area.
Penstemon pseudospectabilis ssp. *pseudospectabilis* **Desert beardtongue**	US: – CA: 2B	Sandy washes or less commonly on rocky slopes in Mojavean and Sonoran desert scrub at 80 to 1,935 meters (260 to 6,350 feet) elevation. In California, known only from Imperial, Riverside, and San Bernardino Counties. Also occurs in Arizona.	Blooms January through May (perennial herb)	**Moderate.** Suitable habitat (sandy washes and desert scrub) is present within the Survey Area.
Saltugilia latimeri **Latimer's woodland gilia**	US: – CA: 1B	Dry desert slopes of coarse sandy to rocky soils in chaparral and Mojavean desert scrub at 400 to 1,900 meters (1,300 to 6,200 feet) elevation.	Blooms April through June	**Low.** Marginally suitable habitat (dry desert slopes) is present within the Survey Area.
Selaginella eremophila **Desert spike-moss**	US: – CA: 2B	Shaded sites in gravelly soils and among rocks or in crevices from 200 to 1,295 meters (700 to 3,000 feet) elevation in Sonoran desert scrub.	Reproductive mostly in June (perennial herb)	**Low.** Marginally suitable habitat (gravelly soils and rock crevices) is present within the Survey Area.

Special-Status Species Summary

Species	Status	Habitat and Distribution	Activity Period	Occurrence Probability
Insects				
Dinacoma caseyi **Casey's June beetle**	US: FE CA: SA	Associated with alluvial sediments, typically in Carsitas gravelly sand (CdC), riverwash, or possibly Carsitas cobbly sand (ChC) of broad, gently sloping alluvial fans at the base of the Santa Rosa Mountains. Known distribution is an area of less than 800 acres (324 hectares) in southern Palm Springs within the Palm Canyon alluvial floodplain and eastward to East Palm Canyon Drive.	Spring (late March through June)	**Absent.** The Survey Area is outside of the species' known geographic range.
Macrobaenetes valgum **Coachella giant sand treader cricket**	US: – CA: SA CVMSHCP: C	Wind-swept sand dune ridges, spring-dampened sandy areas. Restricted to Coachella Valley.		**Low.** Marginally suitable habitat (wind-swept dunes) is present within the Survey Area.
Stenopelmatus cahuilaensis **Coachella Valley Jerusalem cricket**	US: – CA: SA CVMSHCP: C	Inhabits a small segment of the sand and dune areas of the Coachella Valley, in the vicinity of Palm Springs; found in large, undulating dunes piled up at the north base of Mt. San Jacinto.		**Absent.** The Survey Area is outside of the species' known geographic range.
Amphibians				
Rana draytonii **California red-legged frog**	US: FT CA: SSC	Deep, quiet pools of streams, marshes, and occasionally ponds, with dense, shrubby vegetation at edges, usually below 1,200 meters (4,000 feet). Foothills surrounding the Sacramento Valley and coastal streams from Marin County to northwestern Baja California; Believed to be extirpated between Los Angeles County and the Mexican border. Below about 1,000 feet elevation.	December through April	**Absent.** No suitable habitat (deep, quiet pools of streams, marshes, and occasionally ponds, with dense, shrubby vegetation at edges) is present within the Survey Area.
Rana muscosa **Sierra Madre yellow-legged frog**	US: FE CA: SE	Ponds, lakes, and streams at moderate to high elevation; appears to prefer bodies of water with open margins and gently sloping bottom. Transverse Ranges in southern California from 370 to 2,290 meters (1,200 to 7,500 feet) elevation. Restricted to streams in ponderosa pine, montane hardwood-conifer, and montane riparian habitats.	March through June	**Absent.** No suitable habitat (ponds, lakes, or streams) is present within the Survey Area.

Special-Status Species Summary

Species	Status	Habitat and Distribution	Activity Period	Occurrence Probability
Reptiles				
Aspidoscelis hyperythra **Orangethroat whiptail**	US: – CA: SSC	Prefers washes and other sandy areas with patches of brush and rocks, in chaparral, coastal sage scrub, juniper woodland, and oak woodland from sea level to 915 meters (3,000 feet) elevation. Perennial plants required. Occurs in Riverside, Orange, San Diego Counties west of the crest of the Peninsular Ranges, in extreme southern San Bernardino County near Colton, and in Baja California.	March through July with reduced activity August through October	**Moderate.** Suitable habitat (sandy, desert washes) is present within the Survey Area.
Crotalus ruber **Red diamond rattlesnake**	US: – CA: SSC	Desert scrub, thornscrub, open chaparral and woodland; occasional in grassland and cultivated areas. Prefers rocky areas and dense vegetation. Morongo Valley in San Bernardino and Riverside Counties to the west and south into Mexico.	Mid-spring through mid-fall	**Low.** Marginally suitable habitat (desert scrub, rocky areas) is present within the Survey Area.
Gopherus agassizii **Desert tortoise**	US: FT CA: ST CVMSHCP: C	Historically found throughout most of the Mojave and Sonoran Deserts into Arizona, Nevada, and Utah. Believed to have been extirpated from the western and southern portions of the Antelope Valley. Found in creosote bush scrub, saltbush scrub, thornscrub (in Mexico), and Joshua tree woodland. Found in the open desert as well as in oases, riverbanks, washes, dunes, and occasionally rocky slopes.	Spring, and again in early fall in areas of summer rains, with brief periods of activity at other times	**Moderate.** Suitable habitat (creosote bush scrub, washes) is present within the Survey Area.
Phrynosoma blainvillii (coronatum) **Coast horned lizard**	US: – CA: SSC	Found primarily in sandy soil in open areas, especially washes and floodplains, in many plant communities. Requires open areas for sunning, bushes for cover, patches of loose soil for burial, and an abundant supply of ants or other insects. Occurs west of the deserts from northern Baja California north to Shasta County below 2,400 meters (8,000 feet) elevation.	April through July with reduced activity August through October	**Absent.** TheThe Survey Area is outside of the species' known geographic range.
Phrynosoma mcalli **Flat-tailed horned lizard**	US: – CA: SSC CVMSHCP: C	Found in fine sand in desert washes and flats with vegetative cover and ants, generally below 180 meters (600 feet) elevation in Riverside, San Diego, and Imperial Counties.	May be active year-round in mild weather, but peak activity occurs in spring, early summer, and fall	**Absent.** The Survey Area is outside of the species' known elevation and current known geographic range.

Special-Status Species Summary

Species	Status	Habitat and Distribution	Activity Period	Occurrence Probability
Thamnophis hammondii **Two-striped garter snake**	US: – CA: SSC	Highly aquatic. Only occurs in or near permanent sources of water. Streams with rocky beds supporting willows or other riparian vegetation. From Monterey County to northwest Baja California.	Diurnal year-round	**Absent.** No suitable habitat (aquatic) is present within the Survey Area.
Uma inornata **Coachella Valley fringe-toed lizard**	US: FT CA: SE CVMSHCP: C	Fine, loose, windblown sand (dunes), interspersed with hardpan and widely spaced desert shrubs; known only from the Coachella Valley.	April through October (May is peak)	**Absent.** The Survey Area is outside of the species' known geographic range.
Birds				
Aquila chrysaetos (nesting & wintering) **Golden eagle**	US: – CA: CFP	Generally open country of the Temperate Zone worldwide. Nests primarily in rugged mountainous country. Uncommon resident in Southern California.	Year-round diurnal	**Low.** Marginally suitable foraging habitat (rugged mountain areas) is present within the Survey Area.
Athene cunicularia (burrow sites) **Burrowing owl**	US: – CA: SSC (breeding) CVMSHCP: C	Open country in much of North and South America. Usually occupies ground squirrel burrows in open, dry grasslands, agricultural and range lands, railroad rights-of-way, and margins of highways, golf courses, and airports. Often utilizes man-made structures, such as earthen berms, cement culverts, cement, asphalt, rock, or wood debris piles. They avoid thick, tall vegetation, brush, and trees, but may occur in areas where brush or tree cover is less than 30 percent.	Year-round	**Moderate.** Suitable habitat (open country) is present within the Survey Area.
Falco mexicanus (nesting) **Prairie falcon**	US: – CA: SA	Open country in much of North America. Nests in cliffs or rocky outcrops; forages in open arid valleys and agricultural fields. Rare in southwestern California.	Year-round diurnal	**Moderate.** Suitable habitat foraging habitat is present within the Survey Area.
Lanius ludovicianus (nesting) **Loggerhead shrike**	US: – CA: SSC (breeding)	Prefers open habitats with scattered small trees and with fences, utility lines, or other perches. Inhabits open country with short vegetation, pastures, old orchards, cemeteries, golf courses, riparian areas, and open woodlands. Highest density occurs in open-canopied valley foothill hardwood, valley foothill hardwood-conifer, valley foothill riparian, pinyon-juniper, juniper, desert riparian, and Joshua tree habitats. Occurs only rarely in heavily urbanized areas, but often found in open cropland. Found in open country in much of North America.	Year-round	**Moderate.** Suitable habitat (open country, desert scrub) is present within the Survey Area.

Special-Status Species Summary

Species	Status	Habitat and Distribution	Activity Period	Occurrence Probability
Setophagia petechia (nesting) **Yellow warbler**	US: – CA: SSC (breeding) CVMSHCP: C	Riparian woodland while nesting in the western U.S. and northwestern Baja California; more widespread in brushy areas and woodlands during migration. Occurs from western Mexico to northern South America in winter. Migrants are widespread and common. Three subspecies breed in California: *morcomi, brewsteri,* and *sonorana.* (Sonoran yellow warbler nests along the Colorado River.)	Summer, winter, or year-round, depending on locale	**Absent.** No suitable habitat (riparian woodland) is present within the Survey Area.
Toxostoma lecontei **Le Conte's thrasher**	US: – CA: SA CVMSHCP: C	Inhabits sparsely vegetated desert flats, dunes, alluvial fans, or gently rolling hills having a high proportion of saltbush (*Atriplex* spp.) or cholla (*Cylindropuntia* spp.), often occurring along small washes or sand dunes. Prefers dense thorny shrubs (most often saltbush or cholla) for nesting. Uncommon and local resident in low desert scrub throughout most of the Mojave Desert, extending up into the southwestern corner of the San Joaquin Valley. Breeding range in California extends from these areas into eastern Mojave, north into the Owens Valley and south into the lower Colorado Desert and eastern Mojave.	Year-round	**Moderate.** Marginally suitable habitat (sparsely vegetated desert scrubs) is present within the Survey Area.
Vireo bellii pusillus **Least Bell's vireo**	US: FE CA: SE CVMSHCP: C	Riparian forests and willow thickets. The most critical structural component of Least Bell's Vireo habitat in California is a dense shrub layer 2 to 10 feet (0.6–3.0 meter) above ground. Nests from central California to northern Baja California. Winters in southern Baja California.	April through September	**Absent.** No suitable habitat (riparian forest) is present within the Survey Area.
Mammals				
Corynorhinus townsendii **Townsend's big-eared bat**	US: – CA: –	Requires caves, mines, tunnels, bridges, buildings, or other similar structures for roosting. Has also been documented using rock crevices and hollow trees for roosting. Often uses separate sites for night, day, hibernation, or maternity roosts. Ranges from southwestern Canada through the western United States to southern Mexico.	Year-round; nocturnal	**Low.** Suitable foraging habitat is present within the Survey Area.

Special-Status Species Summary

Species	Status	Habitat and Distribution	Activity Period	Occurrence Probability
Chaetodipus fallax pallidus **Pallid San Diego pocket mouse**	US: – CA: SSC	Found in sandy herbaceous areas, usually associated with rocks or coarse gravel in desert wash, desert scrub, desert succulent scrub, pinyon-juniper woodlands, etc. in desert border areas of Southern California into Mexico.	Nocturnal, active year-round	**Low.** Marginally suitable habitat (desert scrub) is present within the Survey Area.
Neotoma lepida intermedia **San Diego desert woodrat**	US: – CA: SSC	Found in desert scrub and coastal sage scrub habitat, especially in association with cactus patches. Builds stick nests around cacti, or on rocky crevices. Occurs along the Pacific slope from San Luis Obispo County to northwest Baja California.	Year-round, mainly nocturnal, occasionally crepuscular and diurnal	**Low.** Marginally suitable habitat (desert scrub) is present within the Survey Area.
Perognathus longimembris bangsii **Palm Springs pocket mouse**	US: – CA: SSC CVMSHCP: C	Primary habitat in the Coachella Valley is dunes and mesquite hummocks associated with honey mesquite (*Prosopis glandulosa* var. *torreyana*) and, to a lesser extent, dunes and hummocks associated with creosote (*Larrea tridentata*) or other vegetation. Its range in the Coachella Valley extends from Joshua Tree National Park southward, west to San Gorgonio Pass, and south to Borrego Springs and the east side of San Felipe Narrows, in Riverside, San Diego, and Imperial Counties. Results of recent morphological and genetic studies indicate that this species also ranges northward at least to Hinkley Valley and Death Valley in San Bernardino County.	Spring through fall	**Moderate.** Marginally suitable habitat (sandy areas) is present within the Survey Area.
Xerospermophilus tereticaudus chlorus **Palm Springs round-tailed ground squirrel**	US: – CA: SSC CVMSHCP: C	Desert succulent scrub, desert wash, desert scrub, alkali scrub; will burrow in man-made levees; prefers open, flat, grassy areas in fine textured, sandy soil. Restricted to Coachella Valley.	February through August (hibernates September through January)	**Low.** Marginally suitable habitat (desert scrub) is present within the Survey Area.
Ovis canadensis nelsonii (peninsular Distinct Population Segment) **Peninsular bighorn sheep**	US: FE CA: ST/CFP CVMSHCP: C	Occurs on open desert slopes below 1,220 meters (4,000 feet) elevation from San Gorgonio Pass south into Mexico; optimal habitat includes steep-walled canyons and ridges bisected by rocky or sandy washes, with available water.		**Absent.** The Survey Area is outside of the species' known geographic range.
Ovis canadensis nelsoni (excluding peninsular Distinct Population Segment) **Desert bighorn sheep**	US: – CA: CFP (except rams when hunting is authorized)	Occurs in open, rocky, steep areas with available water and herbaceous forage; widely distributed from the White Mountains in Mono County to the Chocolate Mountains in Imperial County.		**Low.** Marginally suitable habitat (rocky, steep areas) is present within the Survey Area.

LEGEND	
US: Federal Classifications	
FE	Taxa listed as Endangered.
FT	Taxa listed as Threatened.
CA: State Classifications	
SE	Taxa State-listed as Endangered.
ST	Taxa State-listed as Threatened.
SCE	Candidate for State-listing as Endangered.
SSC	California Species of Special Concern. Refers to animals with vulnerable or seriously declining populations.
CFP	California Fully Protected. Refers to animals protected from take under Fish and Game Code Sections 3511, 4700, 5050, and 5515.
SA	Special Animal. Refers to any other animal monitored by the Natural Diversity Data Base, regardless of its legal or protection status.
1B	California Rare Plant Rank 1B: Rare, threatened, or endangered in California and elsewhere.
2B	California Rare Plant Rank 2B: Rare, threatened, or endangered in California, but more common elsewhere.
4	California Rare Plant Rank 4: A watch list of plants of limited distribution.
	CRPR Extensions
	0.3 Not very endangered in California (less than 20% of occurrences threatened).
California Rare Plant Ranks are assigned by a committee of government agency and non-governmental botanical experts and are not official State designations of rarity status.	
CVMSHCP: Coachella Valley MSHCP Status	
C	Species is adequately conserved under the CVMSHCP.

APPENDIX C

RECOMMENDED AND RESTRICTED PLANT SPECIES

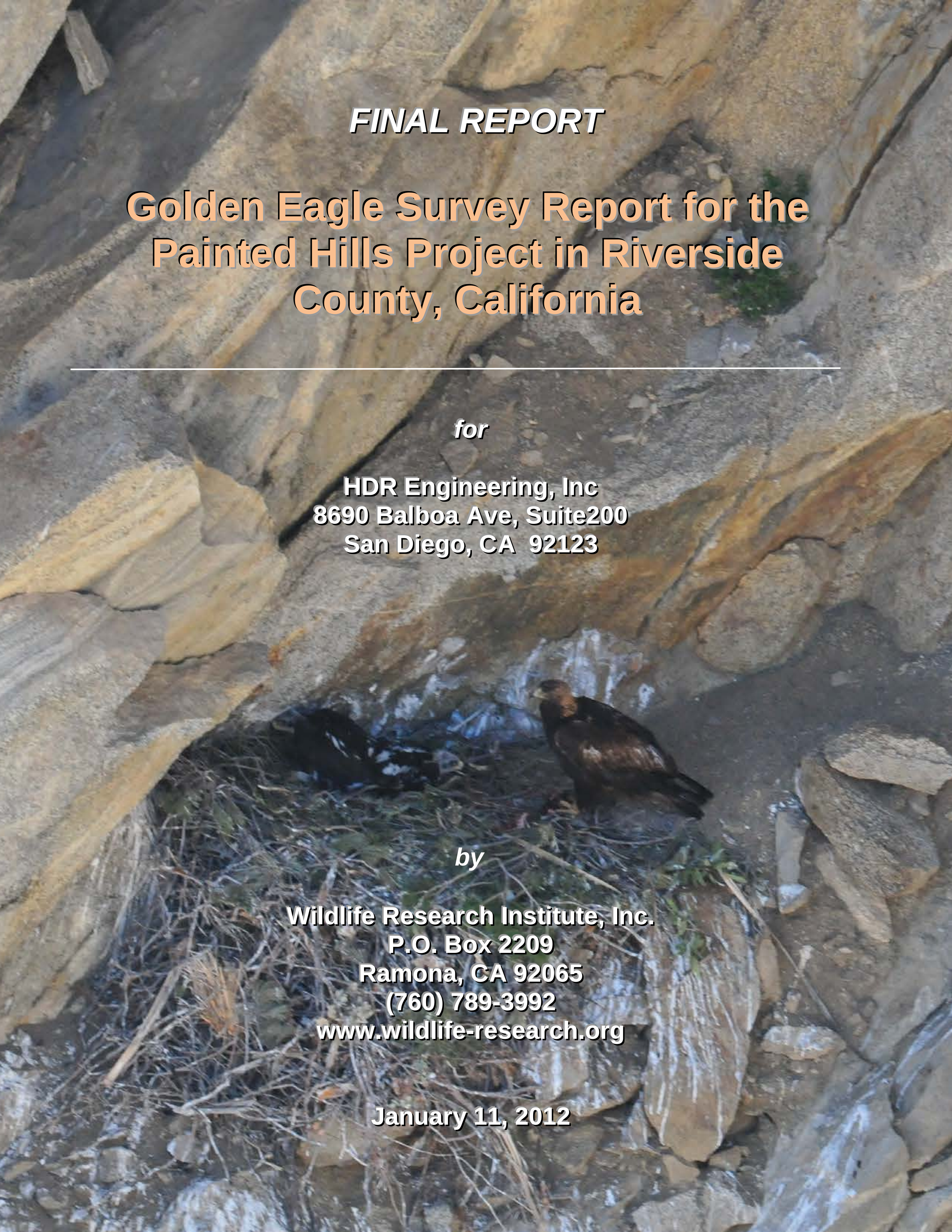
Table 4-112: Coachella Valley Native Plants Recommended for Landscaping[1]

BOTANICAL NAME	COMMON NAME
Trees	
Washingtonia filifera	California Fan Palm
Cercidium floridum	Blue Palo Verde
Chilopsis linearis	Desert Willow
Olneya tesota	Ironwood Tree
Prosopis glandulosa var. torreyana	Honey Mesquite
Shrubs	
Acacia greggii	Cat's Claw Acacia

BOTANICAL NAME	COMMON NAME
Ambrosia dumosa	Burro Bush
Atriplex canescens	Four Wing Saltbush
Atriplex lentiformis	Quailbush
Atriplex polycarpa	Cattle Spinach
Baccharis sergiloides	Squaw Water-weed
Bebia juncea	Sweet Bush
Cassia (Senna) covesii	Desert Senna
Condalia parryi	Crucillo
Crossosoma bigelovii	Crossosoma
Dalea emoryi	Dye Weed
Dalea (Psorothamnus) schottii	Indigo Bush
Datura meteloides	Jimson Weed
Encelia farinose	Brittle Bush
Ephedra aspera	Mormon Tea
Eriogonum fasciculatum	California Buckwheat
Eriogonum wrightii membranaceum	Wright s Buckwheat
Fagonia laevis	(No Common Name)
Gutierrezia sarothrae	Matchweed
Haplopappus acradenius	Goldenbush
Hibiscus denudatus	Desert Hibiscus
Hoffmannseggia microphylla	Rush Pea
Hymenoclea salsola	Cheesebush
Hyptis emoryi	Desert Lavender
Isomeris arborea	Bladder Pod
Juniperus californica	California Juniper
Krameria grayi	Ratany
Krameria parvifolia	Little-leaved Ratany
Larrea tridentate	Creosote Bush
Lotus rigidus	Desert Rock Pea
Lycium andersonii	Box Thorn
Petalonyx linearis	Long-leaved Sandpaper Plant
Petalonyx thurberi	Sandpaper Plant
Peucephyllum schottii	Pygmy Cedar
Prunus fremontii	Desert Apricot
Rhus ovata	Sugar-bush
Salazaria mexicana	Paper-bag Bush

APPENDIX D

GOLDEN EAGLE SURVEY REPORT FOR THE PAINTED HILLS PROJECT IN RIVERSIDE COUNTY, CALIFORNIA



FINAL REPORT

Golden Eagle Survey Report for the Painted Hills Project in Riverside County, California

for

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January 11, 2012

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ACKNOWLEDGMENTS

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SUMMARY

This document provides the findings of the Phase 1 occupancy and Phase 2 productivity surveys for golden eagles conducted within the 10 nautical mile (n.m.) spatial buffer of the Painted Hills project in Riverside County, California in order to comply with the U.S. Fish and Wildlife Service (USFWS) survey recommendations. (Gould and Schmidt 2011) A total of 6 golden eagle nests were observed in 315 square n.m. of survey area comprising 3 territories that had core nesting areas within the spatial buffer of the Painted Hills project. Two of the 3 golden eagle territories were active for the 2011 season, 1 of which (San Jacinto Mountains - NE) produced a total of 2 young.

During the surveys, 3 golden eagles and 9 other wildlife species (i.e., American kestrel [*Falco sparverius*], bighorn sheep [*Ovis canadensis*], common raven [*Corvus corax*], great horned owl [B*ubo virginianus*], peregrine falcon [*Falco peregrinus*], prairie falcon [*Falco mexicanus*], red-tailed hawk [*Buteo jamaicensis*], Swainson's hawk [*Buteo swainsoni*] and turkey vulture [*Cathartes aura*] plus 1 unidentified falcon [*Falco sp*]) were observed totaling 83 unique wildlife documentations. All sightings have been documented with GPS locations and recorded as recommended in the USFWS Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols; and Other Recommendations in Support of Golden Eagle Management and Permit Issuance (Pagel et al. 2010) and the subsequent Draft Eagle Conservation Plan Guidance (Gould and Schmidt 2011).

INTRODUCTION

Golden eagles respond to environmental changes in order to survive and reproduction in golden eagles, as in many predators, can be regulated by prey species abundance. Since 1998, Western North America has been in a prolonged drought and this has affected many species including golden eagles (Bittner et al. 2003). Jackrabbits, an important prey species for golden eagles, have also declined (L. LaPre, Bureau of Land Management [BLM] and M. Jorgenson, California State Parks pers.com.). Golden eagle adults have persevered but reproduction rates have dropped to as low as 12% in some regions, such as the Mojave and Sonoran Deserts of the American Southwest (Bittner et al. 2003).

Eagles are large predatory birds with up to 7-foot wingspans and raising young takes a large investment of time and energy. Breeding in Southern California starts in January, nest building and egg laying in February to March, and hatching and raising the young eagles occur from April through June. Once the young eagles are flying on their own, the adult eagles will continue to feed them and teach them to hunt until late November. This huge investment of time and energy on the part of the adults, just to raise one or two young, may contribute to some pairs taking a year off from breeding occasionally even when food is abundant.

After leaving the nest, young eagles will explore their natal area and may continue to hunt close by or may venture tens to hundreds of miles away; occasionally returning briefly to their natal area (Bittner unpublished data).

WRI has learned, based on 23 years of helicopter and ground studies on golden eagles, that an initial helicopter survey can successfully identify approximately 80 to 90% of the golden eagle territories in a given area. Follow-up ground and helicopter surveys have indicated that some nests, and even some pairs, can be missed during the first survey. Second surveys are conducted to determine reproductive success but can also identify successful nesting attempts that were missed during initial surveys as well as reveal fledging success.

GLOSSARY

Nest Terminology

Nest Condition

The nest condition is an important indicator of how recently the nest has been used and whether the nest should be considered "active", which is an indication of territory occupancy.

Example of a nest in good condition decorated with fresh sticks

Good condition - A golden eagle nest in **good condition** has been worked on in the current year or within the past 1 to 3 years; a determination made by observing the age of sticks or recent addition of other materials that make up the nest. Additionally, the presence of a bowl constructed with yucca, with or without new material, is indicative of recent activity and good condition.

Example of a nest in fair condition

Fair condition **–** A golden eagle nest in **fair condition** has not been used for one to several years, shows moderate signs of weathering, and may or may not include a rough bowl.

Example of a nest in poor condition

Poor condition **–** A golden eagle nest in **poor condition** shows extensive and clear signs of weathering, is in the process of deteriorating, and can often even be decomposing.

Nest Activity

The activity status of a golden eagle nest is an important indicator of how recently the nest has been used and, in the absence of observing an eagle on territory, can provide evidence that a pair of eagles is occupying a territory and preparing for egg laying.

Example of an active nest with new material in bowl

Example of an occupied nest with an incubating female golden eagle

Example of an inactive nest that is deteriorating

Active nest (occupancy implied) - An **active golden eagle nest** is a nest in good condition that has been decorated (new material added to the nest) during the current breeding season. It will usually include the use of yucca, new sticks, fresh greenery and the construction of a bowl, which is created in preparation for egg-laying and incubation. An active nest may not necessarily be **occupied** but does constitute evidence of, and thereby implies, territory occupancy.

Occupied nest (occupancy confirmed) **–** An **occupied golden eagle nest** is an active nest used for breeding in the current year by a pair in which an adult or young golden eagle, or a new egg, has been observed. A nest is considered by the USFWS to be "occupied" throughout the periods of egg laying, incubation, brooding, fledging, and post-fledging dependency of the young.

Once a nest is chosen for incubation, other nests previously observed in the territory to be active no longer need to be monitored.

Inactive nest - An **inactive golden eagle nest** is a nest that is not currently being used by eagles as determined by the continued absence of any nest decoration, adult, egg, or dependent young during the current breeding season. An inactive nest may become active again in subsequent breeding seasons and remains protected under the Eagle Act.

<u>Nest Arrangement</u>

A golden eagle pair may often construct several nests in close proximity to one another. Often times, these nests are within a few feet of each other and may lie in a vertical or horizontal arrangement.

Example of multiple (2) nests in close proximity marked by a single waypoint

***Marking multiple nests at one waypoint* –** During surveys, multiple nests in close proximity to one another are often recorded at a single waypoint for graphic clarity and readability.

WRI uses the following format for denoting multiple nests, for example 2, at one waypoint: A01GE**2**SN, where A is a unique trip identifier, 01 is the waypoint number, GE is the species of the nest builder, <u>2 is the number of nests at the waypoint</u>, and SN is the type of nest such as "stick nest."

Territory Terminology

According to the USFWS Interim Golden Eagle Guidance (Pagel et al. 2010), all nest sites within a breeding territory are deemed occupied while raptors are demonstrating pair bonding activities and developing affinity to a given area.

<u>Active/Occupied Territory</u>

A golden eagle territory may be determined to be "active" (or more specifically "occupied") for the current breeding season if either of the following observations is made: (1) one or both of a golden eagle pair is observed demonstrating pair bonding activity, such as nest building or courtship behavior (active with confirmed occupancy) or (2) if *evidence* of pair bonding activities is observed, such as observing a decorated nest, (active with implied occupancy).

<u>Inactive Territory</u>

A golden eagle territory is determined to be inactive if occupancy or breeding cannot be confirmed. This occurs if no golden eagle pair bonding or evidence of pair bonding is observed for the current breeding season during the surveys. Golden eagles sometimes take a year or two off from breeding and may still be living in the territory even in the absence of breeding. Inactive territories may become active again.

SURVEY AREA

The Painted Hills survey area covered approximately 315 square n.m. across the Colorado Desert Region of the Sonoran Desert in Riverside County, California (Figure 1). A small portion of the survey, almost 48 square n.m., extended approximately 4.5 nautical miles into San Bernardino County and just east of the city of San Bernardino.

The survey area included the following mountain ranges: Little San Bernardino, San Bernardino and San Jacinto Mountains. The terrestrial habitat consisted mostly of creosote bush scrub, yucca and cholla cactus, desert saltbush, sandy soil grasslands, and desert dunes; higher elevations were predominantly pinyon pine and California juniper.

Figure 1. Map of Painted Hills Project Survey Area.

METHODS AND CONSTRAINTS

Methods

WRI conducted aerial surveys surrounding the proposed project area including an approximate 10-nautical mile spatial buffer measured from non-linear project boundaries. Golden eagle nests and their associated territories were documented and named according to USFWS recommendations (Table 1); wildlife observed, including other raptors and special status species, were documented and counted (Table 2); and descriptive data for each observation were recorded on the transect data sheet (Table 3). The activity status of all golden eagle nests were determined during the survey, if possible, and/or confirmed later upon review of photographs. Even in the absence of incubating females or observations of adult golden eagles per se, observations of nest decoration such as fresh yucca or leafy green branches as well as new nest sticks built into and above old nest material helped assess activity at the nest site for the 2011 breeding season.

We contacted Dr. Larry LaPre, of the BLM, to request available historic records or reports of golden eagle nesting activity and/or sightings in the project area. WRI utilized the verbal information provided by Dr. LaPre to improve our survey focus. Additionally, special research permits were acquired from the Joshua Tree National Park (JTNP).

All surveying and reporting complies with the current U.S. Fish and Wildlife Service Interim Golden Eagle Inventory and Monitoring Protocols (Pagel et al. 2010) and the subsequent Draft Eagle Conservation Plan Guidance (Gould and Schmidt 2011).

Survey

Helicopter surveys were conducted for Phase 1 March 31st, 2011. Phase 2 surveys were conducted at least 30 days later on June 11th, 2011, according to USFWS recommendations (Pagel et al 2010, Gould and Schmidt 2011). These surveys were conducted for the target species, golden eagle, in the Colorado Desert Region of the Sonoran Desert in Riverside County, California. We used a Hughes-500 helicopter that provided seating for three wildlife biologists (including at least 2 golden eagle specialists) and the pilot. The pilot used by WRI for these surveys also has extensive golden eagle experience; refer to the WRI Golden Eagle Team biographical sketches for more detail (Appendix A).

We concentrated on any area with suitable golden eagle nesting habitat with possible nesting substrate that included cliffs with geological features, such as flat ledges or shallow cavities/caves that could allow for safe nest construction and were high enough to provide protection from ground-dwelling predators. WRI also used data acquired from our own aerial surveys in previous years (2000-2010) to identify golden eagle nesting areas. We also surveyed large transmission towers in the project area since golden eagles are known to nest on these types of structures and WRI has documented this activity in other parts of the Mojave and Sonoran Deserts.

GPS

Nest site and other location-specific data were determined and documented using hand-held GPS units (Garmin Map60GSx); accuracy less than 10 meters, 95% typical. A sequential number was assigned to each observation that corresponded to the GPS waypoint. Waypoints were recorded using the UTM grid in the WGS 84 Datum. GPS was also used to track our survey routes.

Handwritten notes were taken on field forms that documented species, detailed observations, and corresponded to each GPS waypoint (Table 3).

Photography

Photographs were taken with Nikon equipment with GPS units attached so that latitude and longitude could be recorded on each digital picture. Two cameras were used; one for recording wide-angle shots (18-200mm optically-stabilized zoom lens) and another for recording close-ups (200-400mm optically-stabilized zoom lens). The 400mm zoom lens plus the ability to enlarge the digital photographs allows accurate and detailed records to be captured with minimal disturbance to wildlife. This is also important because it allows review and confirmation of our observations in an environment that is more stable than the cockpit of a helicopter.

Data

We photographed all active golden eagle nests, some other raptor nests, representations of numerous inactive golden eagle nest sites, and other wildlife species observed. The following data were also specifically collected however, per the request of federal agencies, map coordinates for nests of sensitive species (i.e., golden eagle, peregrine falcon, and prairie falcon) are not included in this report but are on file at WRI and are available upon request:

- Species
- Number of nests/alternative nests observed
- Condition of each nest and whether or not it was active
- Nest aspect and elevation
- Nest GPS coordinates
- Nest substrate (e.g., cliff, transmission tower, tree, etc.)
- Age class of golden eagles and other species, if determinable
- Behavior of species observed.

It should be noted that red-tailed hawks in particular, as well as other raptors such as prairie falcons and great horned owls, sometimes utilize golden eagle nests for their own nesting; something observed during surveys for this project. During surveys, these nests were attributed to the current occupant (i.e., hawk or falcon), however the original nest builder (i.e., golden eagle) was recorded in the Notes section of the transect data sheet (Table 3). These old golden eagle nests, when viewed along with more current nests, often help define the history and core nesting area/territory of a particular pair of eagles. Core nesting area is the spatial area that contains the nests used by a breeding pair of eagles over time and is comprised of several nests; the size of this area is variable and depends on many factors including topography, prey availability, adjacent territories of golden eagles and other raptors, etc.

Constraints

Bighorn sheep, which are sensitive to helicopters, share the same type of cliff complexes for lambing that are used by golden eagles for nesting. Due to concomitant bighorn sheep lambing season, including that of the threatened and endangered peninsular bighorn sheep in some areas, aerial observations were not permitted by California Department of Fish and Game (CDFG) for Phase 1 surveys in the San Jacinto Mountains. However, due to the size and complexity of this range, it was difficult to make thorough observations of golden eagle nests and/or territories by ground. Ground observations are inherently less effective in both finding nests and determining nest activity, especially in the absence of observing birds at the nest. Indirect evidence of nest activity (fresh greenery or new sticks in the nest) is difficult or impossible to observe from the ground and/or at distances required to prevent disturbance to the nesting area. Therefore, in the absence of Phase 1 helicopter-based observations, the actual golden eagle occupancy of these mountain ranges is likely to be underestimated because breeding attempts that failed early in the breeding season (during the Phase 1 time period of February to April) would not have been observed or documented.

Because Phase 2 surveys are recommended by the USFWS to be conducted at least 30 days after Phase 1 and because the Joshua Tree National Park permit (Appendix B) was not received until June, Phase 2 surveys were also conducted later than desired. Consequently, the actual number of productive territories (occupied territories that produced young) and/or number of young produced is therefore also likely to be underestimated in the survey area because fledging, which often occurs between May and June in Southern California, may have already occurred.

Excessive winds and downdrafts experienced in the afternoon during the last Phase 2 flight on June 11th prevented thorough surveys in a portion of the San Bernardino Mountains. This area was approximately 70 square miles in size and located in the Kitchen Peak and White Water River Valley area.

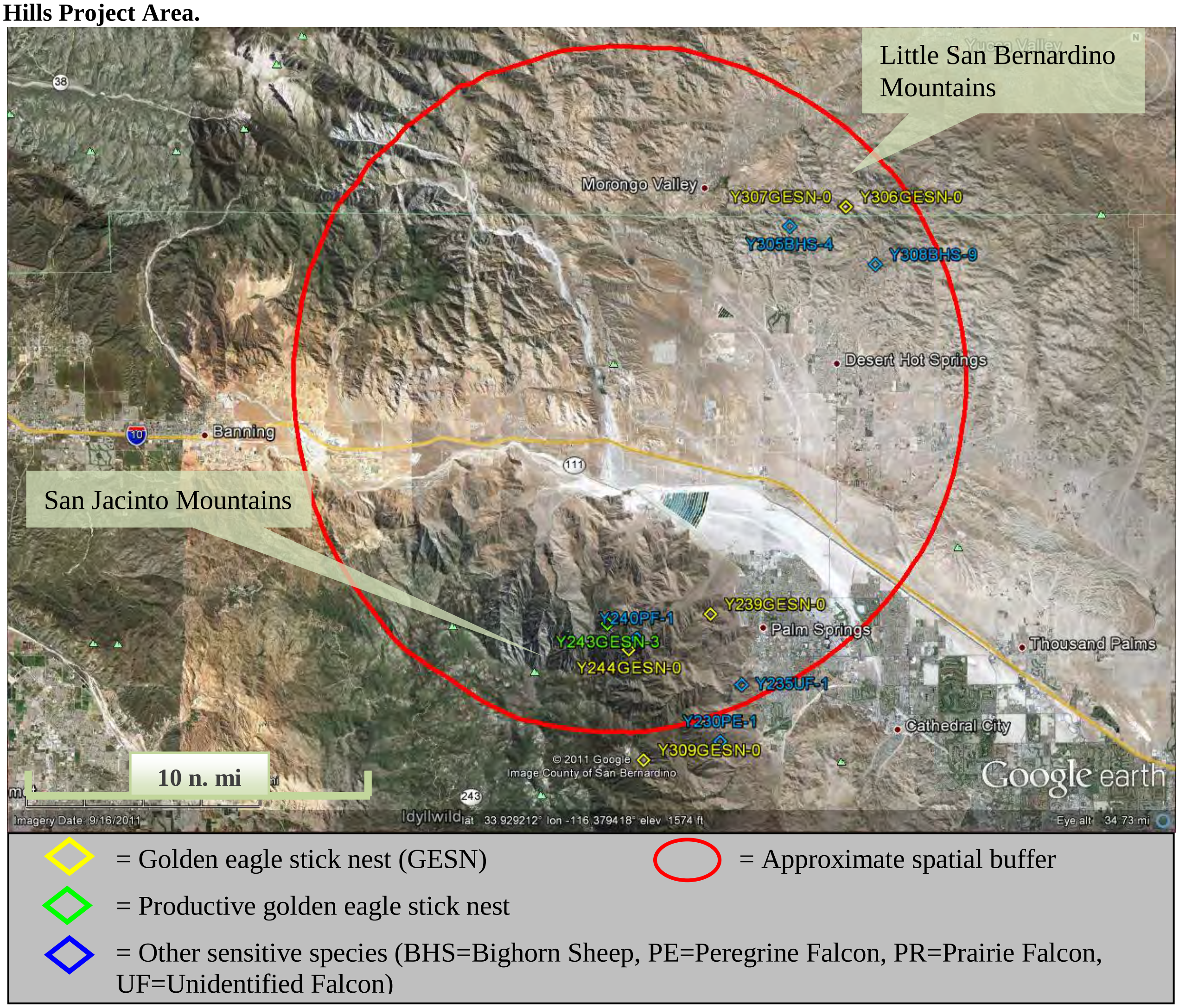
In that these were diurnal surveys focused on golden eagles, we were less likely to observe nocturnal and crepuscular raptors (i.e., owls) or nocturnal mammals. Aerial surveys also tend to under-represent the smaller species, like the American kestrel and burrowing owl (*Athene cunicularia*). No population data can be correctly extrapolated from these surveys except for the focus species, golden eagle.

RESULTS

Map of Golden Eagle Nests and Sensitive Species from Phase 1 and 2 Surveys

The satellite map below shows the project boundary of the Painted Hills Project area, plus approximate 10-nautical mile spatial buffer. Waypoints for golden eagle nests and other sensitive species (i.e., peregrine falcons, prairie falcons, bighorn sheep) observed within or immediately adjacent to the spatial buffer are also provided.

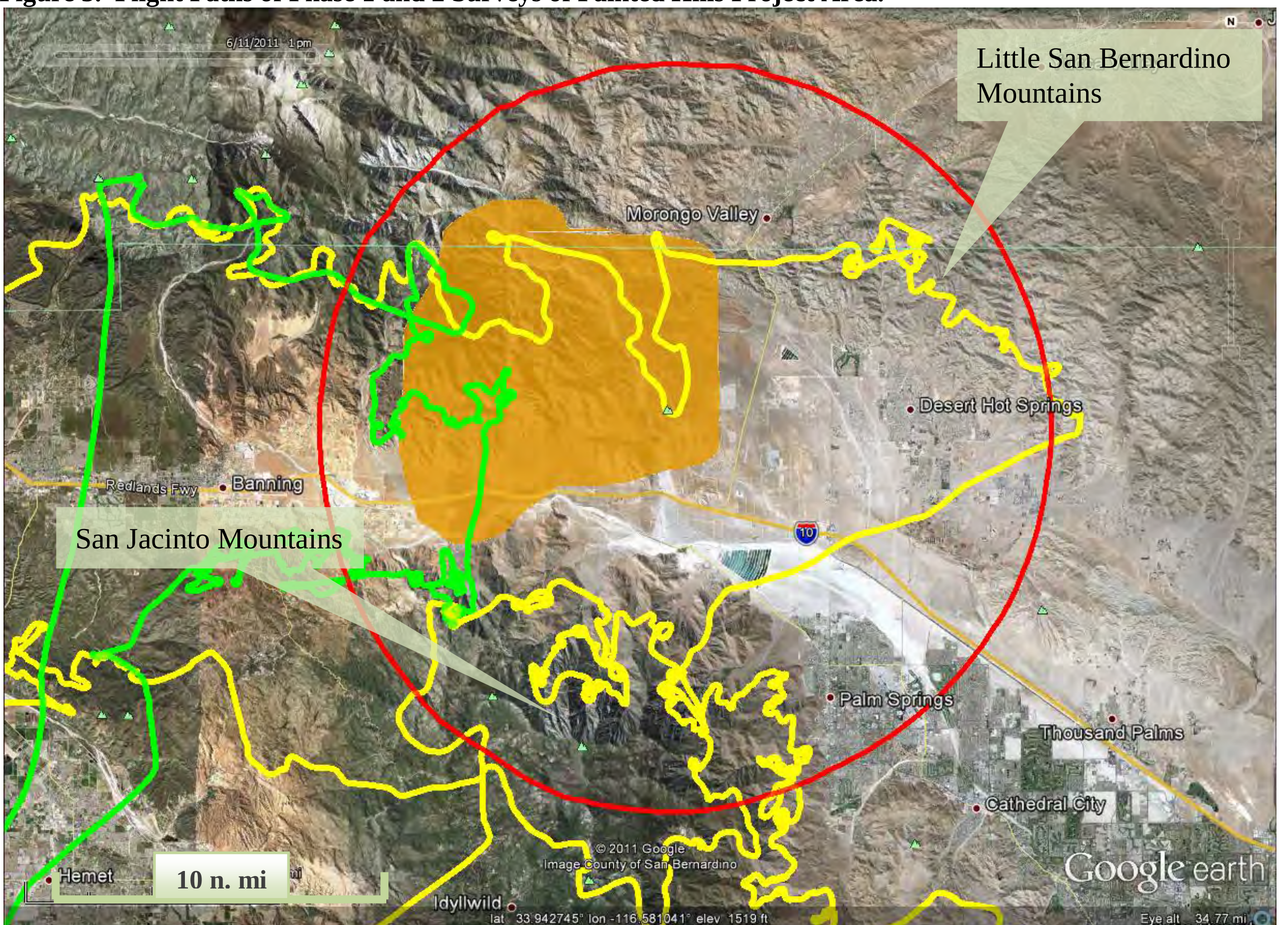
Figure 2. Golden Eagle Nests and Sensitive Species Observed During Phase 1 and 2 Surveys of the Painted Hills Project Area.



Map of Survey Flight Paths from Phase 1 and 2 Surveys

The flight paths taken by WRI for Phase 1 and 2 golden eagle surveys surrounding the Painted Hills project area are depicted below. Areas surveyed during Phase 1 that lacked golden eagle activity were not revisited during Phase 2; in contrast, areas that could not be surveyed during Phase 1 due to concomitant bighorn sheep lambing were surveyed more thoroughly for Phase 2.

Figure 3. Flight Paths of Phase 1 and 2 Surveys of Painted Hills Project Area.



= Phase 1 survey flight path

= Phase 2 survey flight paths

= Spatial buffer

= Area suspected to have golden eagle nests but excessive winds and downdrafts prevented thorough surveys

Golden Eagle Nests and Associated Territories from Phase 1 and 2 Surveys

The table below lists the territory number, trip identifier (a unique alpha character applied to each survey conducted by WRI during 2011), a waypoint number for each golden eagle nest identified, the species that built or is occupying the nest, the type of nest, the number of golden eagles observed in the nest, the status of nest activity (i.e., active or not during 2011 breeding season), the USGS Quad territory name (incorporating the state, county, and US Geological Survey [USGS] Quad; which is the USFWS recommended naming convention), the geographical area where the nest was located, the survey phase in which the nest was observed, the original waypoint number of nests revisited during phase 2, and if the nest was located immediately outside the spatial buffer. Productive territories are denoted with green highlighting.

Table 1. Golden Eagle Nests and Associated Territories from Phase 1 and 2 Surveys.

Territory #	Trip ID	Waypoint #	Species	Nest Type	# of Golden Eagle Young	GE Activity for 2011 Season (Yes/No/Possibly)	USGS Quad Territory Name	Geographical Area	USGS Quad
1	Y	309	GE	SN	0	N	CA-RIV-33116/G5-001-01	San Jacinto Mountains	Palm Springs
2	Y	243	GE	SN	2	Y	CA-RIV-33116/G6-001-01	San Jacinto Mountains	San Jacinto Peak
2	Y	244	GE	SN	0	N	CA-RIV-33116/G6-001-02	San Jacinto Mountains	San Jacinto Peak
2	Y	239	GE	SN	0	N	CA-RIV-33116/G6-001-03*	San Jacinto Mountains	Palm Springs
3	Y	306	GE	SN	0	N	CA-SBD-34116/A4-001-01	Little San Bernardino Mountains - W	Yucca Valley South
3	Y	307	GE	SN	0	Y	CA-SBD-34116/A4-001-02	Little San Bernardino Mountains - W	Yucca Valley South

CA=California, GE=Golden Eagle, RIV=Riverside County, SBD=San Bernardino County, SN=Stick Nest.
*Based on the USFWS recommended naming convention, the territory name is based on the location of the first nest observed for a given territory. Territories denoted with an asterisk in this table were physically located in a different USGS Quad than the first observed nest but retain the Quad identifier of the first nest.

Raptors and Other Wildlife Observed During Phase 1 and 2 Surveys

Raptors and other wildlife, including other raptors and special status species, were documented based on USFWS recommendations and are provided in Table 2 below; 83 unique wildlife observations were made.

Table 2. Raptors and Other Wildlife Observed During Phase 1 and 2 Surveys of Painted Hills Project Area.

Species	Little San Bernardino Mountains	San Bernardino Mountains	San Jacinto Mountains	Total
American Kestrel			1	1
Bighorn Sheep	13			13
Common Rave		17	18	35
Golden Eagle			3	3
Great Horned Owl			4	4
Peregrine Falcon			2	2
Prairie Falcon			3	3
Red-tailed Hawk	1	2	10	13
Swainson's Hawk		7		7
Turkey Vulture			1	1
Unidentified Falcon			1	1
Total	14	26	43	83

All Data from Phase 1 and 2 Surveys

Map coordinates (i.e., UTM) of the nests of sensitive species (i.e., golden eagles, peregrine falcons, prairie falcons) have been withheld per request of federal agencies in order to protect these species, but are on file at WRI. If needed, this information is available upon request. Golden eagle data are noted in bold type.

Table 3. All Data from Phase 1 and 2 Surveys of Painted Hills Project Area.

Trip ID	Waypoint #	Species	Nest Type	# of Individuals	Position (UTM)	Nest Aspect	Nest Condition	Nest Substrate	Nest Active in 2011 (Yes/No/Possibly)	Elevation	Notes (age, sex, substrate, etc.)	Geographical Area
(3/31/2011) - 2 flights, flight #1 - 77-78°F, 0% cloud cover, wind 0-5mph, 0% precip, 10+ visibility C. Meador, J. Wells, R. Rivard												
K	108	U	SN	0	11 S 517589 3750812	NW	G	R		2568 ft	probably CR	San Jacinto Mountains
K	109	CR	SN	0	11 S 518233 3750340	W	G	R	Y	2346 ft	nice bowl	San Jacinto Mountains
K	110	CR		3	11 S 518422 3749957					2595 ft	observed in flight	San Jacinto Mountains
K	111	CR		6	11 S 520446 3749642					4056 ft	observed in flight	San Jacinto Mountains
K	112	RT		1	11 S 523214 3748807					3627 ft	observed in flight	San Jacinto Mountains
K	113a	TV		1	11 S 522904 3748214					4481 ft	observed in flight	San Jacinto Mountains
K	113b	CR		3	11 S 522904 3748214					4481 ft	observed in flight	San Jacinto Mountains
K	114a	AK		1	11 S 523161 3747561					4987 ft	adult observed in flight	San Jacinto Mountains
K	114b	U	SN	0	11 S 523161 3747561	E		R		4987 ft		San Bernardino Mountains
K	115	CR		2	11 S 525243 3757322					3068 ft	observed in flight	San Bernardino Mountains
K	116	SW		2	11 S 525414 3758256					3036 ft	Swainson's observed in flight	San Bernardino Mountains
K	117	RT		1	11 S 526057 3758657					3268 ft	observed in flight	San Bernardino Mountains
K	118	CR		11	11 S 524727 3758782					3797 ft	observed in flight	San Bernardino Mountains
K	119	SW		5	11 S 523676 3758881					3744 ft	Swainson's observed in flight	San Bernardino Mountains
K	120	CR		1	11 S 522196 3757903					3273 ft	observed in flight	San Bernardino Mountains
K	121	RT		1	11 S 521653 3758255					3449 ft	observed in flight	San Bernardino Mountains
K	122	CR	SN	0	11 S 520521 3757964	W		R		3093 ft		San Bernardino Mountains
K	123	CR		1	11 S 519413 3757028					3258 ft	flew from perch	San Bernardino Mountains

Trip ID	Waypoint #	Species	Nest Type	# of Individuals	Position (UTM)	Nest Aspect	Nest Condition	Nest Substrate	Nest Active in 2011 (Yes/No/Possibly)	Elevation	Notes (age, sex, substrate, etc.)	Geographical Area
(6/11/2011) - 2 flights, flight #1 - 77-62°F, 0-50% cloud cover, 0-3mph wind, 0% precip, 10-5+ visibility D. Bittner, J. Lincer, R. Rivard												
Y	230	PE		1						2412 ft	observed in flight	San Jacinto Mountains
Y	231	RT	SN	0	11 S 539938 3739900	SW		R	Y	2299 ft	white wash, worn down	San Jacinto Mountains
Y	232	U	SN	0	11 S 540062 3739855	SW		R		2182 ft		San Jacinto Mountains
Y	233	U	SN	0	11 S 539619 3740083	SW		R		2496 ft		San Jacinto Mountains
Y	234	RT		2	11 S 539978 3739913					2252 ft	juvenile observed perched, and observed in flight	San Jacinto Mountains
Y	235	UF		1	11 S 540880 3740349					1849 ft	unidentified falcon observed briefly in flight	San Jacinto Mountains
Y	236	GHO		1	11 S 538712 3742823					3003 ft	observed in flight	San Jacinto Mountains
Y	238a	CR	SN	3	11 S 539060 3744295	SW	G	R	Y	2311 ft	2 young in nest, 1 observed in flight	San Jacinto Mountains
Y	238b	RT		1	11 S 539060 3744295					2311 ft	juvenile observed in flight	San Jacinto Mountains
Y	**239**	**GE**	**SN**	**0**		**SW**	**P**	**R**	**N**	**2235 ft**		**San Jacinto Mountains**
Y	240	PE		1	11 S 535071 3743048					4520 ft	observed in flight	San Jacinto Mountains
Y	241	GHO		1	11 S 534010 3743756					4909 ft	observed in flight	San Jacinto Mountains
Y	242	RT		1	11 S 534336 3744696					4984 ft	observed in flight	San Jacinto Mountains
Y	**243**	**GE**	**SN**	**3**		**N**	**G**	**R**	**Y**	**5661 ft**	**3 birds in nest; 1 adult, 2 young**	**San Jacinto Mountains**
Y	**244**	**GE**	**SN**	**0**		**W**	**F**	**R**	**N**	**5845 ft**	**has not been used for a couple of years**	**San Jacinto Mountains**
Y	245	RT		1	11 S 529741 3744352					6205 ft	adult observed perched	San Jacinto Mountains
Y	246	WTS		-	11 S 529933 3743966					6889 ft	white wash in rock (horizontal) crevice denoting hibernating location	San Jacinto Mountains
Y	247	RT		2	11 S 530700 3745340					4274 ft	juvenile observed in flight, associated with point #248	San Jacinto Mountains

Trip ID	Waypoint #	Species	Nest Type	# of Individuals	Position (UTM)	Nest Aspect	Nest Condition	Nest Substrate	Nest Active in 2011 (Yes/No/Possibly)	Elevation	Notes (age, sex, substrate, etc.)	Geographical Area
Y	248	RT	SN	0	11 S 530612 3745571	E	G	R	Y	3993 ft	associated with point #247	San Jacinto Mountains
Y	249	RT		1	11 S 530268 3747409					3076 ft	juvenile observed in flight	San Jacinto Mountains
Y	250	GHO		2	11 S 530752 3747753					3040 ft	observed in flight	San Jacinto Mountains
Y	251	RT	SN	0	11 S 530550 3747908	SW	G	R	Y	2894 ft		San Jacinto Mountains
Y	252	CR		2	11 S 523311 3747486					4941 ft	observed in flight	San Jacinto Mountains
Y	253	PR		3		N		R	Y	4823 ft	1 adult observed in flight and perched near nest; 2 young observed perched in front of nest	San Jacinto Mountains
Y	254	RT		1	11 S 521923 3747990					4702 ft	adult observed in flight	San Jacinto Mountains
Y	255	CR		1	11 S 522261 3745499					5597 ft	observed in flight	San Jacinto Mountains
flight #2 - 64-70°F, light haze cloud cover, 5-10 mph wind, 0% precip, 7-10+ visibility D. Bittner, J. Lincer, R. Rivard												
Y	300	XX			11 S 525728 3765514					4709 ft	strong winds prevented thorough search of this area	San Bernardino Mountains (White Water River Valley)
Y	301	CR		1	11 S 531528 3763262					3739 ft	observed in flight	San Bernardino Mountains
Y	302	CR		1	11 S 533286 3762235					3625 ft	observed in flight	San Bernardino Mountains
Y	303	XX			11 S 540509 3765457					3446 ft	high winds sustained at 30+ prevented thorough surveys in this area	San Bernardino Mountains (White Water River Valley)
Y	304	RT		1	11 S 542962 3765146					3675 ft	observed in flight	Little San Bernardino Mountains
Y	305	BHS		4	11 S 543355 3765387					3441 ft	2 ewes and 2 lambs	Little San Bernardino Mountains
Y	**306**	**GE**	**SN**	**0**		**NW**	**G**	**R**	**N**	**3005 ft**		**Little San Bernardino Mountains**
Y	**307**	**GE**	**SN**	**0**		**E**	**G**	**R**	**Y**	**3143 ft**		**Little San Bernardino Mountains**

Trip ID	Waypoint #	Species	Nest Type	# of Individuals	Position (UTM)	Nest Aspect	Nest Condition	Nest Substrate	Nest Active in 2011 (Yes/No/Possibly)	Elevation	Notes (age, sex, substrate, etc.)	Geographical Area
Y	308	BHS		9	11 S 547991 3763306					3396 ft	ewes	Little San Bernardino Mountains
Y	**309**	**GE**	**SN**	**0**		**S**	**G**	**R**	**N**	**6403 ft**		**San Jacinto Mountains**

AK=American Kestrel, BHS=Bighorn Sheep, CR=Common Raven, F=Fair, G=Good, GE=Golden Eagle, GHO=Great Horned Owl, P=Poor, PE=Peregrine Falcon, PR=Prairie Falcon, R=Rock, RT=Red-tailed Hawk, SN=Stick Nest, SW=Swainson's Hawk, TV=Turkey Vulture, U=Unidentified, UF=Unidentified Falcon, WTS=White-throated Swift, XX=Other.
*If no nest type is indicated, then the species was observed independently of a nest (e.g., flying, perched, etc.).

Photographs of Golden Eagle Nests and Other Observations

A 2-year old golden eagle (K85GE-1) observed during surveys in the area on March 30th flying in the San Jacinto Mountains just outside the Painted Hills project area spatial buffer (Phase 1).

An active golden eagle stick nest (Y243GESN-3) with an adult and 2 young, approximately 7 to 8 weeks old; observed June 11th in the San Jacinto Mountains (Phase 2).

A red-tailed hawk stick nest (Y231RTSN-0) that produced young this season; observed June 11th in the San Jacinto Mountains (Phase 2).

A prairie falcon adult, perched on bush, with 2 young perched on rock (Y253PR-3); observed June 11th in the San Jacinto Mountains (Phase 2).

An inactive golden eagle stick nest (Y306GESN-0) in good condition; observed June 11th in the Little San Bernardino Mountains (Phase 2).

An active golden eagle stick nest (Y307GESN-0) in good condition with prey remains visible in nest; observed June 11th in the Little San Bernardino Mountains (Phase 2).

DISCUSSION OF FINDINGS

WRI conducted Phase 1 and 2 surveys for the 2011 golden eagle breeding season in the Colorado Desert Region of the Sonoran Desert in Riverside County and in a small portion of the San Bernardino Mountain Range in San Bernardino County, California.

Six golden eagle nests, comprising 3 territories, were documented with core nesting areas within the Painted Hills spatial buffer, 2 (Little San Bernardino Mountains - W, San Jacinto Mountains - NE) were documented to be active for the 2011 breeding season, 1 of which (San Jacinto Mountains - NE) produced a total of 2 young.

Because aerial surveys could not be conducted in the San Jacinto Mountains for Phase 1 due to concomitant bighorn sheep lambing season, the actual golden eagle occupancy for these areas is likely to be underestimated because breeding attempts that failed early in the breeding season would not have been observed or documented. Additionally, this constraint and the delayed JTNP permit resulted in Phase 2 surveys, with a USFWS recommended lag time of at least 30 days post Phase 1, being conducted at a later time than desired. The actual number of productive territories and/or number of young produced is therefore also likely to be underestimated because fledging, which often occurs between May and June in Southern California, may have already occurred..

Additionally during Phase 1 and 2 surveys, 3 golden eagles, 1 American kestrel, 13 bighorn sheep, 35 common ravens, 4 great horned owls, 2 peregrine falcons, 3 prairie falcons, 13 red-tailed hawks, 7 Swainson's hawks, 1 turkey vulture and 1 unidentified falcon were observed totaling 83 unique wildlife documentations. All golden eagle nests and territories have been assigned a USGS Quad name, and all sightings have been documented with GPS locations and recorded, as recommended by the USFWS (Pagel et al. 2010, Gould and Schmidt 2011).

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Pagel J.E., D.M. Whittington and G.T. Allen. 2010. Interim Golden Eagle technical guidance: Inventory and monitoring protocols; and other recommendations in support of golden Eagle management and permit issuance. Division of Migratory Bird Management, U.S. Fish and Wildlife Service.

APPENDIX A
Wildlife Research Institute Golden Eagle Team
Note: Not all individuals, necessarily, participated in this survey.

Dave Bittner
Executive Director, WRI
Wildlife Biologist/Raptor Ecologist
Mr. Dave Bittner is a Co-founder and Executive Director of The Wildlife Research Institute, Inc. and has been a Wildlife Biologist for more than 44 years. Much of his work has been with raptors of various species but he has also studied and banded 3700 Great Blue Herons, conducted mammal research, and trapped and tagged over 3,000 mammals of various species. Dave currently coordinates an annual golden eagle and raptor population study throughout Southern California, including the Western Mojave Desert and the Anza-Borrego Desert State Park. He began helicopter surveys on raptors in the Mojave in 1968, in Korea in 1969, and in Ohio in the 1970’s. He is the current Primary Investigator (P.I.) for the Southern California Golden Eagle Population Study, the longest continuous running golden eagle study of its kind in the Western Hemisphere starting in 1867. Dave’s involvement began in 1968 in the Western Mojave but now includes all of Southern California and Nevada. Currently, he is also the P.I. for WRI's satellite and VHF telemetry-based golden eagle migration and habitat use study in cooperation with the US Forest Service, Montana Parks and Wildlife, Nevada Dept. of Wildlife and the California Department of Fish and Game. WRI, under Dave's direction, has conducted annual helicopter surveys on golden eagles and raptors in general since 1996. Dave has banded thousands of raptors since 1963 and has banded over 530 golden eagles, over 150 with VHF and satellite telemetry. He has conducted Bighorn Sheep surveys, both aerial and ground, for Desert Bighorn Sheep in the Mojave Desert and for Peninsular Bighorn Sheep in the Anza-Borrego Desert State Park and Baja, Mexico since 1998. Dave has also surveyed Bighorn Sheep in Montana where WRI has a Research Station. His education includes a B.Sc. in Zoology and Wildlife Management from Ohio State University (1968). He also conducted graduate studies in Avian Reproduction and Natural Resources (1975-1977) at The Ohio State University. Dave has worked for the U.S. Fish and Wildlife Service, Cleveland Museum of Natural History, and the Ohio Department of Natural Resources and has taught at two universities and one technical college.

Jeffrey L. Lincer, Ph.D.
Research Director, WRI
Senior Scientist/Wildlife Biologist/Raptor Ecologist
Dr. Lincer is a Co-founder and Research Director of The Wildlife Research Institute, Inc. and has extensive experience surveying for raptors, including helping establish WRI’s Montana Raptor Migration Station. He has actively participated in the institute’s Southern California Golden Eagle project since 2000, including helicopter and ground surveys since 2001. He has conducted numerous raptor surveys for federal, state, county, and local governments, and the private sector across desert and mountain habitat in the California Mojave and Anza-Borrego deserts, San Diego County, Nevada and the mountains of northern Baja Mexico. In addition, Jeff has over 100 hours of aerial surveying for Bald Eagles and over 50 hours for fish-eating birds. He has conducted Bighorn Sheep surveys in the Mojave Desert and for the Anza-Borrego Desert State Park since 1998. Dr. Lincer's background includes 40 years as a scientist, scientific advisor, and administrator in the environmental research and management areas. He has taught college level courses in environmental and occupational health, environmental science, ornithology, and mangrove ecology, produced over 100

scientific publications and papers (most on raptors), authored dozens of environmental reports, and served as advisor to high-level governmental offices and national/international conservation programs. Jeff received his Bachelors and Masters degrees in Wildlife Biology/Wildlife Management from Syracuse University and his Doctorate in Ecology and Toxicology from Cornell University. He is most well known for his work with raptors and other threatened/endangered species and his ability to manage complex interdisciplinary projects and work productively with government agencies. He is a Past-President of the Southern Chapter of The Wildlife Society. As President of the Raptor Research Foundation (RRF) from l982 to l988, he oversaw the greatest growth of that professional organization in its entire history. He chairs RRF’s Leslie Brown Award Grant Committee (for research on African raptors) and chaired the First International Burrowing Owl Symposium and Workshop. He is the Co-editor for the Proceedings of the First International Symposium on Burrowing Owls, a Co-editor of the proceedings of the First California Burrowing Owl Symposium, and is a contributing Technical Editor for a recent book on California's endangered species. Dr. Lincer was the founding Director of the National Wildlife Federation's (NWF) Raptor Information Center. During his NWF tenure, he coordinated with government agencies and the private sector, developed computerized literature databases, and prioritized eagle and other raptor habitat throughout the United States for acquisition. He served as Consulting Editor for the joint RRF/Bureau of Land Management publication, "Raptor Habitat Management Multiple Use Mandate." Over the last four decades, he has worked on major projects from Alaska to Africa, addressing raptor population trends, ecological monitoring, environmental impacts, ecotoxicology, and habitat protection and acquisition.

Leigh Bittner
Vice-President, WRI
Field Assistant

Mrs. Bittner first flew golden eagle helicopter surveys in 1996. She has participated in golden eagle nest surveys, nest observations, eagle banding, tagging and tracking in California since 1991, New Mexico, 2001 and Montana since 2000. Leigh has also been involved in tagging and releasing of some of the first California Condors in California, 1992, and Arizona, 1996. Leigh is a co-founder of the Wildlife Research Institute, Inc. and has been a Board member since 1996. She is a retired Marketing Manager from Hallmark Corporation and also helps coordinate office operations to support WRI's field activities.

Chris Meador
WRI Assistant Director
Wildlife Biologist

Mr. Meador is a full-time Wildlife Biologist for the Wildlife Research Institute (WRI) and has been a Wildlife Biologist for the past eight years. Chris started conducting helicopter surveys on golden eagles and other raptors in 2008, including over 250 hours of helicopter survey experience. He has conducted numerous raptor surveys for federal, state, county and local governments, and the private sector across desert, coastal and mountain habitats. He co-leads WRI’s Southern California Golden Eagle Population Study, the longest running study of its kind in the Western Hemisphere and has participated in it for the past ten years. He currently carries out myriad tasks as the project manager for various projects pertaining to the golden eagle. These include observation, trapping, tagging, and affixing radio and satellite telemetry transmitters to nestling, juvenile and adult golden eagles in San Diego County as well as migrating golden eagles in

Montana. He maintains and oversees much of the Wildlife Research Institute's tracking process including gathering, interpreting and publishing data and findings using GPS and GIS integration. Chris has conducted Bighorn Sheep surveys, both aerial and ground, in the Mojave Desert and for the Anza-Borrego Desert State Park since 2008. He has assisted with projects, including research, education and reintroduction on a broad range of species from endangered mammals (black footed ferret) to sensitive fish, black-tailed prairie dog and from Burrowing Owls to Desert Tortoises. Mr. Meador also conducts educational programs on multiple topics including natural history, ecology and conservation pertaining to many different species. He is an expert in identification and ecology of North American raptors. He holds a Bachelor of Arts degree with a double major in Environmental Studies and Psychology from Prescott College in Prescott, Arizona.

James Hannan, Ph.D.
Senior Wildlife Biologist

Dr. Hannan has experience with WRI conducting helicopter surveys of golden eagles and other raptors since 2002. Jim also helps on WRI's long running golden eagle Research project with nest observation, rappelling to, banding and tracking golden eagles since 2000. Jim, started golden eagle migration counts and banding in Montana in 2001. He is fluent in Spanish and served as an International Environmental Consultant for the Peace Corps and United Nations Volunteer programs His professional experience includes two years as a Peace Corps Volunteer (fisheries and agriculture, in Panama), one-year Peace Crops staff (fisheries development in Puerto Rico), and one year at the Smithsonian Institution. His academic experience also includes three years as Professor of Marine Biology and Environmental Studies at Florida Institute of Technology. Jim also spent twelve years as a private environmental consultant (contracts included Mexican aquaculture, impacts to Caribbean coral reefs, deer and other game studies involving radio transmitters for the California Dept of Fish and Game). He also served as a Texas game ranch manager, naturalist for East Africa wildlife filming company, fishery management advisor for the Florida Keys and holds a NAUI diver certificate and Florida EMT certificate. Dr. Hannan, is a WRI Senior Wildlife Biologist and Professor, Mesa College. He received his BS in 1965 from Humboldt State University, his MS in 1969 from University of Oregon, and his PhD in 1973 from the University of Miami (FL).

Daniel Palmer
Wildlife Biologist

Daniel received his Bachelor of Science in Biology from San Diego State in 2002 and has conducted graduate studies since that time. He is an experienced biologist, who has worked on a number of projects throughout Southern California for WRI and the USGS. WRI projects included surveys and monitoring for burrowing owls on private land and March Air Reserve Base, and golden eagle ground and aerial surveys on private property, State Park property, and US Forest Service land. Daniel has trapped for burrowing owls in order to assist with banding and relocation, and he has trapped for golden eagles in order to assist with banding, tagging, and satellite transmitter placement. He has also assisted with several banding trips, which included banding, tagging, and the placement of satellite transmitters on several golden eagle nestlings. During his work with WRI during 2011, Daniel logged well over 320 hours of survey time with golden eagles, as well as over 300 hours of monitoring and observation time for golden eagles and 23 other species of raptors. Before WRI, Daniel had worked for the USGS surveying for bats and Arroyo toads (*Anaxyrus californicus*) on US National Forest Service land, California State Park land, California Fish and Game reserves, Bureau of Land Management property, and on Marine Corps Base Camp Pendleton. Daniel decided to switch his focus back to raptors before becoming part of the WRI team. He has been a raptor biologist and observer for most of his biology career, and some of his recorded raptor data dates back to 1999.

Katie Quint
Wildlife Biologist
Ms. Quint received her Bachelor of Science in Zoology with a minor in Psychology from North Carolina State University in 2010. Part of her academic experience involved keeping and training over 60 species of large captive ungulates, small mammals, reptiles, and birds at both accredited and non-profit private zoos in Hawaii and North Carolina, respectively. She has committed herself to volunteer efforts for various animal shelters and zoos since 2007, where she specialized in designing and presenting educational programs in addition to providing animal care. Ms. Quint has one year of Golden Eagle experience including aerial and ground surveys in California and Nevada. She has participated in Golden Eagle and Burrowing Owl banding events as well as Burrowing Owl monitoring projects for WRI.

Renée Rivard, Pharm.D.
Wildlife Biologist
Dr. Rivard is currently a member of the Wildlife Research Institute’s Golden Eagle team; she has accumulated over 225 hours of extensive aerial transect surveys while participating in more than 18 golden eagle projects conducted by WRI for numerous renewable energy projects across desert and mountain habitat in the California Mojave desert, San Diego and adjacent counties, and Nevada. Additionally, she has spent over 150 hours conducting ground observations while participating in WRI’s ongoing golden eagle research and monitoring project in San Diego County and Montana as a member of the banding, repelling, telemetry, and trapping teams. She maintains the Golden Eagle Database and helps maintain Burrowing Owl artificial burrows on premises at WRI headquarters and continues to expand her knowledgebase related to these and other raptors. Renée assists with WRI’s annual Hawk Watch educational program about the Ramona Grasslands and its raptor residents and migrants. Her 20+ years of database, scientific publishing, and medical research experience provide her with the background and skills to efficiently and professionally assimilate survey data for WRI, clients and agencies. Over the last 5 years, she has accumulated diverse and valuable wildlife knowledge and skills as a wildlife rescuer, rehabilitator, and veterinarian assistant for non-profit organizations in Australia and, more recently, as a field technician and laboratory technician for the San Diego Zoo’s Institute for Conservation Research Applied Animal Ecology Department and Wildlife Disease Laboratory, respectively. Renée received her Bachelor’s of Science in Biology from the University of South Alabama (1987), graduated *cum laude* with her Doctorate of Pharmacy from Creighton University (1995), and completed specialized post-graduate papers in medical literature evaluation from the University of Auckland in New Zealand (2001).

Brittany Schlotfeldt
Wildlife Biologist
Ms. Schlotfeldt has experience with mammals and birds and field transect experience in both the marine and desert environments. Brittany has one year experience conducting helicopter surveys

of golden eagles and other raptors. She assisted with the research on coral recruitment across various conditions in Hawaii (Donald Potts Lab, UCSC) and tracked sea otters for SORAC (Sea Otter Research and Conservation) at the Monterey Bay Aquarium. Brittany has also assisted with, and performed, a number of tasks in the upland and desert habitats for various Wildlife Research Institute (WRI) projects. In the desert environment, she has assisted with WRI's research on golden eagles (radio telemetry and tracking), burrowing owls (transect surveys, field observations, trapping, and banding), and desert tortoises (surveyed over 100 miles of protocol transects in the Western Mojave Desert with Drs. Boarman and Lincer, and Mr. Peter Woodman). This study, which was recently completed, was a follow-up on an earlier project focused on the potential impacts of vehicular traffic, and highway fencing, on tortoise mortality (Boarman and Sazaki 2006). She has additional experience with desert tortoises on Fort Irwin, where she conducted numerous surveys and assisted with the VHF-transmittering of tortoises in an effort to relocate the individuals. Ms. Schlotfeldt received her Bachelor's of Science in Marine Biology from the University of California, Santa Cruz (2008).

Jeff Wells
Wildlife Biologist
Mr. Wells has been involved with WRI's golden eagle research since 1991 including trapping, banding and tracking. Jeff has ten years experience with WRI conducting helicopter surveys of golden eagles and other raptors. He has his Bachelors in Wildlife Studies from San Diego State University and has over 20 years experience as a private wildlife biologist. For the past 5 years, Jeff has been a Wildlife Biologist for the US Forest Service.

James Newland
Field Biologist
Mr. Newland has assisted WRI on golden eagle research for the last 4 years banding, trapping, and VHF and satellite tracking. James has also assisted trapping and tracking golden eagles at WRI's migratory research center in Montana. He has one year experience conducting helicopter surveys of golden eagles and other raptors. James has a Bachelor's of Science in Electrical Engineering and has worked for numerous large communication corporations.

Jeff Laws
Field Biologist/Bio-climber
Mr. Laws has assisted WRI with Golden Eagle research and field work since 1995. He has also assisted trapping and tracking Golden Eagles at WRI's migratory research center in Montana. Jeff has five years experience conducting helicopter surveys of Golden Eagles and other raptors with WRI. Jeff works as a climber and field installer for San Diego Gas & Electric Company.

Mel Cain
Pilot, Utility Helicopters
Mr. Cain has more than 55 years experience flying helicopters for wildlife surveys. Utility Helicopters, with their Hughes-500 helicopters, has assisted WRI in Golden Eagle and raptor surveys for the last 10 years in the United States and Mexico. Mel has 12 years of experience in New Zealand trapping and transporting big game including deer and elk. He has conducted

hundreds of netting and translocations of Bighorn Sheep and Tule Elk in California for California Fish and Game and California State Parks. Mel works frequently in Mexico and Canada and maintains NAFTA and Mexican permits to conduct wildlife and resource surveys.

Gregg Matson, M.D.
Pilot, Cherry Helicopters
Dr. Matson is a practicing physician who also started and headed a helicopter company in Hawaii to provide industrial and tourist services. Cherry Helicopters uses Hughes-500 helicopters to conduct these surveys. Gregg, WRI, and Cherry Helicopters have conducted wildlife surveys both in the United States and Mexico. He has supported WRI in aerial helicopter surveys of Golden Eagles, raptors and other wildlife for the last 8 years.

Barry Martin
Pilot, Western Tracking Institute
Mr. Martin is a WRI Research Associate and Director of the Western Tracking Institute. He has a Bachelor's in Business from Fresno State and an Associate's degree in Aeronautics. He has 42 years of flying experience and 22 years in the Navy with over 300 aircraft carrier landings. Concurrent with his Navy experience, he flew for over 21 years as a pilot for American Airlines. In total, Barry has over 20,000 hours of experience in the air. In 1989, Barry started the San Diego Tracking Team and started the Western Tracking Institute in 2007 to further expand his studies in wildlife populations and movements. In 2006, he started VHF tracking from aircraft primarily for mountain lions and 2 years later, began assisting WRI in aerial VHF tracking of Golden Eagles.

APPENDIX B
2011 Joshua Tree National Park Permit

SCIENTIFIC RESEARCH AND COLLECTING PERMIT

Grants permission in accordance with the attached general and special conditions

United States Department of the Interior
National Park Service

Joshua Tree NP

Study#: JOTR-00157
Permit#: JOTR-2011-SCI-0030
Start Date: Jun 06, 2011
Expiration Date: Jun 30, 2011
Coop Agreement#: n/a
Optional Park Code: JOTR

Name of principal investigator:

Name: Dave Bittner **Phone:** 7607893992 **Email:** WildlifeResearchInstitute@gmail.com

Name of institution represented:

Wildlife Research Institute

Co-Investigators:

Name: Chris Meador	**Phone:** 7607893992	**Email:** cmeador@wildlife-research.org
Name: Rene Revard	**Phone:** 760-789-3992	**Email:** rrevard@wildlife-research.org

Project title:

Golden Eagle Surveys

Purpose of study:

To determine potential conflicts with wildlife productivity and surviability that might result from proposed solar projects located adjacent to the southern and eastern edges of but just outside the park. In addition a large linear transmission line is proposed just south of the park and also requires surveys for raptors and in particular Golden Eagles. The survey, per USFWS protocol,is a ten mile radius around the project area. The area of the park to be surveyed by helicopter is the Coxcombs and Eagle mountains and the southern edge of the park facing the I-10 corridor.

Subject/Discipline:

Birds / Ornithology

Locations authorized:

All suitable Golden Eagle habitat within a 10 miles radius from proposed solar site. Helicopter survey is proposed to occur in south-east portion of park, including Eagle Mountains and Coxcomb Mountains.

Transportation method to research site(s):

Helicopter flight survey on a single day only. The helicopter is a Hughes 500, a small and manuerable helicopter that we use for wildlife surveys. We will fuel and access from outside the park and will only be airborne above the park.

Collection of the following specimens or materials, quantities, and any limitations on collecting:

1) Permittee will strictly adhere to the USFWS (Feb 2010) guidelines on "Interim Golden Eagle Inventory and Monitoring Protocols; and Other Recommendation". Avoid any disturbance to nesting raptors. Keep the maximum distance (approach only as close as needed to identify) from nesting raptors possible when collecting data. Park values the data collected as part of this effort but, is concerned that data may be collected in a way that disturbs a nesting raptor population that is spatially remote and relatively free of human disturbance. Helicopter blade "wash" should not disturb raptors. USFWS protocol states that any disturbance to raptors is considered "take" and should be avoided at all costs.

2) Prior to and throughout project's study, permittee should coordinate with the Park's Wildlife Ecologist regarding sensitive wildlife habitat and concerns. Prior to aerial surveys in the Park, permittee will submit and follow the flight plan as discussed with Wildlife Ecologist and all NEPA and NHPA compliance must be completed. Permittee must provide a preliminary verbal report of his findings by no later than Wed, June 8, 2011 (weather permitting) or within 24 hours of post-aerial eagle surveys.

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3) Recommend that surveying for eagles occur no less than 500 feet above ground level and checking for eagle nests & activity should be kept as short as possible. If bighorn sheep activity is noted, then fly back to a higher elevation to minimize impacts. Request that an ornithologist and a bighorn sheep biologist be present to provide flight guidance to minimize impacts to both taxa (e.g. avoid harrassing animals).

Name of repository for specimens or sample materials if applicable:

n/a

Specific conditions or restrictions (also see attached conditions):

Park Conditions - Joshua Tree NP

Joshua Tree National Park Research Conditions & Restrictions

- Permittee will strictly adhere to the USFWS (Feb 2010) guidelines on "Interim Golden Eagle Inventory and Monitoring Protocols; and Other Recommendation". Avoid any disturbance to nesting raptors. Keep the maximum distance (approach only as close as needed to identify) from nesting raptors possible when collecting data. Park values the data collected as part of this effort but, is concerned that data may be collected in a way that disturbs a nesting raptor population that is spatially remote and relatively free of human disturbance. Helicopter blade "wash" should not disturb raptors. USFWS protocol states that any disturbance to raptors is considered "take" and should be avoided at all costs.

- Prior to and throughout project's study, permittee should coordinate with the Park's Wildlife Ecologist regarding sensitive wildlife habitat and concerns. Prior to aerial surveys in the Park, permittee will submit and follow the flight plan as discussed with Wildlife Ecologist and all NEPA and NHPA compliance must be completed. Permittee must provide a preliminary verbal report of his findings by no later than Wed, June 8, 2011 (weather permitting) or within 24 hours of post-aerial eagle surveys.

- Recommend that surveying for eagles occur no less than 500 feet above ground level and checking for eagle nests & activity should be kept as short as possible. If bighorn sheep activity is noted, then fly back to a higher elevation to minimize impacts. Request that an ornithologist and a bighorn sheep biologist be present to provide flight guidance to minimize impacts to both taxa (e.g. avoid harrassing animals).

- When annual IAR(s) and final report are submitted to the Park, permittee must provide copies of all field records (e.g. field notes, data collected, results of scientific analyses, maps w/ GPS coordinates, photos, reports, etc...) on archival or acid-free quality paper to the Park Research Coordinator.

- Permits must be carried at all times by all individuals covered under the permit while conducting research in the park.

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1. This permit, issued by the National Park Service (hereafter referred to as NPS), allows the named principal investigator to collect certain animal, plant, or mineral resources in the locations and quantities specified. Archeological and paleontological materials may not be collected or disturbed under this permit unless accompanied by a current Antiquities Permit.

2. Field assistants may collect only under the direct supervision of the principal investigator named on the permit. The permit holder is responsible for seeing that each assistant understands the permit stipulations. Assistants collecting independently must be issued their own collecting permits.

3. This permit does not give the bearer license to violate any NPS regulations.

4. A pre-field work meeting may be required between the principal investigator(s) and NPS staff to clarify and reinforce permit conditions, access, research/collecting methods, reporting, communications and other items related to this permit

and the research proposal.

5. Before initiating field research please contact the park Research Coordinator at (760)367-5579. Identify yourself by name, organization, or agency, and describe where you will be working, and vehicle(s) being used.

6. If designated parking areas are not convenient, park in a safe place with plenty of sight distance for other traffic that does not cause any damage to the resources.

7. Place a copy of the enclosed Research and/or Collecting Permit in the driver side window of your parked vehicle.

8. If access is required inside administratively closed areas, make advance arrangements, ensure that your permit notes these access issues, and advise the local federal dispatch center (1-909-383-5652) before going into those closed park areas. Ask for the park service dispatcher and inform them of your permitted activity, permit number and time in and out of the area.

10. All collecting (if permitted) must be done away from roads, trails, and developments, unless otherwise specified in the permit. Collection methods shall not attract attention or cause unapproved damage to the environment. If visitors inquire about your collecting, please provide information to them in a courteous and informative manner. This information should reflect â that collecting without a permit carries stiff penalties and that collection permits are available only for a reputable scientific or educational institution or a State or Federal agencyâ .

11. Collected specimens will remain Federal property unless and until ownership is conveyed.

12. The Research Coordinator does require locality records (UTMs) for all plots, survey areas, research vicinities, excavations, transects or any other georeferenceable aspects of activities noted in this permit. The Research Coordinator may also require an inventory and locality record (UTMs) for any or all specimens before they are removed and, after the collection has been assembled, to submit it for examination. An electronic metadata form to be used for this purpose is available through the Research Coordinator. Applicability of this requirement to your research activity should be discussed with the park Research Coordinator prior to any activities.

13. Collected specimens may be used for scientific or educational purposes only, shall be dedicated to public benefit, and shall not be used for commercial profit.

14. The NPS reserves the right to designate the depository of all specimens removed from the park and to approve or restrict transfers of specimens between depositories. The NPS also reserves the right to designate the U.S. National Museum or the park museum as the depository of any specimen removed from the park, after the collector has made necessary studies and published the results of those studies.

15. Each specimen (or groups of specimens labeled as a group) that is stored, exhibited, conserved, etc. must bear labels stating that they are the property of the NPS and must be accessed and cataloged in the NPS National Catalog.

16. One copy (or more if specified) of all scientific and other publications resulting entirely or in part from research and/or collecting through the issuance of this permit will be furnished to the Superintendent of the park. Field notes should be copied and furnished in either electronic format (portable document file â pdf) or as a hard copy. For information regarding cataloging, identification or deposition of field notes and reports, contact Museum Curator Melanie Spoo at (760) 367-5571.

17. This permit expires on the date shown, but no later than December 31 of the year issued. A new collecting permit may be issued for each subsequent calendar year of study only after the Investigator's Annual Report for the completed year is received by the park Superintendent.

18. Nothing in this permit shall be construed as granting any exclusive research privileges or automatic right to continue, extend, or renew this or any other line of research under new permit(s). Each research/collecting proposal request will be evaluated on its own merit.

19. Violation of these terms and conditions may result in the suspension or revocation of the permit. Failure on the part of the collector(s) to adhere to the policies outlined by the park and those policies as stipulated in the Code of Federal Regulations (CFR), Title 36, Section 2.5, and National Park Service (NPS) Management Policies may result in the withdrawal of this collecting permit.

20. 36 CFR, Chapter 1, Section 2.5 -- Research Specimens: further defines and clarifies the basic conditions under which this permit is issued.

21. Authority - The permittee is granted privileges covered under this permit subject to the supervision of the superintendent or a designee, and shall comply with all applicable laws and regulations of the National Park System area and other federal and state laws. A National Park Service (NPS) representative may accompany the permittee in the field to ensure compliance with regulations.

22. Responsibility - The permittee is responsible for ensuring that all persons working on the project adhere to permit conditions and applicable NPS regulations. Violations of the conditions of this permit may be punishable by a fine as provided by law, or by imprisonment not exceeding 6 months, or both, and shall be adjudged to pay all costs of the proceedings. 36 CFR, Chapter 1, Section 1.3(a).

23. False information - The permittee is prohibited from giving false information that is used to issue this permit. To do so will be considered a breach of conditions and be grounds for revocation of this permit and other applicable penalties.

24. Assignment - This permit may not be transferred or assigned. Additional investigators and field assistants are to be coordinated by the person(s) named in the permit and should carry a copy of the permit while they are working in the park. The principal investigator shall notify the park's Research and Collecting Permit Office when there are desired changes in the approved study protocols or methods, changes in the affiliation or status of the principal investigator, or modification of the name of any project member. Changes must be approved and noted on the permit before implemented. Attaching email correspondence confirming changes is an acceptable method of noting changed activities.

25. Revocation - This permit may be terminated for breach of any condition. The permittee may consult with the appropriate NPS Regional Science Advisor to clarify issues resulting in a revoked permit and the potential for reinstatement by the park superintendent or a designee.

26. Reports - The permittee is required to submit an Investigatorâ s Annual Report and copies of final reports, publications, and other materials resulting from the study. Principal Investigators will receive emailed instructions on how and when to submit an annual report. This is typically completed at the end of the calendar year. Park research coordinators will analyze study proposals to determine whether copies of field notes, databases, maps, photos, and/or other materials may also be requested. The permittee is responsible for the content of reports and data provided to the National Park Service.

27. Confidentiality - The permittee agrees to keep the specific location of sensitive park resources confidential. Sensitive resources include threatened species, endangered species, and rare species, archeological sites, caves, fossil sites, minerals, commercially valuable resources, and sacred ceremonial sites.

28. Methods of travel - Travel within the park is restricted to only those methods that are available to the general public unless otherwise specified in additional stipulations associated with this permit.

29. Other permits - The permittee must obtain all other required permit(s) to conduct the specified project.

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30. Insurance - If liability insurance is required by the NPS for this project, then documentation must be provided that it has been obtained and is current in all respects before this permit is considered valid.

31. Mechanized equipment - No use of mechanized equipment in designated, proposed, or potential wilderness areas is allowed unless authorized by the superintendent or a designee in additional specific conditions associated with this permit. Use of artificial light for the purposes of viewing wildlife, that is not expressly stated in this permit is prohibited. [CFR 36, Part 1, Ch 2.2 (b)(4)(e)]

32. NPS participation - The permittee should not anticipate assistance from the NPS unless specific arrangements are made and documented in either an additional stipulation attached to this permit or in other separate written agreements.

33. Permanent markers and field equipment - The permittee is required to remove all markers or equipment from the field after the completion of the study or prior to the expiration date of this permit. The superintendent or a designee may modify this requirement through additional park specific conditions that may be attached to this permit. Additional conditions regarding the positioning and identification of markers and field equipment may be issued by staff at individual parks.

34. Access to park and restricted areas - Approval for any activity is contingent on the park being open and staffed for required operations. No entry into restricted areas is allowed unless authorized in additional park specific stipulations attached to this permit.

35. Notification - The permittee is required to contact the parkâ s Research and Collecting Permit Office (or other offices if indicated in the stipulations associated with this permit) prior to initiating any fieldwork authorized by this permit. Ideally this contact should occur at least one week prior to the initial visit to the park.

36. Expiration date - Permits expire on the date listed. Nothing in this permit shall be construed as granting any exclusive research privileges or automatic right to continue, extend, or renew this or any other line of research under new permit(s).

37. Other stipulations - This permit includes by reference all stipulations listed in the application materials or in additional attachments to this permit provided by the superintendent or a designee. Breach of any of the terms of this permit will be grounds for revocation of this permit and denial of future permits.

Recommended by park staff(name and title):

Reviewed by Collections Manager:

Yes ___ No ___

Approved by park official:

Date Approved:

Title:

Superintendent

I Agree To All Conditions And Restrictions Of this Permit As Specified
(Not valid unless signed and dated by the principal investigator)

(Principal investigator's signature)

6/6/2011
(Date)

THIS PERMIT AND ATTACHED CONDITIONS AND RESTRICTIONS MUST BE CARRIED AT ALL TIMES WHILE CONDUCTING RESEARCH ACTIVITIES IN THE DESIGNATED PARK(S)

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APPENDIX E

AVIAN USE MEMO

Exhibit A

Painted Hills IV

Avian Use

Painted Hills IV Wind Energy Project, Avian Use

PREPARED FOR: David Hastings, First Wind
Irina Makarow, First Wind

PREPARED BY: Patti Murphy, CH2M HILL
David Phillips, CH2MHILL

DATE: May 31, 2011

Introduction

Greyback Wind LLC, a fully owned subsidiary of First Wind, is requesting a determination of Substantial Conformance to Permit WECS 52, Rev. 1, to allow the construction of wind generation turbines on approximately 238 acres in the southern half of Section 1, T3S, R3E, within the jurisdiction of Riverside County (County).

The Project is located within the San Gorgonio Pass (or Pass) where wind energy generation projects have been implemented since the 1980s. Up to 5,487 acres of land in this area are determined to be suitable for wind energy development. Of these lands, 2,300 acres of private and 3,187 acres of United States Bureau of Land Management (BLM)-administered public lands are presently developed for wind energy production (BLM, 2007a). In 2008, the American Wind Energy Association (AWEA) estimated that the Pass included approximately 3,200 turbines delivering approximately 615 megawatts (MW) of power (AWEA, 2008).

Since the early 2000s, a number of projects in the Pass have been either “re-powered” (old turbines being replaced by newer, more-efficient turbines) or “overpowered” (newer, more-efficient turbines added to an existing generation site). The purpose of this document is to summarize publicly available avian use information that has been published since the County’s original approval of Commercial Wind Energy Combining System (WECS) Permit 52, Revision Number 1 to construct up to 18 1.5-MW turbines in 1999. This memorandum also discusses the relationship of this information to the anticipated avian use at Section 1 South.

Project Description

The Project site is generally located within the San Gorgonio Pass, a low-elevation, narrow pass between Mt. Gorgonio to the north and Mt. Jacinto to the south. The area is windy most of the year due to the air pressure equalization that occurs between the Pacific coast to the west and the interior deserts to the east. Precipitation in the region is typically less than 10 inches per year and temperatures range from 32 to 120 degrees Fahrenheit.

Greyback Wind, LLC, is proposing the Painted Hills IV Project to construct and operate 13 wind turbines on two separate sections of private land within Riverside County (Figure 1). The southern parcel, referred to as Section 1, consists of approximately 238 acres in the southern half of Section 1, T3S, R3E, within the jurisdiction of the County, ranging from

1,380 feet above mean sea level (msl) at the southeast corner of the parcel to 1,720 feet above msl at the western boundary. Section 1 is located within an operating wind facility consisting of approximately 239 wind turbines and associated access roads and ancillary facilities.

In 1999, Riverside County approved permits for construction of 18 Zond 750-kilowatt (kW) turbines on Section 1, and Greyback Wind LLC is applying for a substantial conformance determination for the installation of eight 1.5-MW turbines, in lieu of the permitted 18 turbines. Under the current plan, all existing turbines on Section 1 will remain operational. While the 1.5-MW turbine is a taller turbine with a larger rotor diameter than the Zond, the installation of the eight turbines, rather than the originally-permitted 18 Zond turbines, results in a 13 percent reduction in total rotor-swept area. A comparison of the technical specifications of the approved Zond versus the proposed 1.5-MW turbine is presented in Table 1.

TABLE 1
Comparison of Permitted and Proposed Turbine Characteristics

Technical Specifications	Permitted Zond 750-kW turbines	Proposed 1.5 MW turbines
Hub Height	65 meters	80 meters
Rotor Diameter	50 meters	70 meters
Blade Tip Height	90 meters	115 meters
Rotor-Swept Area	1,964 square meters (m^2)	3,850 m^2
Quantity	18	8
Total Rotor Swept Area	35,352 m^2	30,800 m^2
Reduction in Total Rotor Swept Area	0%	13%
Total Project Generation Capacity	13.5 MW	12 MW

The northern parcel, referred to as Section 31, consists of 160 acres located in the southern half of Section 31, T2S, R4E, San Bernardino Meridian, within the jurisdiction of the City of Desert Hot Springs (City) at approximately 1,800 feet above msl. The northern parcel is located within an operating wind energy facility consisting of approximately 69 wind turbines and associated unpaved access roads. The Painted Hills IV Project proposes to construct five additional turbines on this property and remove approximately 16 of the existing turbines.

Avian Use and Mortality Studies

The Painted Hills IV Project site has been included within regional avian use and risk studies conducted for the San Gorgonio Pass since the 1980s. More recent avian data has been collected and general avian use characterizations have been included in the environmental analyses conducted for recently proposed projects in the vicinity of Painted Hills IV. The available regional and site-specific avian use and mortality studies are summarized in the following sections.

Region-Wide Analyses

Since the initial development of wind energy in the San Gorgonio Pass in the 1980s, the potential risks to avian species have been investigated by regulating agencies, such as Riverside County, the California Energy Commission, and BLM, as well as by Project proponents, such as Southern California Edison. These studies have focused on estimating the density and utilization patterns of migrating birds and anticipating potential avian mortality rates for the Pass.

Avian Use in the San Gorgonio Pass

High use by migratory songbirds has been documented in the Pass during both the spring and fall seasons. McCrary et al. (1983) estimated 32 million birds flew through the Coachella Valley during spring of 1982, and 37 million birds during the fall of 1982 (McCrary et al., 1984), based on passage rates recorded with radar equipment. The study area covered by McCrary included the Painted Hills IV site within the San Gorgonio Pass, and areas outside of the Pass, including Palm Canyon, the Whitewater floodplain, and Thousand Palms.

McCrary et al. (1984) observed that the migratory birds in San Gorgonio Pass generally flew at heights ranging from 200 to 400 meters above the ground, even higher than the rotor-swept area of the taller, modern turbines. A smaller proportion (11 percent) of bird flight was observed below 127 meters. The study noted that on very windy nights, birds can be blown down closer to the ground or may seek shelter at ground level, in which cases the turbines on the ridge tops can present a risk of collision.

Anderson et al. (2005) completed an assessment of avian risk for projects in this area (*Avian Monitoring and Risk Assessment at the San Gorgonio Wind Resource Area* [included as Attachment A]), and the proposed Painted Hills IV Project site was included in the "Medium Elevation Area" within the study area. Their study was designed to provide statistical evidence regarding differences in use, fatality rates, and the risk index among levels of multiple factors. The methodology was developed collaboratively by biostatisticians and field methodology experts representing federal, state, utility, consulting, and environmental organizations. The methods are consistent with those suggested in "Studying Wind Energy/Bird Interactions: A Guidance Document" (Anderson et al., 1999).

During the surveys, the medium elevation area had consistently low numbers of avian species across all seasons, with summer comprising the lowest avian use (mean number of individuals per survey) for all elevation areas and all seasons. During all seasons, passerines were consistently the most-frequently observed group. At sites between 400 and 800 meters from the nearest wind turbine, the five most-abundant species observed were passerines with the exception of red-tailed hawk and American kestrel comprising the second and fourth most-abundant in summer and red-tailed hawk the third most-abundant in winter. At sites more than 1 kilometer from the nearest turbine, the only raptor in the five most-abundant species was the burrowing owl, and then only during the summer season. Bald and golden eagles were observed during the avian use studies, although it is not clear where they were observed within the study area.

Recorded Avian Mortality in the San Gorgonio Pass

Data indicate that wind energy development projects in the San Gorgonio Pass pose substantially less risk to avian species overall and result in fewer number of fatalities from turbine collisions, compared to projects in other parts of the state. McCrary et al. (1986) estimated that 6,800 birds were killed annually, based on 38 dead birds (consisting of 25 different species) found while monitoring nocturnal migrants. Considering the high number of nocturnal migrants relative to fatalities, the authors concluded that the level of mortality was biologically insignificant.

Anderson et al. (2000) observed that mean fatality rates were lowest in the high-elevation area, and second lowest in the medium elevation area, suggesting that low elevation and the presence of water present greater collision risk to birds. Phase 1 of their studies included a total of 830 carcass searches (carcass search areas included one to numerous turbines) from March 3, 1997, to May 29, 1998. Phase 2 included a total of 600 carcass searches from August 18, 1999, to August 11, 2000.

Only one golden eagle was recorded as killed during Phase 1 of the Anderson et al. (2005) studies (one additional golden was observed, but was not included in the summary fatality data because it was found injured and euthanized). American coot (11), Rock dove (12), and unidentified bird (11) were the most-abundant species in the Phase 1 datasets, whereas all raptors combined comprised only eight fatalities—red-tailed hawk (2), golden eagle (1), barn owl (3), great horned owl (1), and burrowing owl (1).

Phase 2 data showed less range, with five rock doves comprising the highest number of recorded fatalities, and raptors combined comprising only four total fatalities—red-tailed hawk (1), American kestrel (1), great horned owl (1), and an unidentified owl (1). The unadjusted estimate of raptor fatalities for the wind resource area (including Low, Medium, High Elevation and Water Areas) was 0.006 per turbine per year, much lower than estimated fatality rates in the Altamont Pass (Smallwood and Thelander, 2004) or Tehachapi Pass Wind Resource Areas (Anderson et al., 2004).

Because eagles, other raptors, and species of special status or conservation concern comprise such a small component of the actual bird strikes (Anderson, 2005), it is unlikely that these projects in the San Gorgonio Pass contribute to any measureable population level impacts either regionally or throughout the range of each species. This is consistent with raptor fatality estimates of 0.010 per turbine per year in San Gorgonio, and 0.048 per turbine per year for both Altamont and Montezuma Hills provided by Western Ecosystems Technology, Inc., as reported in *A Summary of Existing Studies and Comparison to Other Sources of Avian Collision Mortality in the United States* (National Wind Coordinating Committee [NWCC], 2001).

Site-Specific Data from Projects in the Vicinity

Eight existing wind energy projects with similar site characteristics occur in the vicinity of the proposed Painted Hills IV Project (Cabazon, Dillon Wind, Edom Hills, Mesa Wind, Mountain View IV, Palm Springs Repower, Tenderland, and Whitewater). Avian point count surveys were conducted more recently for the Dillon Wind and Palm Springs Repower projects in the vicinity of the Painted Hills IV Project. The results of these studies were generally consistent with the results described for the regional McCrary and Anderson studies.

Dillon Wind Project

The Dillon Wind Project is located approximately 1.2 miles East of Painted Hills IV (Figure 2). Bird use count surveys were conducted from March through July 2006 within the Project's three main areas. Four sets of surveys (March 23 and 24, April 18, June 1, and July 24) were conducted at each of the project's three areas (labeled 1, 3, and 5) during which birds were observed for 30 minutes outwards for a distance of 800 meters. Twelve bird species were observed, with only red-tailed hawk observed at a height within the rotor-swept area (approximately 38 to 100 meters) (Amalong and Mudry, 2007). The other species observed and the heights at which they were observed are provided in Table 2.

TABLE 2
Avian Point Count Survey Data- Species Observed (No. Observed/Flight Height [meters]) by Month and Observation Point for the Dillon Wind Energy Project

Date	Mar 2006			Apr 2006			Jun 2006			Jul 2006		
Project Area/Species	**1**	**3**	**5**	**1**	**3**	**5**	**1**	**3**	**5**	**1**	**3**	**5**
Black phoebe		1/20										
Black-throated sparrow										1/0		
Common raven	1/10			1/10								
European starling					1/30							
Horned lark	1/0											
House finch		1/0	2/5	3/0								
Lincoln's sparrow			12/0									
Loggerhead shrike		1/0										
Northern mockingbird	1/0											
Red-tailed hawk			1/500	2/60		1/30			1/50			
Unidentified swallow	4/20			1/30								
White-crowned sparrow				7/0	7/0	3/0						
Total Birds Observed	7	3	15	14	10	4	2	0	1	1	0	0

Source: Amalong, Matt and Dwight Mudry. 2007. General Biological Resources Assessment: Dillon Wind Energy Conversion System, County of Riverside, California. Appendix E of the Final Environmental Impact Report prepared for Commercial WECS Permits 116 and 117.

Based on the low number of birds observed, the low number flying in the rotor-swept area, and the low raptor fatality rates estimated by Anderson et al. (2005) for the San Gorgonio projects, bird fatality risks at the Dillon Wind Energy Project are anticipated to be low (County of Riverside, 2006a).

Palm Springs Repower Project, Commercial WECS Permit Nos. 116 and 117

Bird use count surveys were conducted for 10 days during the spring and summer of 2010, prior to construction of this repower project. The project includes two separate properties, located approximately 1.1 miles to the southwest and 2.5 miles to the southeast of Painted Hills IV (Figure 2). Frequency of avian use and number of species detected was reported as very low, with resident ravens being the only species observed within the rotor-swept area. Additionally, avian fatality was monitored for the wind turbines that were removed as part of the Project, prior to their removal. Only seven carcasses were observed during approximately 2,400 turbine visits associated with avian mortality surveys over a 3-year period from January 2006 to December 2008 (City of Palm Springs, 2010). No information on the species of the carcasses was provided.

Additional Avian Information from Projects in the Vicinity

Though focused bird use counts have not been conducted for Painted Hills IV or for many of the recently proposed wind energy projects in the vicinity, some information is available based on incidental sightings recorded as part of more general wildlife survey reports. The information is presented here to further qualitatively characterize avian use in the area.

Painted Hills IV Project

In April 2011, Garcia and Associates (GANDA) conducted focused wildlife surveys for desert tortoise and burrowing owl on the Painted Hills IV Project site. During these surveys, incidental observations of other wildlife species were also documented. The avian species observed onsite included western kingbird, common raven, red-tailed hawk, Gambel's quail, mourning dove, western mockingbird, and western meadowlark (Finck, 2011).

Cabazon Wind Energy Project, Commercial WECS Permit No. 118

Least Bell's vireo was sighted in the vicinity of the project in 1984 and is assumed to be onsite (County of Riverside, 2006b). Incidental sightings of Le Conte's thrasher and yellow warbler date back to 1930 or earlier, and no other special status bird species sightings are known for the site (County of Riverside, 2006b).

Edom Hills Wind Repower Project

Bird observations during wildlife surveys for the project, located approximately 8.8 miles to the southeast of the Painted Hills IV site (Figure 2), included common raven, loggerhead shrike, mourning dove, Gambel's quail, American kestrel, and warbling vireo. One potential burrowing owl burrow was recorded and no other sensitive bird species were observed (BLM, 2007b).

Mountain View IV Wind Energy Project

The Mountain View IV project is located approximately 3.9 miles southeast of the Painted Hills IV site, south of Interstate 10. Surveys for general biological resources recorded sightings of mourning dove, common raven, horned lark, and loggerhead shrike. In an area of ponded water and drying mudflats, mallard, cinnamon teal, killdeer, and least sandpiper were observed, along with other common water birds. A single burrowing owl and burrow were observed. No other sensitive bird species were found.

Whitewater Wind Energy Project, Commercial WECS Permit No. 115

Located less than a mile from the Painted Hills IV site, a single burrowing owl and burrow were recorded during wildlife surveys for the Whitewater project. No other sensitive bird species were observed (County of Riverside, 2006c). No data for non-sensitive avian species was provided.

Discussion and Conclusions

Based on the data available for the region and the turbine specifications and design elements incorporated into the Painted Hills IV Project, it is reasonable to assume that the Project would not contribute to significant adverse impacts to any avian species potentially present in the area. Additionally, the project does not pose any greater impact to avian species than the original, 18-turbine project that the County permitted in 1999; and in fact, it is anticipated to pose a smaller risk.

Regional Characterization of Risks to Avian Species

The Painted Hills IV Project is sited in an area where migratory bird studies have documented avian use at heights taller than the rotor-swept area of even the taller, modern turbines. Studies of the San Gorgonio Pass, including data from the Painted Hills IV site, have documented relatively low numbers of avian species, including few observations of raptors, and estimated low bird strike and raptor fatality rates.

Recent site-specific avian studies conducted for other wind energy projects in the area have corroborated the conclusions of regional studies, and wind energy projects in the Pass appear to be well-sited with regard to minimizing potential impacts to avian populations.

Relative Impacts of Painted Hills IV and the Previously Permitted Project

Compared to the 18 Zond turbines that were originally permitted, the eight turbines included in the currently proposed Painted Hills IV Project would reduce the rotor-swept area of the project by 13 percent, from 35,352 to 30,800 m^2. The rotor-swept area is presumably the area of greatest collision risk to birds due to the spinning blades. By reducing the project rotor-swept area, it is anticipated that potential impacts due to bird strikes would be reduced, compared to the project approved under the revised WECS 52 permit.

The increased overall height of the 1.5-MW turbines over the 750-kW turbines is not anticipated to create greater risk of avian collisions, based on McCrary’s observation that the vast majority of nighttime migrants in the San Gorgonio Pass fly at heights of 200 to 400 meters above the ground—well above the height of the 115-meter blade tip height of the turbines proposed as part of the Painted Hills IV Project.

Conclusion

Due to its location within the Pass in a mid-elevation area, its proximity to recently studied sites with estimated low avian risks, the siting of wind turbines away from open water and riparian vegetation, and the use of tubular monopole tower design that eliminates perching attractants associated with lattice structures and guy wires, the Painted Hills IV Project is designed to avoid impacts to avian species. In addition, in comparing the specifications of the 18 turbines permitted by the County in 1999, the Painted Hills IV Project would reduce risks to avian species by reducing the total rotor-swept area included on the site.

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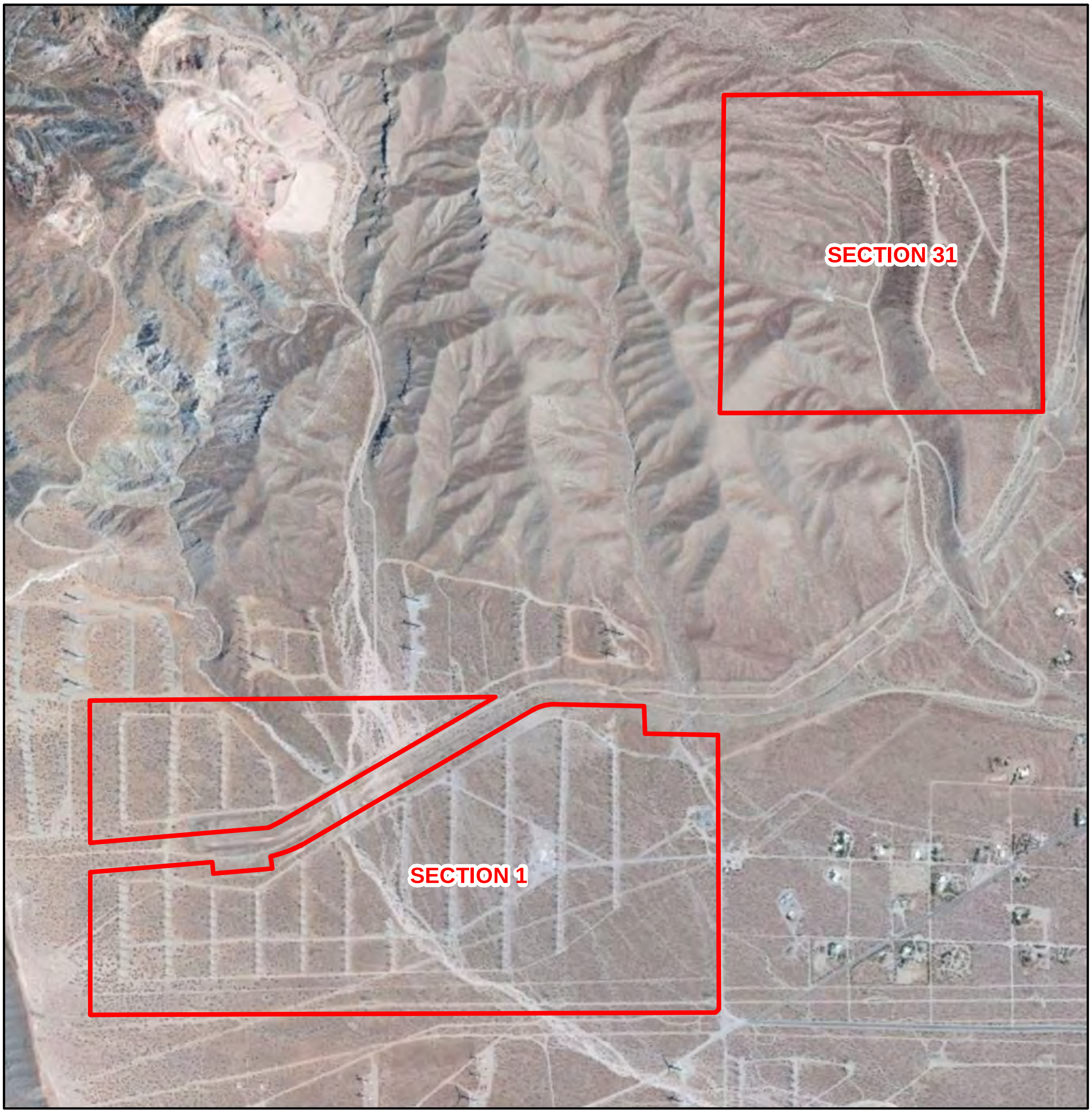
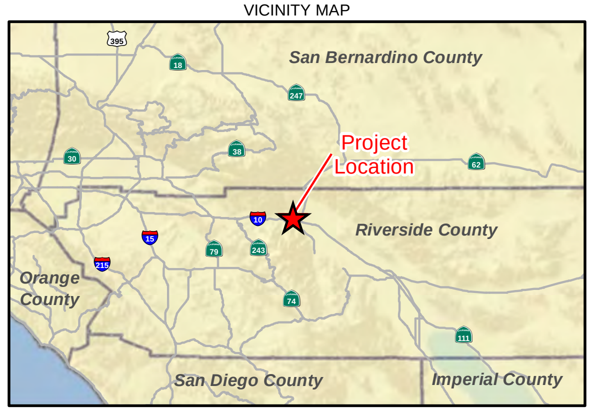


LEGEND

Painted Hills Project Boundary

VICINITY MAP



N

0 600 1,200
Feet

FIGURE 1
Painted Hills IV Wind Energy Repower Project Area
Painted Hills Project
Riverside County, CA

CH2MHILL

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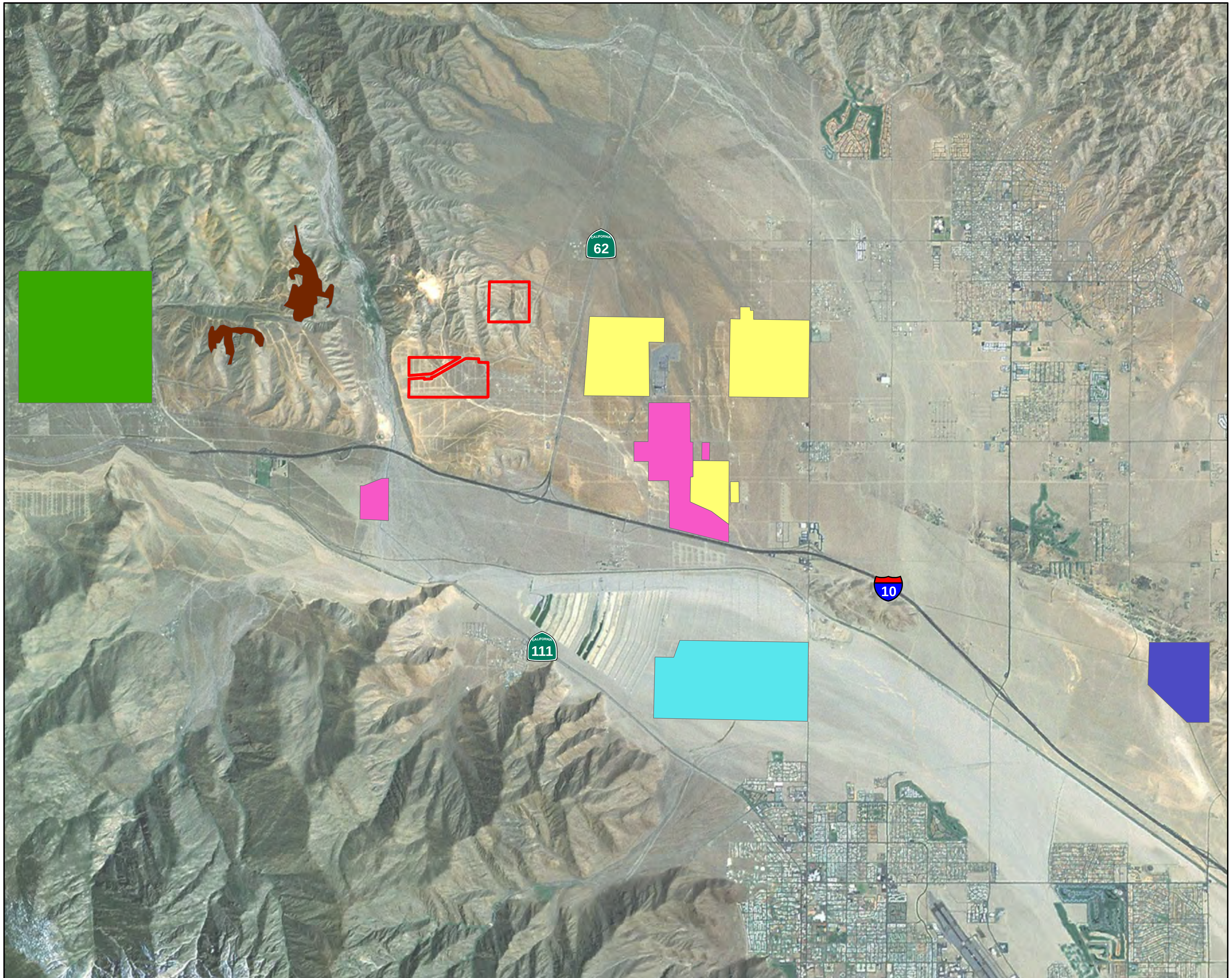

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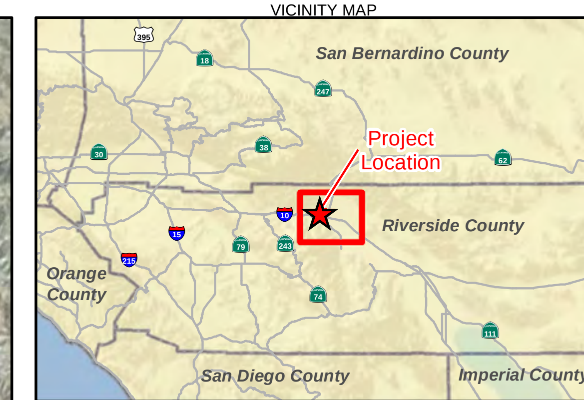

LEGEND

Painted Hills Project Area

Surrounding Wind Energy Project Areas

- Dillon Wind
- Edom Hills
- Mesa Wind
- Mt View IV
- Palm Springs Repower
- Tenderland

Note:
All Surrounding Sites are approximate and are meant show the general area and shape of each project site only.

N

0 3,000 6,000
Feet

FIGURE 2
Projects in the Vicinity of Painted Hills IV Wind Energy Repower Project
Painted Hills Project
Riverside County, California

CH2MHILL

Attachment A

A national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy

National Renewable Energy Laboratory

Innovation for Our Energy Future

Avian Monitoring and Risk Assessment at the San Gorgonio Wind Resource Area

Phase I Field Work: March 3, 1997 – May 29, 1998

Phase II Field Work: August 18, 1999 – August 11, 2000

R. Anderson, J. Tom, and N. Neumann
State Energy Resources Conservation and Development Commission
Sacramento, California

W.P. Erickson, M.D. Strickland, M. Bourassa, K.J. Bay, and K.J. Sernka
Western EcoSystems Technology, Inc.
Cheyenne, Wyoming

Subcontract Report
NREL/SR-500-38054
August 2005

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NREL Technical Monitor: K. Sinclair

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List of Abbreviations

away-from-turbine (adj)	AFT
California Energy Commission	CEC
Geographical Information System	GIS
Global Positioning System	GPS
National Renewable Energy Laboratory	NREL
large lattice turbines	LLT
large tubular turbines	LTT
large two-bladed tubular turbines	L2TT
near-turbine (adj.)	NT
small lattice turbines	slt
small tubular turbines	stt
tag image file format	TIFF
Universal Transverse Mercator	UTM
vertical axis turbines	VATs
quality assurance and quality control	QA/QC
Wind Resource Area	WRA

1.0 Introduction

The early wind energy developments were planned, permitted, constructed, and operated with little consideration for the potential impacts to birds (Anderson *et al.* 1999). Observations of dead raptors at the Altamont Pass Wind Resource Area (WRA) (Anderson and Estep 1988, Estep 1989, and Orloff and Flannery 1992) triggered concern from regulatory agencies, environmental/conservation groups, wildlife resource agencies, and wind and electric utility industries about possible impacts to birds associated with wind energy development.

Although many bird species have experienced fatalities, raptors have received the most attention (Anderson *et al.* 1996a, 1996b, 1997, 1999, 2000; Anderson and Estep 1988; Estep 1989; Howell 1995; Howell and Noone 1992; Hunt 1994; Johnson *et al.* 2000a, 2000b; Luke and Watts 1994; Martí 1994; Orloff and Flannery 1992, 1996; and Thelander and Rugge 2000, Smallwood and Thelander 2004). Emphasis on raptor fatalities probably emerged for several reasons. Low raptor population relative to many other bird groups and the symbolic and emotional value raptors hold to the American public have both contributed to an increased awareness. Businesses have legal considerations under federal and state statutes. Raptors are protected by the Federal Migratory Bird Treaty Act. Some raptors are protected by the Bald and Golden Eagle Protection Act and the Endangered Species Act.

Other studies in WRAs have documented deaths of songbirds and other non-raptorial birds (Anderson *et al.* 2000; Erickson *et al.* 2000, 2001; Higgins *et al.* 1995; Johnson *et al.* 1998, 1999, 2000a, 2000b; Orloff and Flannery 1992; Osborn *et al.* 1996; Pearson 1992; Thelander and Rugge 2000; and Winkelman 1994) and waterbirds (Anderson *et al.* 2000; Erickson *et al.* 2001; Johnson *et al.* 2000a, 2000b, 2002; Pearson 1992; and Winkelman 1985, 1989, 1990, 1992a, 1992b, 1994). Most birds are also protected by the Federal Migratory Bird Treaty Act.

Bats also have been killed at wind energy facilities (Anderson *et al.* 2000; Erickson *et al.* 2000; Higgins *et al.* 1995, and Johnson *et al.* 1997, 1998, 1999, 2000a, 2000b, 2003). Generally, bat fatalities have included migratory species that appear to be widely distributed throughout North America. Bats, as well as other avian species, are emerging as a consideration when permitting wind energy development.

The San Gorgonio wind plant consists of approximately 3,000 turbines of various types and sizes. Previous studies conducted at the San Gorgonio wind plant documented relatively low raptor fatality, with relatively higher fatality of passerines and waterbirds. Researchers estimated 6,800 birds were killed annually at the San Gorgonio wind facility based on 38 dead birds found while monitoring nocturnal migrants (McCrary *et al.* 1986). The 38 avian fatalities included 15 passerine species. McCrary *et al.* (1983, 1984) estimated that 69 million birds pass through the Coachella Valley annually during migration; 32 million in the spring and 37 million in the fall. Considering the high number of passerines migrating through the area relative to the number of passerine fatalities, the authors concluded that this level of fatality was biologically insignificant (McCrary *et al.* 1986).

The level of concern will likely remain high until we have a better understanding of the factors related to bird fatality. Studies, such as this research conducted in the San Gorgonio WRA, should provide valuable information regarding avian use and fatality and help reduce the level of uncertainty for wind energy development.

The primary objective of this study was to estimate and compare bird utilization, fatality rate, and the risk index attributable to factors such as avian groups, turbine sizes and types, and geographic locations within the operating wind plant in the San Gorgonio WRA in south central California during two study periods (March 1997 to May 1998; August 1999 to August 2000).

2.0 Coordination and Funding

California Energy Commission (CEC) staff and Western EcoSystems Technology (WEST, Inc.) personnel worked together on this project. Funding was provided by the CEC and National Renewable Energy Laboratory (NREL).

3.0 Study Area

The San Gorgonio Pass is a narrow, low-elevation pass situated at approximately 180 - 850 m in elevation (Figures 1 and 2). The pass is bordered on the north by Mt. San Gorgonio (3,505 m) and on the south by Mt. San Jacinto (3,293 m). The great differences in elevation and topography are a result of the San Andreas and San Jacinto fault systems, which over millions of years have created a wedge in the San Bernardino Mountains. This wedge is known as the San Gorgonio Pass and is a windy area due to the natural tendency for air pressure to equalize between the Pacific coast and the interior deserts. The vegetation in the San Gorgonio Pass WRA includes vegetation-type components of both the Mojave and Colorado deserts. Vegetation types in the WRA include the following series: creosote bush, creosote bush-white bursage (*Ambrosia dumosa)*, brittlebush (*Encelia farinosa)*, and scalebroom (*Lepidospartum squamatum*) (Sawyer and Keeler-Wolf, 1995, Table 1).

We did not quantify prey abundance during our study, nor did we visually detect what we considered to be a large number of potential prey for raptors during the field work.

The WRA receives less than 25.4 cm of rain annually, with most occurring during the winter months. Temperatures range from around freezing to 49°C. The WRA is windy much of the year with the predominant wind direction from the west, with occasional easterly winds.

The WRA at San Gorgonio Pass was developed during the early 1980s. During this research project, approximately 3,000 wind turbines were operating. This WRA is the third largest developed WRA in California and produces approximately 25% of the electricity produced annually from wind energy in California. For the purpose of this study the developed WRA was subdivided into four geographic locations: the *High* elevation area, which was above 610 m above Mean Sea Level (MSL) elevation; the *Medium* elevation area, which was between 305 m and 610 m MSL elevation; the *Low* elevation area, which was below 305 m MSL elevation; and the *Water* area. The *Water* area was contained in the *Low* elevation area and includes hundreds of acres of surface water. This surface water is created by runoff from Whitewater Creek and water diverted from other sources and pumped into recharge basins. This surface water often remains year-round in some of the basins. Permanent study sites were selected at the three elevation areas and from the *Water* area. Approximately 85% of the area was available to be sampled (access granted).

3.1 High Elevation Area

The *High* elevation area included the confines of two distinct wind farms occupying the foothills northwest of Palm Springs. The two managed developments were Mesa to the northwest and Swan Mill to the adjoining southeast. *High* elevation area was predominately characterized by steep slopes, rolling hills, and an elevation greater than 610 m. Vegetation was dense and ranged from exclusive brittle bush in the lower reaches of the area to increasingly complex shrub communities at higher elevations. The Mesa development was populated solely by small turbines on lattice towers (slt). Swan Mill contained only small turbines on tubular towers (stt).

3.2 Medium Elevation Area

The *Medium* elevation area was located immediately north of Highway 10 and west of North Palm Springs. The area also extended to Painted Hills, west of Highway 62. The *Medium* elevation area included a variety of turbine types and concentrations and is a “patch work” of individual properties. Topographically, the *Medium* elevation area sloped northward to the base of the Little San Bernardino Mountains. The vegetation community was predominately creosote/white burrsage.

3.3 Low Elevation Area

The *Low* elevation area was located south of Highway 10 within the “island” created by Interstate 10, Highway 111, and Indian Avenue. The majority of the turbines in this area were located in one large area with a layout of sequential rows. A railroad track divided a small northern population of lattice turbines from the major development. The *Low* elevation area was predominately a flat sandy drainage. The lower edge of the *Medium* elevation area creosote habitat extended into the northern boundary. Vegetation was sparse to barren through the center, while scalebroom, dalea, burrsage, and other minor shrubs increased to the south.

3.4 Water Area

The southwestern portion of the *Low* elevation area contained a series of 21 parallel water recharge basins. These basins had a north-south orientation and were approximately 150 m wide and 900 m long. Each was separated by an earthen dike. Sixteen of these dikes supported a row of wind turbines. Daily water levels varied drastically and were determined by the Coachella Valley Water District. Not all of the 21 basins were full at any one time, and the easternmost basins exhibited no sign of ever holding water. The western basins were the most likely to contain water, and on a consistent basis, at least 6 of the basins contained some measure of water during this study. This region was defined by areas containing water during February 1997. Wind turbines within 100 m of standing water were included in this area. During the Phase II study, the basins contained less water than during the Phase I study.

4.0 Study Objectives and Key Research Questions

The primary objective of this study was to estimate and compare bird utilization, fatality rates, and the risk index among factors including bird taxonomic groups, wind turbine and reference areas, wind turbine sizes and types, and geographic locations. The key questions addressed to meet this objective include:

- Are there any differences in the level of bird activity, called "utilization rate" or "use", with the operating wind plant and within the surrounding undeveloped areas (reference area)?
- Are there any differences in the rate of bird fatalities (or avian fatality) within the operating wind plant or the surrounding undeveloped areas (reference area)?
- Does bird use, fatality rates, or bird risk index vary according to the geographic location, type and size of wind turbine, and/or type of bird within the operating wind plant and surrounding undeveloped areas (reference area)?
- How do raptor fatality rates at San Gorgonio compare to other wind projects with comparable data?

5.0 Study Design

The methods used in this study were developed through a collaborative process that included biostatisticians and field methodology experts representing federal, state, utility, consulting, and environmental organizations. The methods and metrics conform to those suggested in "Studying Wind Energy/Bird Interactions: A Guidance Document" (Anderson *et al.* 1999).

This was a mensurative study (Hurlbert 1984, Morrison *et al.* 2001) designed to provide statistical evidence regarding differences in use, fatality rates, and the risk index among levels of multiple factors. In addition, confounding of some factors existed. For example, the *Medium* elevation area for Phase I had no large tubular towers when studied. Therefore, geographic location was confounded with turbine type, and significant differences observed may be due to geographic location or to turbine type. The basic study design was a stratified random design, with geographic location, turbine sizes, and tower types used in defining strata.

5.1 Sample Site Selection

Subsequent to Phase I studies and prior to Phase II studies, the *Low/Water* areas were repowered with large tubular turbines replacing many small turbines. Phase II included a sample of these large tubular turbines (LTT).

5.1.1 Phase I

One-hundred-seventy-eight sample sites were selected using a stratified random sampling selection process. Each of the 178 sample sites included zero to ten turbines, with a total of 423 turbines sampled. These sites included 20 sites >1 km from the nearest turbines, 20 sites between 400 m and 800 m from turbines, and 138 sites at turbines. The 40 sample sites selected at >1 km and between 400-m and 800-m distances from operating wind turbines were selected to allow detection of differences in bird utilization, bird fatality, or bird risk index between a site near a turbine (NT) and a site away from turbine (AFT).

Wind turbine type consisted of three stratum:

- Large tubular turbine (horizontal axis turbine >26 m rotor diameter on tubular tower)
- Small tubular turbine (horizontal axis turbine <26 m rotor diameter on tubular tower)

- Small lattice turbine (horizontal axis turbine <26 m rotor diameter on lattice tower).

The turbine sites include large and small turbines, lattice and tubular tower turbines, end-row turbines, and a variety of distinct natural and physical settings.

5.1.2 Phase II

Sixty near-turbine (NT) sites were selected in Phase II within the *Water* and *Low* areas and included a mix of small tubular turbines (stt), large tubular turbines (LTT), and a few large two-bladed tubular turbines (L2TT).

5.2 Selection of Bird Utilization and Carcass Search Sites at Turbines

5.2.1 Phase I

For each of the four geographic locations, the numbers of sites to be selected were determined according to availability of differing turbine types and numbers. Individual survey site locations were then selected considering the circumstances unique to each subset. Within each of the four subdivisions, site selections were performed in a similar but separate operation for each of the available turbine types.

Each development was stratified to insure uniform placement of survey locations within the defined area. Stratification was dependent upon factors such as property boundaries, turbine layout, turbine concentrations, vegetation type, and topography. Each stratified unit was not necessarily equal in the number of a particular turbine type.

After determining the site selection percentages for each stratified area, individual turbines from each turbine type were chosen by random selection. First, each turbine was assigned a number (one by one, row by row), starting from an assigned corner of the stratified unit. Random numbers were then generated with the use of a random numbers chart. The corresponding assigned turbine numbers were established as the initial study site locations. If selected sites were closer than 100 m, a replacement site was selected.

The sample design resulted in the following number of turbines and turbine types for the permanent study sites (Table 3): 23 LTT, 63 stt, and 52 slt. These turbines were distributed according to geographic location as follows: 21 slt, 8 stt, and 3 LTT at the *High* elevation area; 15 stt and 12 slt at the *Medium* elevation area; 25 stt, 12 slt, and 20 LTT at the *Low* elevation area; and 15 stt and 7 slt at the *Water* area (Table 2).

The carcass search plot was defined as a 50-m radius circular area centered on the selected turbine, and the bird use plot was defined as variable circular plot centered at the selected turbine. The search plot could contain more than one turbine. The permanent site search plots comprised approximately 1.94 acres.

<u>5.2.1.1 High Elevation Area</u>

The *High* elevation area included two distinct wind farms occupying the foothills northwest of Palm Springs. The two developments were Mesa to the northwest and Swan Mill to the adjoining southeast. The Mesa development contained only slt, while Swan Mill contained only stt turbines. No LLT or vertical axis turbines (VATs) were available for selection in the San Gorgonio study area.

Due to their homogenous turbine types, Mesa and Swan Mill were independently stratified. Each area was roughly uniform in shape. This allowed for stratified units of nearly equal size and turbine population within Swan Mill. Mesa does not have a uniform turbine layout. Therefore, units were of dissimilar sizes reflecting variations in turbine concentrations.

5.2.1.2 Medium Elevation Area

The *Medium* elevation area included a variety of turbine types and concentrations. The layout was a “patch work” of individual properties. Stratification of the *Medium* elevation area was primarily determined by the distinct property borders of individual turbine developments.

5.2.1.3 Low Elevation Area

The majority of turbines were located in one large area in a sequential row layout (Figure 2). A railroad track divided a small northern population of lattice turbines from the major development. The uniform shape of the *Low* elevation area allowed for stratification by approximately equal turbine numbers. This was especially true for stt. Slt were stratified between two major populations. The easternmost row of turbines contained the only LTT available for selection within the entire study area. Therefore, the complete row of seven turbines was selected.

5.2.1.4 Water Area

Both stt and slt were contained within distinct areas and were therefore stratified uniformly. Due to the variability of basin water fill, turbines selected in February 1997 were not necessarily within 100 m of water during the course of the study.

5.2.2 Phase II

For Phase II, new sites were selected within the *Low* and *Water* areas. Sixty sites were selected, 38 from the *Low* elevation area and 22 from the *Water* area. Twenty-six stt, 28 LTT, and six L2TT were selected (Table 3). These turbines were distributed according to geographic location as follows: 11 stt; 11 LTT in the *Water* area; and 15 stt, 17 LTT, and six L2TT in the *Low* area (Table 2).

5.3 Selection of Bird Utilization and Carcass Search Sites away from Turbines

5.3.1 Phase I

Sites far from wind turbines were also selected within each of the four previously described strata. These away-from turbine (AFT) sites, or control sites, were at least 400 m from the nearest turbine and were located in areas consistent with the definitions of the associated subdivision.

AFT sites were predominately selected based on access, as the limited number of potential locations did not provide for a random selection. Available undeveloped land provided an adequate number of acceptable sites considered representative of the *Low* and *Medium* elevation areas. The topography, access, and elevation boundaries severely limited the number of potential site locations for the *High* elevation area. Availability within the *Water* area was limited by the small size of the defined area.

5.3.2 Phase II

Only sites at turbines were selected.

5.4 Observer Detection Efficiency Site Selection

Two observer detection bias studies were conducted. Each study included representative topographical and vegetation coverage of the three main areas (*High*, *Medium*, and *Low*) within the San Gorgonio study area. Selected sites met three requirements: 1) they avoided established survey locations, 2) they were accessible, and 3) the area allowed for three 50-m radius circles for dead bird searches. Trials were conducted in September 1997 and March 1998.

A site selected in the *High* elevation area represented the rolling topography and dense vegetation of that region. The *Medium* elevation area provided a relatively flat creosote dominated environment. The *Low* elevation area presented a representative sandy area dominated by sparse scalebroom and tumbleweeds.

5.5 Scavenging Study Site Selection

Two independent scavenging studies were conducted during the project, using 215 carcasses. Up to a total of 16 brown or white (cryptic/noncryptic) chicken carcasses and 16 brown or white chick carcasses were placed within each of the four sub-areas each trial. In each sub-area, up to eight chickens and eight chicks were placed at NT turbine sites, and eight of each were placed at AFT sites (> 400 m away from nearest turbines). Selected scavenging sites had to be at least 100 m from an existing survey location.

At NT sites, the scavenging bait location was established 50 m from the selected turbine, perpendicular to the row. The direction of the perpendicular line was determined randomly by coin toss (heads = right, tails = left). The bait was placed 10 m north of the 50-m perpendicular site location.

6.0 Field Methods

6.1 Geographic Information System (GIS)

Characteristics of the San Gorgonio WRA study area were mapped using a Geographical Information System (GIS). Digital topographic maps (1:24,000) were obtained from the U.S. Geological Survey and used as base maps. These maps contained topographic information, roads, watercourses, and various other physical features. Aerial photographs of the study area were scanned into the computer in tag image file format (TIFF) and included as a GIS layer. The aerial photographs were used to identify additional features such as roads, powerlines, wind turbines, and buildings not found on the base map layer. Vegetation types were outlined on the aerial photographs and confirmed by comparing the vegetation at selected ground locations with the photo-interpreted types. The vegetation types for the study area were then digitized to create a vegetation layer. Universal Transverse Mercator (UTM) system coordinates were obtained for all the turbines using a Global Positioning System (GPS) handheld unit. The UTM coordinates collected at each turbine were used to create another GIS layer containing turbine locations. Other turbine information was attributed to each turbine in the GIS database, such as turbine manufacturer, turbine height, rotor swept area/volume, and type of tower. The GIS layers were created using Arc/Info, ArcView, and DIMPLE remote sensing image analysis software.

6.2 Vegetation Types Classification

Vegetation types (Sawyer and Keeler-Wolf 1995) were identified on the ground and on aerial photographs and transferred to a GIS information layer. The information was used for analysis of habitat influence on bird use and other parameters. The vegetation type within 50 m of each carcass search plot center was documented. This included the vegetative structure and dominant (e.g., highest percent cover overstory) and up to two sub-dominant plant species. Four vegetation structures were identified for the San Gorgonio WRA: 1) grass, 2) sub-shrub, 3) large shrub, and 4) wooded. Plant groups and/or species within each structure and each phase of the study are presented in Table 1.

6.3 Bird Utilization Count

Bird utilization counts were variable point counts modified to document behavior and other flight characteristics. Bird utilization counts were conducted for 14 months from March 4, 1997 through May 29, 1998. Each sample site was visited approximately every 6 weeks. Two 5-minute utilization counts were conducted at each site during each visit. At each of the sample sites, four 5-minute utilization counts (720) were conducted quarterly (2880 counts annually). Bird utilization counts were conducted between 07:00 and 11:00 am. The observer conducted the count from the center (or as near as possible) of the sample site. Erickson *et al.* (2002) summarized studies of the use of wind developments by birds.

Data collected during each site visit consisted of site and bird observation information. Site information included:

- Site number
- Observer
- Date
- Start and end times
- Applicable weather (precipitation, fog presence, cloud cover, temperature, wind speed and direction, and background sound levels).

Observation information included:

- Utilization count number
- Starting time
- A unique observation number
- Species
- Number of individuals
- Estimated distance from observer at initial sighting
- Estimated closest distance to observer
- Behavior/activity (flying, perching, soaring, hunting, and foraging), height above ground, and behavior if the bird approached the turbine within ≤50 m of the turbine or WRA structures
- Type and operational status of the closest turbine to the observation. For all observations, flight height (to the nearest meter) was recorded when the bird (or group of birds) was first observed and when/if they entered within 50 m of a turbine
- Avoidance behavior (e.g., flaring, other avoidance behavior, perching)
- Comments or unusual observations (recorded in the comment section of the data form).

6.4 Carcass Searches

The objective of the carcass searches was to document bird fatalities. At each of the permanent sites, one carcass search was conducted quarterly. Circular plots with a radius of 50 m centered at each sample turbine site were systematically searched. The intensity of each search was habitat dependent and typically took from 30 minutes to 2 hours. For example, searching short grassland was quicker than searching thick shrubby areas.

Data collected during each carcass search included: a unique carcass number, site, date, observer, species, sex and age when possible, time, condition (e.g. intact, scavenged, feather spot), cause of death (when possible), description of injury(ies), identification of and distance to nearby structures, distance to closest turbine, classification of closest turbine (i.e., mid-row and end-row), and distance to plot center. Comments describing the characteristics of the carcass indicating the cause of death or other pertinent information were also recorded. All carcasses discovered were 1) photographed as found, 2) plotted on a detailed map of the study area showing the location of the wind turbines and associated facilities such as power lines and towers, and 3) collected for species verification. Bird carcasses found by personnel at times other than the scheduled search (incidental find) were noted and photographed but were not removed from the plots.

6.5 Observer Detection Efficiency Study

Circular plots 100 m in diameter were identified with pinflags placed at the north, east, south, and west edges. An individual, not conducting searches as a part of the trial, placed small and large native bird carcasses and carcass parts at randomly selected locations within the plot. All placements were documented and then compared with the observer's findings to determine the proportion of small and large carcasses or carcass parts detected by each observer.

6.6 Scavenging Bias Study

Brown chicken and chick carcasses (64 of each for each scavenging trial) were used to simulate large and small bird carcasses for scavenging rate comparisons near turbines and at different distances from turbines. Two independent scavenging bias trials were conducted using 215 carcasses. The scavenging bias trials were conducted April 1997 and December 1997. Up to 32 chicken and chick carcasses (16 each) were placed in each geographic location. In each location, eight chickens and eight chicks were placed at NT sites, and eight of each were placed at away-from-turbine locations greater than 0.1 km away from the nearest turbines. Because we used carcasses that were not representative of the bird species that were observed as fatalities, this information was primarily used to describe relative differences in scavenging by study area, near and away from turbines, and habitat.

7.0 Statistical Analysis Methods

7.1 Bird Use

Bird activity was described by the calculation of utilization rates. We defined utilization rate as the number of observations of birds per number of utilization counts (surveys). Only birds visually observed within 200 m of the site center were considered in the calculation of mean utilization rates. Observations of birds only heard and not seen were not used in the calculation of mean utilization rates because turbine and wind noise often mask bird calls. This ensured that turbine or wind noise would not bias bird use estimates in developed WRAs compared to undeveloped areas.

7.2 Observed Bird Fatality Rates

Bird fatality rate was defined as the number of unique bird carcasses found per search per plot (50-m radius of focal turbine):

$$bird\ \ fatality\, rate = {}^{number\, of\ \ fatalities}\!\Big/_{number\, of\ searches}\ .$$

Since searches are conducted on a quarterly basis, the fatality rate used in the comparative analyses represents the observed number of fatalities per 3-month period per sample site. This fatality rate could be multiplied by 4 to come up with an observed annual fatality rate per search plot unadjusted for scavenging and search efficiency biases, with each search plot typically containing one or more turbines. An annual per-turbine fatality rate was calculated by adjusting the annual fatality rate per search plot to account for the effective area of the wind project that was searched (12% of the total search area within 50 m of turbine strings).

7.3 Bird Risk Index

We defined an index to bird risk index as the fatality rate divided by the utilization rate. For example, considering only birds observed within 200 m of the site center, the overall bird risk index for the San Gorgonio Pass WRA is:

$$bird\ risk = \frac{fatality\, rate}{utilization\, rate}$$

Bird utilization rates (use) and bird fatality can increase proportionately without changing bird risk index. However, an increase (or decrease) in fatality with no change in use causes an increase (or decrease) in risk index. Similarly, an increase (or decrease) in use with no change in fatality causes a corresponding decrease (or increase) in risk index. Bird risk index can therefore be used to compare differences for variables of interest (i.e., geographic location, avian group, turbine size, and turbine type) while accounting for observed differences in use and fatality rates associated with individual values of each variable. This index, a relative number that can range from zero to a large number, is used to compare levels of other factors such as turbine type and should not be construed as an absolute measure of the risk index. The numerator represents a fatality rate (number of fatalities/3-month period/site). The denominator represents the number of birds observed per 5-minute period. To equate the risk index to a more direct measure of the likelihood of collision per bird observation near wind turbines, the index must be divided by the number of 5-minute periods within the 3-month search interval. For example, a risk index of 1.0 from the equation above can loosely be interpreted in the following way: one fatality is estimated to occur in a 3-month period for every 10,800 bird observations (90 days in 3-month interval times 120 5-minute daylight periods per day) within 200 m of the turbine during that 3-month period. Detection biases associated with bird observations and detection and scavenging biases for fatalities would affect the risk index measurement.

7.4 Comparison Factors and Analyses

The primary analysis variables considered in comparing use, fatality rates, and the risk index are listed in Table 3. For each metric and variable of interest, 95% confidence intervals were calculated. The null hypothesis of "no difference" was tested at two-tailed α-level of 0.10 by investigating the overlap of the confidence intervals. Given the high variability in field data of this sort, we discuss statistically significant differences and trends in the data that were supported by consistent patterns across several comparisons.

Other factors, which we did not attempt to model, may be important. Cause of the differences was not inferred from the statistical analyses because of the observational nature of the study and the possibility of confounding factors. Professional judgment and trends in the data were the primary methods we used to interpret pattern and to make inferences regarding the results.

7.5 Scavenging Bias Trials

Scavenging rates by season and habitat were described by calculations of the proportion of birds removed after 8 and 10 days and the estimated mean time until removal. Given the limited nature of these data (i.e., few trials and limited species of trial carcass), data were only used to describe the characteristics of 1) scavenging rates, and 2) general comparisons of rates of factors (i.e., season, vegetation, between study areas, and between the San Gorgonio and Tehachapi studies).

7.6 Observer Detection Bias Trials

The observer detection probability was estimated by:

$$p = \frac{\#\,\text{of carcasses detected}}{\#\,\text{of carcasses placed}}\,.$$

Given the limited nature of these data (i.e., few trials), data were only used to describe the relative efficiency of the searches and general comparisons of detection rates and the influence of factors such as season and vegetation.

8.0 Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) measures were used during all stages of the project, including field training, data collection, field form completeness, data entry, data analysis, and report preparation. Field forms were created and lists of variables documented and defined for each research study. A detailed protocol (standard operating procedure) was prepared for Bird Utilization Counts, Carcass Searches, Scavenging Bias Trials, and Observer Detection Trials. These protocols assisted in maintaining a high level of precision and consistency in data collection.

Field personnel were trained in all field collection methods. A computerized database was created to store and retrieve field data. Personnel experienced in data entry using a pre-defined format to make subsequent data analysis more efficient entered data from field forms into electronic data files. Printouts of the entered data were compared with the completed and previously checked field forms to verify the accuracy of the data entries. All data entry errors were corrected.

At the end of the study, the complete database was sent to statistical personnel for additional QA/QC and data analysis. Anomalies or inconsistencies were resolved with field staff and changes were made where necessary with the proper documentation. Results of data analysis were compared for accuracy during all stages against hand calculations and other alternate methods of calculation.

9.0 Results

9.1 General Avian Use, Frequency Occurrence, and Species Composition

9.1.1 Phase I

A total of 3,313 5-minute bird utilization counts and 830 carcass searches (carcass search areas included one to numerous turbines) were completed in San Gorgonio Pass WRA during Phase I studies from 3 March 1997 to 29 May 1998. During the utilization counts, 84 unique species were documented in 2,194 sightings of 17,861 individuals (Table 4 and Appendix A).

9.1.1.1 Near-Turbine Sites

For all geographic locations combined, 25 species were observed during spring (1 March to 15 April), 33 species were observed during summer (16 April to 30 September), 31 species were observed during fall (1 October to 15 December), and 29 species were observed during winter (16 December to 28/29 February) (Table 5).

Different patterns in numbers of species observed were found depending on geographic location and season. The *Medium* elevation area had consistently low numbers of species across all seasons (range of 6 to 8). The *Water* area had fewer numbers of species observed during spring (11) compared with summer (19), fall (21), and winter (18). The *Low* elevation area had greater numbers of species observed during summer (12) compared with spring (8), fall (7), and winter (9). The *High* elevation area had fewer numbers of species observed during fall (7) compared with spring (13), summer (14), and winter (13) (Table 5).

Avian use (mean number of individuals per survey) across all geographic locations was highest during winter (5.39 individuals/survey) followed by fall (3.40), spring (1.94), and summer (0.54). The highest use occurred at the *Water* areas during winter (13.01), and the lowest use was recorded at the *Medium* elevation areas during summer (0.14). The *Water* areas had consistently higher use while the *Medium* and *High* elevation areas had consistently lower use for most seasons (Table 5 or 6).

Avian richness (mean number of species per survey) was low overall across all geographic locations and was lowest in the summer (0.17 species/survey). Fall, spring, and winter had greater richness compared with summer, although they were not very different from one another (0.32, 0.38, and 0.44 respectively). The highest estimate of avian richness occurred at the *Water* areas during winter (1.06), and the lowest estimate occurred at the *Low* elevation areas during summer (0.09). Avian richness was greater in general at the *Water* areas except during spring when the *High* elevation areas were slightly higher (0.49 species/survey for the *Water* areas compared to 0.56 for the *High* elevation area) (Table 5).

9.1.1.2 Away-from-Turbine Sites

AFT sites had consistently higher number of species observed than did NT sites, except for fall when both had similar number of species (31 NT sites and 29 AFT sites). For all geographic locations combined, 35 species were observed during spring (1 March to 15 April), 39 species were observed during summer (16 April to 30 September), 29 species were observed during fall (1 October to 15 December), and 39 species were observed during winter (16 December to 28/29 February) (Table 5).

Different patterns in numbers of species observed depended on geographic location and season. These patterns were also different from those observed at NT sites. The *Medium* elevation area had consistently moderate numbers of species observed across all seasons (range from 9 to 11). The *Water* area had greater numbers of species observed during winter (25) compared with summer (19), fall (20), and spring (18). The *Low* elevation area had far fewer numbers of species observed during fall (3) compared with spring (13), summer (10), and winter (10). The *High* elevation area had few numbers of species observed during fall (5) compared with moderate numbers during spring (11) and winter (8) with the greatest number of species observed during summer (18) (Table 5).

Avian use patterns also differed at AFT sites compared with NT sites. Avian use (mean number of individuals per survey) across all geographic locations at AFT sites was highest during fall (19.43 individuals/survey), followed by winter (10.43), spring (4.67), and summer (4.18). The highest use occurred at the *Water* area during fall (61.94), and the lowest use was recorded at the *Medium* elevation area during summer (0.55). Similar to NT sites, the *Water* area AFT sites had consistently higher use while the AFT sites in the *Medium* and *High* elevation areas had consistently lower use for all seasons (Table 5 or 6).

Avian richness (mean number of species per survey) was also low overall for AFT sites; however, every category (geographic location by season) was higher than that observed for NT sites. The highest estimates of avian richness across all geographic locations were observed during winter (1.06 species/survey) and fall (1.04). Summer has the lowest avian richness among the four seasons (0.55). The highest estimate of avian richness occurred at the *Water* area during winter (2.35), and the lowest estimate occurred at the *Low* elevation area during summer (0.22). This same pattern of avian richness was also observed at NT sites. Avian richness was greater overall at the *Water* area (Table 5).

9.1.2 Phase II

A total of 2,222 5-minute bird utilization counts and 600 carcass searches were completed in San Gorgonio Pass WRA during Phase II studies from 18 August 1999 to 11 August 2000. During the utilization counts, 59 unique species were documented in 914 sightings of 3,764 individuals (Table 4 and Appendix A).

9.1.2.1 Near-Turbine Sites

The number of species observed was similar at NT sites for Phase I and Phase II surveys during spring and summer. During fall and winter however, only half as many species were observed during Phase II surveys compared with Phase I. For all Phase II geographic locations combined, 26 species were observed during spring, 30 species were observed during summer, 17 species were observed during fall, and 14 species were observed during winter (Table 5).

The number of species observed at the *Low* elevation area was lower for all seasons during Phase II surveys compared with Phase I (Table 5). At the *Water* area, the number of species observed during Phase II was substantially higher during spring and summer and lower during fall and winter compared with Phase I. At the *Water* area, the greatest number of species was observed during summer (28), followed by spring (24), fall (15), and winter (12). At the *Low* elevation area, numbers of species were low throughout the year with the greatest number of species observed during summer (9), followed by spring and fall (6) and winter (5).

Avian use also differed between Phase I and Phase II surveys at NT sites. Phase II use estimates were higher during spring, similar during summer, and substantially lower during fall and winter compared with Phase I estimates (Table 5). Avian use during Phase II across all geographic locations was highest during spring (2.90 individuals/survey), followed by summer (0.50), winter (0.41), and fall (0.21). The highest use occurred at the *Water* area during spring (5.17), and the lowest use was recorded at the *Low* elevation area during summer and fall (0.09). As observed during Phase I studies, the *Water* area had consistently higher use while the *Low* elevation area had consistently lower use for all seasons during Phase II (Table 5 or 6).

Avian richness was low overall during Phase II and similar to Phase I during spring and summer. Phase II estimates of avian richness during fall and winter were less than half of the Phase I estimates. Avian richness across all geographic locations during Phase II was lowest in the fall (0.13 species/survey). Summer and winter had greater richness, though compared with spring, were not very different from the fall (0.18, 0.17, and 0.40 respectively). Phase II estimates of avian richness at the *Water* area were higher during spring and lower during summer, fall, and winter compared with Phase I. At the *Low* elevation area, Phase II estimates of avian richness were lower during spring, fall, and winter and similar during summer compared with Phase I. The highest estimate of avian richness during Phase II occurred at the *Water* area during spring (0.82), and the lowest estimate occurred at *Low* elevation areas during summer and fall (0.07). As observed during Phase I studies, avian richness was greater at the *Water* area than at the *Low* elevation area for all seasons during Phase II (Table 5).

9.2 Avian Use by Bird Group

9.2.1 Phase I: Near-Turbine Sites

Although patterns varied among geographic locations, waterbirds (species observed in each group are provided in Appendix A) had consistently higher mean abundance (mean number of individuals observed per 5-minute utilization survey) than other groups across the spring, summer, and fall seasons. Passerines outnumbered waterbirds during winter at the *Water* area. Waterbirds were least abundant during summer. Both raptors and other birds were at very low numbers throughout the year. Corvid abundance was highest during spring and lowest during summer and fall. Passerine abundance was highest during winter, followed by fall, spring, and summer (Table 6).

Except for waterbirds and passerines at the *Water* and *Low* areas, mean abundance was low overall for all geographic locations. Waterbirds had the highest mean abundance recorded at the *Water* area during fall (8.28 individuals/survey). Waterbirds were not observed at any *Medium* and *High* elevation areas. Raptors were not observed at any *Medium* and *High* elevation areas during fall. Other birds were not observed at any *Water* areas during the spring, *Low* elevation areas during the fall, *Medium* elevation areas during the spring and summer, and *High* elevation areas during fall or winter. Otherwise, other birds observed at the *Low* elevation area during spring and summer and raptors at the *Low* elevation area during the spring had the lowest mean abundance (< 0.01 individuals/survey) (Table 6).

9.2.2 Phase I: Away-from-Turbine Sites

Although patterns varied among geographic locations, waterbirds had consistently higher mean abundance than other groups across all seasons. Waterbirds were far more abundant during fall and had greater abundance during all seasons at AFT sites compared with NT sites. Both raptors and other birds were at very low numbers throughout the year; however, numbers were higher in most cases at AFT sites compared to NT sites. Both corvid and passerine abundance were highest during winter and lowest during summer with passerines consistently higher than corvids. Corvids were more abundant during winter at AFT sites; however, they had similar levels of abundance between away-from-turbine and NT sites during other seasons. During fall and winter, passerines were lower in abundance at AFT sites than NT sites. The opposite pattern was observed during spring and summer (Table 6).

Except for waterbirds and passerines at the *Water* and *Low* areas, mean abundance was low for all geographic locations. Waterbirds had the highest mean abundance recorded at the *Water* area during fall (60.35 individuals/survey). Waterbirds were not observed at any *Medium* elevation areas during the spring, summer, or fall. They were also not observed at any *High* elevation areas. Raptors were not observed during the spring, summer, and winter at the *Water* areas, during the summer and fall at the *Low* elevation areas, and during the spring and fall at either the *Medium* or *High* elevation areas. Corvids were not observed at the *Low* elevation areas during the fall. Other birds were not observed at all in the fall. Additionally, other birds were not observed during spring at the *Water* areas, during winter at the *Low* and *High* elevation areas, and during summer at *Medium* elevation areas. Other birds observed at the *Low* elevation area, corvids observed at the *Medium* and *High* elevation areas, and raptors observed at the *High* elevation area during summer had the lowest mean abundance (0.01 individuals/survey) (Table 6).

9.2.3 Phase II: Near-Turbine Sites

Patterns of abundance by season differed between Phase I and Phase II surveys. During Phase II surveys, abundance estimates for waterbirds and corvids were higher for spring only. Phase II abundance estimates for raptors and passerines during all seasons, and waterbirds and corvids during summer, fall, and winter, were primarily lower for Phase II than for Phase I. Other birds were equally abundant during Phase I and Phase II surveys. Waterbirds (species observed in each group are provided in Appendix A) had consistently higher mean abundance than other groups across the spring and summer seasons during Phase II. Corvids and passerines outnumbered waterbirds during fall and winter, though this was primarily due to the absence of waterbirds at the *Low* elevation area during summer, fall, and winter. Waterbirds were most abundant during spring, followed by summer, and fall and winter. Raptors and other birds were at very low numbers throughout the year. Corvid abundance was highest during spring, followed by winter, summer, and fall. Passerines were twice as abundant during winter as during the spring, summer, and fall (Table 6).

The *Water* area abundance estimates were higher during Phase II than Phase I for waterbirds during spring, corvids during spring and summer, and passerines during summer. All other Phase

II abundance estimates at the *Water* and *Low* areas were lower than Phase I estimates. Except for waterbirds at the *Water* and *Low* areas during spring, mean abundance was low for all avian groups and all geographic locations during Phase II surveys. Waterbirds had the highest mean abundance recorded at the *Water* area during spring (4.39 individuals/survey). Raptors were not observed at any *Water* areas during spring and the *Low* elevation areas during winter. Other birds were not observed at the *Water* area during spring and fall and at the *Low* elevation area during spring and winter. Other birds observed at the *Low* elevation area during fall and raptors observed at the *Low* elevation area during spring and summer had the lowest mean abundance (< 0.01 individuals/survey - Table 6).

9.3 Avian Use by Species

9.3.1 Phase I: Near-Turbine Sites

The most abundant avian species, based on mean number per 5-minute utilization survey during the spring and summer, was unidentified gull, with American coot and house finch the most abundant species during the fall and winter, respectively (Table 7). At the *Water* area, the most abundant species varied by season with killdeer in spring, unidentified gull in summer, American coot in fall, and house finch in winter. At the *Low* elevation area, house finch was the most abundant species during fall and winter, while unidentified gull was the most abundant species during spring, and double-crested cormorant was the most abundant species during summer. At the *Medium* elevation area, the most abundant species was white-throated swift during spring, horned lark during summer, white-crowned sparrow during fall, and house finch during winter. At the *High* elevation area, the most abundant species was European starling during spring, common raven during summer, yellow-rumped warbler during fall, and western meadowlark during winter.

The most frequently occurring avian species throughout the year was common raven, except for winter when it followed house finch. Common raven was followed by European starling in spring, loggerhead shrike in summer, and American coot in fall (Table 8). At the *Water* area, the common raven was the most frequently occurring species for the spring and summer and the second most frequent behind American coot and house finch in the fall and winter, respectively. Common raven was followed by European starling in spring and Brewer's blackbird in summer. At the *Low* elevation area, the common raven was the most frequently occurring species throughout the year, except in the winter when it followed house finch. Common raven was followed by unidentified gull during the spring, loggerhead shrike in the summer, and American kestrel in the fall. At the *Medium* elevation area, European starling was the most frequently occurring species in spring and summer, with common raven the most frequently occurring species during fall and house finch in winter. At the *High* elevation area, common raven was the most frequently occurring species in summer and fall, with European starling the most frequently occurring species during spring and rock wren in winter.

American kestrel was the most commonly observed raptor species (Table 4), comprising 35% of the observations, followed by red-tailed hawk (33%). Other raptor species observed included golden eagle (13 detections), prairie and peregrine falcon (4), and northern harrier and unidentified buteo (1).

9.3.2 Phase I: Away-from-Turbine Sites

The most abundant avian species, based on mean number per 5-minute utilization survey during the spring, summer, and winter, was unidentified gull, with American coot the most abundant species during the fall (Table 7). At the *Water* area, the most abundant species was unidentified gull for summer and winter, with California gull in spring and American coot in fall. At the *Low* elevation area, unidentified gull was the most abundant species during spring and fall, while double-crested cormorant was the most abundant species during summer and ring-billed gull was the most abundant species during winter. At the *Medium* elevation area, the most abundant species varied by season with Le Conte's thrasher in spring, barn swallow in summer, western meadowlark in fall, and unidentified gull during winter. At the *High* elevation area, the most abundant species was the unidentified sparrow during spring and fall, mourning dove during summer, and common raven during winter.

The most frequently occurring avian species was the common raven in spring and winter, Brewer's blackbird in summer, and American coot in fall (Table 8). At the *Water* area, the American coot was the most frequently occurring species for the fall and winter, with common raven and Brewer's blackbird in the spring and summer, respectively. At the *Low* elevation area, the most frequently occurring species varied throughout the year, with common raven in spring, unidentified gull in summer, white-crowned sparrow in fall, and house finch in winter. At the *Medium* elevation area, the unidentified sparrow was the most frequently occurring species in spring, burrowing owl the most frequently occurring species during summer, rock wren in fall, and common raven in winter. At the *High* elevation area, the common raven was the most frequently occurring species in spring and winter, with mourning dove the most frequently occurring species during summer and rock wren in fall.

The red-tailed hawk was the most commonly observed raptor species (Table 4), comprising 40% of the observations, followed by burrowing owl (17%). Other raptor species observed included American kestrel (4 detections), prairie falcon (3), northern harrier and bald eagle (2), osprey and golden eagle (1).

9.3.3 Phase II: Near-Turbine Sites

The most abundant avian species overall, based on mean number per 5-minute utilization survey, was common raven during the summer and fall, unidentified gull during the spring, and Brewer's blackbird during the winter (Table 7). At the *Water* area, the most abundant species varied throughout the year: unidentified gull in spring, American coot in summer, house finch in fall, and Brewer's blackbird during the winter. At the *Low* elevation area, common raven was the most abundant species during summer, fall, and winter, while the unidentified gull was the most abundant species during spring.

The most frequently occurring avian species throughout the year was common raven, followed by loggerhead shrike in summer and fall, unidentified gull in spring, and Say's phoebe in winter (Table 8). At the *Water* elevation area, common raven was the most frequently occurring species throughout the year, followed by unidentified gull during spring, killdeer during summer, American kestrel in the fall, and unidentified sparrow in the winter. At the *Low* elevation area, the common raven was again the most frequently occurring species throughout the year, followed by loggerhead shrike during the summer and fall, unidentified gull during the spring, and Say's phoebe in the winter.

American kestrel was the most commonly observed raptor species (Table 4), comprising more than 43% of the observations, followed by prairie falcon (39%). Other raptor species observed included red-tailed hawk (2 detections), osprey (1), and common barn owl (1).

9.4 Avian Flight Height Characteristics

Flight height characteristics were calculated by taxonomic groups and geographic locations, combining Phase I and Phase II for the *Low* and *Water* areas (Table 9). The mean flight height of bird groups for the San Gorgonio WRA was 21.32 m. Overall, flight heights were highest for raptors (40.95 m), followed by waterbirds (35.59 m) and corvids (21.53 m). For the *High* and *Low* elevation areas, mean flight heights were highest for waterbirds, followed by raptors and corvids. For the *Medium* elevation area, mean flight heights were highest for raptors, followed by corvids. For the *Water* area, mean flight heights were highest for raptors, followed by waterbirds and other birds. For all AFT sites combined, mean flight heights were highest for raptors, followed by corvids and waterbirds. The highest mean flight height was observed at the *High* elevation area (28.51 m), followed by the *Low* elevation area (25.60 m), the *Water* area (21.43 m), the *Medium* elevation area (18.31 m), and AFT sites (16.22 m). Although we see from Table 9 that the mean flight height for raptors overall was 41 m and 33 m for AFT sites, the distribution (%) by height categories was very similar.

9.5 Avian Perching Behavior

Considering all birds except raptors, most observations of perched individuals were on vegetation (24.5%) or the ground (23.2%, Table 10). Power lines (poles, conductors, and lines) were the most common structure used as a perch (12.6%), followed closely by slt (11.9%). The other structure type that was represented with at least 5% of the perched bird observations was the stt (7.5%). No birds were observed perching on LTT.

A total of 44 perching events were documented for raptors (Table 10). Power lines (poles, conductors, and lines, 52.3%) and meteorogical towers (wires and towers, 15.9%) comprised more than 68% of the perched raptor observations. Slt and stt comprised nearly 14% of the observations, while no raptors were observed perching on LTT.

9.6 Avian Fatality Counts and Composition

9.6.1 Phase I: Overall

Sixty-one unknown or turbine-related bird fatalities representing 19 unique species were identified during Phase I in the San Gorgonio Pass WRA (Table 11). A wounded immature, female golden eagle was found by a Zond Mesa employee and taken to Cochella Wild Bird Center, where it was euthanized. In addition, 2 bat fatalities representing two species were found. A Mexican free-tailed bat (*Tadarida brasiliensis*) was found during a carcass search at a low elevation, NT site, and a hoary bat (*Lasiurus cinereus*) was found outside the study area.

Thirty-two (52.5%) of the fatalities were found at NT sites, 7 (11.5%) were found at AFT sites, and the remaining 22 (36.1%) were not associated with study sites, though they were found within the study area.

Twenty of the 61 unknown or turbine-related fatalities (32.8%) were waterbirds (Table 12). Waterbird species with the most fatalities were American Coot (11) and mallard (3). Other waterbird fatalities included 1 each of snow goose, sora, and unidentified grebe, teal, duck, and egret. Eight of the fatalities (13.1%) were raptors. Raptor species with the most fatalities included common barn owl (3) and red-tailed hawk (2). Other raptor fatalities included 1 each of golden eagle, great horned owl, and burrowing owl. Only one corvid species, the common raven (3), suffered fatalities, representing only 4.9% of the total. Only 4 of the fatalities (6.6%) were passerines. Passerine fatalities consisted of European starling (2) and white-throated swift and western meadowlark (1). Other birds comprised 24.6% of the fatalities. Other bird species with fatalities included rock dove (12) and mourning dove (3).

Sixteen of the 61 fatalities (26.2%) were feather spots, 24 (39.3%) consisted of feathers and/or bones, 13 (21.3%) were intact, and 8 (13.1%) were dismembered. Thirty-nine of the 61 bird fatalities (63.9%) were found during scheduled carcass searches. The remaining fatalities were found by observers while conducting other study activities or by power company employees (Appendix B). Only fatalities found during scheduled carcass searches were used to estimate fatality rates.

Turbines were the closest structure that could have caused fatality for 33 of the 61 fatalities (54.1%). Turbines were the first or second closest structure in 52 fatalities (85.2%). Dead birds were found from 2 to 2000 m (mean = 217.4 m) away from the closest turbine. When the closest structure was a turbine, dead birds were found from 2 to 450 m (mean = 36.5 m) away from the turbine. When the closest structure was not a turbine and the second closest structure was a turbine (n = 17), dead birds were found from 4 to 790 m (mean = 171.5 m) away from the turbine. Twelve (19.7%) of the 61 fatalities were found less than or equal to 10 m from a turbine, 14 (23.0%) from 10 m ≤ 20 m, 7 (11.5%) from 20 m ≤ 30 m, 7 (11.5%) from 30 m ≤ 40 m, 2 (3.3%) from 40 m ≤ 50 m, and 18 (29.5%) ≥ 50 m from a turbine. Twenty-six fatalities (42.6%) were associated with structures other than turbines as the two closest structures. Other structures located closest to (< 100 m) dead birds were other human-made structures (8), distribution lines (3), fences (3), main roads traveled greater than 56 kph (2), and meteorological towers (1).

Cause of death could not be determined for 48 (78.7%) of the 61 fatalities. Thirteen (21.3%) of the fatalities resulted from collisions with turbines. Two additional fatalities were not included in the above totals during Phase I at the San Gorgonio Pass WRA. Cause of death was determined to be non-turbine related. A greater roadrunner was killed due to a collision with a vehicle, and a mallard was probably poached.

9.6.2 Phase I: Near-Turbine Sites

Nine of the 32 unknown or turbine-related fatalities (28.1%) found at NT sites were waterbirds (Tables 11 and 12). The waterbird species with the most fatalities at NT sites was American Coot (5). Other waterbird fatalities included 1 each of mallard, sora, unidentified grebe, and egret. Two of the fatalities (6.3%) were raptors, including 1 each of red-tailed hawk and burrowing owl. Only one corvid species suffered a fatality: a single common raven representing only 3.1% of the total. Only 3 of the fatalities (9.4%) were passerines. Passerine fatalities consisted of 1 each of European starling, white-throated swift, and western meadowlark. Other birds comprised 31.3% of the fatalities. Other bird species with fatalities included rock dove (9) and mourning dove (1).

Turbines were the closest structure that could have caused fatality for 25 of the 32 fatalities (78.1%) found at NT sites. Turbines were the first or second closest structure in 31 fatalities (96.9%). Dead birds were found from 5 to 49 m (mean = 20.5 m) away from the closest turbine at NT sites. When the closest structure was not a turbine and the second closest structure was a turbine (n = 6), dead birds were found from 10 to 46 m (mean = 20.0 m) away from the turbine. The horizontal distribution of dead birds surrounding the closest turbine regardless of other structures is depicted in the first frame of Figure 3. Eight (25.0%) of the 32 fatalities were found less than or equal to 10 m from a turbine, 10 (31.3%) from 10 m ≤ 20 m, 7 (21.9%) from 20 m ≤ 30 m, 4 (12.5%) from 30 m ≤ 40 m, and 2 (6.3%) from 40 m ≤ 50 m from a turbine. No fatalities were associated with structures except at the two closest turbines at the NT site. Other structures located closest to dead birds, when the second closest structure was a turbine, included other human-made structures (4), main roads traveled greater than 56 kph (1), and meteorological towers (1).

9.6.3 Phase I: Away-from-Turbine Sites

Seven fatalities were found at AFT sites during carcass searches compared with 29 at NT sites (Table 12).

Five of the 7 unknown or turbine-related fatalities (71.4%) found at AFT sites were waterbirds (Table 11): American Coots (3), 1 mallard, and 1 unidentified teal. No raptor, corvid, or passerine fatalities were found at AFT sites. A single rock dove was found making the other birds category 14.3% of the fatalities. A single unidentified bird was also found.

Turbines were the first or second closest structure in 4 fatalities (57.1%). Dead birds were found from 400 to 2000 m (mean = 907.9 m) away from the closest turbine at AFT sites. When the closest structure was a turbine, the dead bird was found at 450 m (n = 1) away from the turbine. When the closest structure was not a turbine and the second closest structure was a turbine (n = 3), dead birds were found from 400 to 790 m (mean = 563.3 m) away from the turbine. The horizontal distribution of dead birds surrounding the closest turbine regardless of other structures is depicted in the second frame of Figure 3. At the AFT sites, two fatalities were associated with non-turbines as the two closest structures. Other structures located closest to dead birds included main roads traveled greater than 56 kph (1) and fences (1).

9.6.4 Phase II: Overall

Thirty-one unknown or turbine-related bird fatalities representing 12 unique species were identified during Phase II in the San Gorgonio Pass WRA (Table 12). Seven feather spots were found. A fatality could not be confirmed in these cases. The total number of fatalities was similar to that found during Phase I surveys of *Water* and *Low* areas (27). It is, however, not directly comparable due to the difference in search effort. A total of 600 searches (10 each for 60 sites) were completed during Phase II surveys, compared with only 381 searches (3 to 5 each for 79 *Water* and *Low* areas) completed during Phase I surveys.

Nine of the 31 unknown or turbine-related fatalities (29.0%) were waterbirds (Table 11). Waterbird species with the most fatalities were unidentified gull (4) and mallard (2). Other waterbird fatalities included 1 each of cinnamon teal, unidentified duck, and American coot. Four of the fatalities (12.9%) were raptors. Raptor species with fatalities included 1 each of red-tailed hawk, American kestrel, great horned owl, and unidentified owl. Only one corvid species suffered fatalities: common raven (2), representing 6.5% of the total. Six of the fatalities (19.5%) were passerines. Passerine fatalities consisted of 1 each of black phoebe, Western meadowlark, Brewer's blackbird, and 3 unidentified passerines. Other birds comprised 16.1% of the fatalities. Other bird species with fatalities included rock dove (5).

Ten of the 31 fatalities (32.3%) were feather spots, 13 (41.9%) consisted of feathers and/or bones, 4 (12.9%) were intact, and 4 (12.9%) were dismembered. More feather spots and fewer intact carcasses were found during Phase II studies than during Phase I. Twenty-four of the 31

Phase II bird fatalities (77.4%) were found during scheduled carcass searches. This was larger than the percentage of Phase I bird fatalities found during scheduled carcass searches. The remaining fatalities were found by observers while conducting other study activities or by power company employees (Appendix B). Only fatalities found during scheduled carcass searches were used to estimate fatality rates.

Turbines were the closest structure that could have caused fatality for 24 of the 31 fatalities (77.4%). Turbines were the first or second closest structure in 30 fatalities (96.8%). When the closest structure was a turbine, dead birds were found from 7 to 66 m (mean = 31.5 m) away from the turbine. When the closest structure was not a turbine and the second closest structure was a turbine (n = 6), dead birds were found from 9 to 56 m (mean = 35.8 m) away from the turbine. Two (6.5%) of the 31 unknown or turbine related fatalities were found less than or equal to 10 m from a turbine, 4 (12.9%) from 10 m ≤ 20 m, 10 (32.3%) from 20 m ≤ 30 m, 7 (22.6%) from 30 m ≤ 40 m, 4 (12.9%) from 40 m ≤ 50 m, and 3 (9.7%) ≥ 50 m from a turbine. Only one fatality (3.2%) was associated with structures other than turbines as the two closest structures. Other structures located closest to (< 20 m) dead birds were meteorological towers (1) and main roads traveled greater than 56 kph (1).

Cause of death could not be determined for 15 (48.4%) of the 31 fatalities. Sixteen (51.6%) fatalities resulted from collisions with turbines. A common raven nest at turbine 5-7 (*Water* area) was the site of additional fatalities not directly attributed to wind turbines. Two immature ravens were found dead due to starvation, exposure, and/or internal injuries during late May 2000. A third immature raven was taken to a rehabilitation center and later released. The adult male from the nest was found electrocuted in mid-June 2000.

None of the 7 fatalities whose age could be determined were immature birds. Of the adult fatalities, 6 (85.7%) collided with turbines and 1 (14.3%) had an undetermined cause of death.

9.6.5 Phase II: Near-Turbine Sites

Nine of the 26 unknown or turbine-related fatalities (34.6%) at NT sites during Phase II surveys were waterbirds (Table 11). Waterbird species with the most fatalities were unidentified gull (4) and mallard (2). Other waterbird fatalities included 1 each of cinnamon teal, unidentified duck, and American coot. Two of the fatalities (7.7%) at NT sites were raptors. Raptor species with fatalities included 1 each of great horned owl and unidentified owl. Only one corvid species suffered fatalities: common raven (2), representing 7.7% of the total. Four of the fatalities (15.4%) were passerines. Passerine fatalities at NT sites consisted of 1 western meadowlark and 3 unidentified passerines. Other birds comprised 19.2% of the fatalities. Other bird species with fatalities at NT sites included rock dove (5).

Turbines were the closest structure that could have caused fatality for 21 of the 26 unknown or turbine-related fatalities (80.8%) found at NT sites. Turbines were the first or second closest structure in all 26 fatalities. Dead birds were found from 7 to 50 m (mean = 28.4 m) away from the closest turbine at NT sites. When the closest structure was a turbine, dead birds were found from 7 to 48 m (mean = 27.6 m) away from the turbine. When the closest structure was not a turbine and the second closest structure was a turbine (n = 5), dead birds were found from 9 to 50 m (mean = 31.8 m) away from the turbine. The mean distances of dead birds from turbines were all larger during Phase II studies compared with Phase I. The horizontal distribution of dead birds surrounding the closest turbine regardless of other structures is depicted in the third frame of Figure 3. The distribution found during Phase II studies is different from that found during

Phase I studies. Overall, dead birds were found farther away from turbines during Phase II studies. Two (7.7%) of the 26 fatalities at NT sites were found less than or equal to 10 m from a turbine, 4 (15.4%) from 10 m ≤ 20 m, 10 (38.5%) from 20 m ≤ 30 m, 6 (23.1%) from 30 m ≤ 40 m, and 4 (15.4%) from 40 m ≤ 50 m from a turbine. At the NT sites, no fatalities were associated with non-turbines as the two closest structures. Other structures located closest to dead birds when the second closest structure was a turbine included distribution lines (3) and fences (2).

9.7 Standardized Bird Utilization, Fatality Rates, and Risk index Comparisons

In this section, comparisons of bird utilization rates, fatality rates, and risk index were made among the primary analysis factors. Bird utilization rates were compared for general analysis categories such as seasons, taxonomic groups, and geographic locations. Fatality rates and the risk indices were compared for all variables except season because searches were performed quarterly and the actual season the fatality occurred cannot always be determined. This is especially true for feather spots and non-fresh carcasses.

9.7.1 Seasons: Utilization

Mean utilization rates and 95% confidence intervals by taxonomic groups were calculated for each season (Table 13).

9.7.1.1 Phase I: Near-Turbine Sites

Higher use was observed during the winter (5.39) and fall (3.40) compared to the spring (1.94) and summer (0.54). Use was highest for waterbirds and passerines. Use was very low for corvids, raptors, and other birds (Table 13). Some differences existed in the observed proportions of use by groups between seasons. Winter use was significantly ($p < 0.10$) higher than spring, and summer use was significantly ($p < 0.10$) lower than the use for all other seasons. Fall use was not significantly different from spring or winter.

9.7.1.2 Phase I: Away-from-Turbine Sites

Higher use was observed during the fall (19.43) and winter (10.43), primarily due to large flocks of waterbirds, compared to spring (4.67) and summer (4.18). Higher use was observed for AFT sites for every season compared to the NT sites. Use was highest for waterbirds, followed by passerines, corvids, other birds, and raptors. Some differences existed in the observed proportions of use by groups between seasons. Fall use was significantly ($p < 0.10$) higher than spring and summer use but was not significantly different from winter use. Spring ($p < 0$), summer, and fall use did not differ significantly.

9.7.1.3 Phase II: Near-Turbine Sites

Higher use was observed during the spring (2.90) compared to summer (0.50), winter (0.41), and fall (0.21). Phase II spring use was higher than for Phase I, while winter and fall were lower, and summer was similar. Use was highest for waterbirds, followed by passerines, corvids, other birds, and raptors. Some differences existed in the observed proportions of use by groups between seasons. Spring use was significantly ($p < 0.10$) higher than all other seasons. Fall use was significantly ($p < 0.10$) lower than summer and spring use but was not significantly different from winter.

9.7.2 Taxonomic Groups: Bird Utilization

Mean utilization rates by taxonomic groups were calculated and presented in Table 13.

9.7.2.1 Phase I: Near-Turbine Sites

The mean utilization rate by all birds was 2.23 birds/survey. Use was highest for waterbirds (1.09 birds/survey), followed by passerines (1.00), corvids (0.11), raptors (0.02), and other birds (0.01). Use by raptors and other birds was not significantly different from each other, but were significantly lower ($p < 0.10$) than waterbirds, passerines, and corvids. Corvids had significantly ($p < 0.10$) higher use than raptors and other birds and significantly ($p < 0.10$) lower use than waterbirds and passerines. Use by waterbirds and passerines was significantly ($p < 0.10$) higher than use by any other avian group; however, they were not significantly different from each other.

9.7.2.2 Phase I: Away-from-Turbine Sites

The mean utilization rate by all birds was 7.70 birds/survey, which was more than three times higher than the NT sites. Overall, use was highest for waterbirds (6.28 birds/survey), followed by passerines (1.15), corvids, other birds (0.12), and raptors (0.02). Waterbirds, passerines, and other birds had higher use for AFT sites compared to the NT sites, whereas corvids and raptors were very similar. Use by raptors was lower (although not statistically significant) than other birds and was significantly ($p < 0.10$) lower than waterbirds, passerines, and corvids. Corvids had significantly ($p < 0.10$) higher use than raptors and significantly ($p < 0.10$) lower use than waterbirds and passerines. Use by waterbirds was significantly ($p < 0.10$) higher than use by any other avian group. Use by passerines was significantly ($p < 0.10$) lower than waterbirds' use and was significantly ($p < 0.10$) higher than use by corvids, other birds, and raptors. Other birds had significantly ($p < 0.10$) lower use than waterbirds and passerines but were not significantly different from corvids and raptors.

9.7.2.3 Phase II: Near-Turbine Sites

The mean utilization rate by all birds was 0.78 birds/survey, which was more than three times lower than the Phase I use. Overall, use was highest for waterbirds (0.49 birds/survey), followed by passerines (0.14), corvids (0.12), and other birds and raptors (0.01). Waterbirds and passerines had lower use for Phase II compared to the Phase I, whereas corvids, raptors, and other birds were very similar. Use by raptors and other birds was significantly ($p < 0.10$) lower than waterbirds, passerines, and corvids, but they were not significantly different from each other. Corvids and passerines had significantly ($p < 0.10$) higher use than raptors and other birds and significantly ($p < 0.10$) lower use than waterbirds; however, they were not significantly different from each other. Use by waterbirds was significantly ($p < 0.10$) higher than use by any other avian group.

9.7.3 Taxonomic Groups: Fatality

Fatality by taxonomic groups is presented in Table 14.

9.7.3.1 Phase I: Near-Turbine Sites

Total bird fatality was 0.044 carcasses/survey. Fatality was highest for waterbirds (0.014 carcasses/survey), followed by other birds (0.011), passerines (0.004), raptors (0.003), and corvids (0.001). There were no significant differences in fatality between taxonomic groups.

9.7.3.2 Phase I: Away-from-Turbine Sites

Total bird fatality was 0.035 carcasses/survey, which was lower than the NT sites. The only fatalities observed were waterbirds (0.025 carcasses/survey) and other birds (0.005). There were no significant differences in fatality between the two taxonomic groups.

9.7.3.3 Phase II: Near-Turbine Sites

Total bird fatality was 0.040 carcasses/survey, which was slightly lower than in Phase I. Fatality was highest for waterbirds (0.013 carcasses/survey), followed by other birds (0.008), passerines (0.007), and raptors and corvids (0.003). There were no significant differences in fatality between taxonomic groups.

9.7.4 Taxonomic Groups: Risk Index

The average risk index by taxonomic groups was calculated and presented in Table 15.

9.7.4.1 Phase I: Near-Turbine Sites

Total bird risk index was 0.019. Risk index was highest for other birds (0.918 carcasses/bird use unit), followed by raptors (0.167), corvids (0.013), waterbirds (0.012), and passerines (0.004) (Table 15). There were no significant differences in risk index between taxonomic groups.

9.7.4.2 Phase I: Away-from-Turbine Sites

Total bird risk index was 0.005, which was lower than the NT sites. The only avian groups with any risk index were other birds (0.043 carcasses/bird use unit) and waterbirds (0.004) (Table 15). There were no significant differences in risk index between the two taxonomic groups.

9.7.4.3 Phase II: Near-Turbine Sites

Total bird risk index was 0.052, which was higher than Phase I. Risk index was highest for other birds (0.881 carcasses/bird use unit), followed by raptors (0.412), passerines (0.047), corvids (0.028), and waterbirds (0.027) (Table 15). There were no significant differences in risk index between taxonomic groups.

9.7.5 Geographic Location: Utilization

Mean utilization rates by taxonomic groups were calculated for each geographic location (Table 13).

9.7.5.1 Phase I: Near-Turbine Sites

Higher use was observed within the *Water* (6.18 birds/survey) and *Low* (2.30) areas, compared to the *High* (0.57) and *Medium* (0.42) elevation areas. Use was highest for waterbirds (1.09), followed by passerines (1.00), corvids (0.11), raptors (0.02), and other birds (0.01) (Table 13). Some differences existed in the observed proportions of use by groups within different geographic locations. Use at the *Water* area was significantly ($p < 0.10$) higher than all other geographic locations. The *Low* elevation area use was significantly ($p < 0.10$) higher than the *Medium* and *High* elevation areas and significantly ($p < 0.10$) lower than the *Water* area. The *Medium* and *High* elevation areas were significantly ($p < 0.10$) lower than the *Water* and *Low* areas; however, they were not significantly different from each other.

Raptors showed similar use at all geographic locations with the highest use at the *Water* area (0.04 birds/survey) and the lowest use at the *Low* elevation area (0.01). The highest use for corvids was observed at the *Water* area (0.16). Significantly ($p < 0.10$) lower use was observed at the *Medium* elevation area (0.05). No other significant differences were observed among geographic locations for corvids. Passerines use was highest in the *Water* area (1.81). Significantly ($p < 0.10$) lower use was observed at the *High* (0.45) and *Medium* (0.34) elevation areas. The *Medium* elevation area was also significantly ($p < 0.10$) lower than the *Low* elevation area for passerines. The *Low* and *Water* areas were not significantly different from each other for passerines. There were no significant differences in use among the geographic locations for other birds. Waterbirds were only observed at the *Water* (4.16) and *Low* (0.92) areas, which were significantly ($p < 0.10$) different from each other.

9.7.5.2 Phase I: Away-from-Turbine Sites

Higher use was observed within the *Water* (25.70 birds/survey) area, compared to the *Low* (2.90), *High* (1.35), and *Medium* (1.03) elevation areas. *Water* area had more than four times the use than the NT sites. The other geographic locations were also all higher for AFT sites compared to NT sites. Use was highest for waterbirds (6.28), followed by passerines (1.15), corvids and other birds (0.12), and raptors (0.02) (Table 13). Some differences existed in the observed proportions of use by groups within different geographic locations. Use at the *Water* area was significantly ($p < 0.10$) higher than all other geographic locations. No other significant differences were observed among the geographic locations.

9.7.5.3 Phase II: Near-Turbine Sites

Higher use was observed within the *Water* area (1.57 birds/survey) compared to the *Low* elevation area (0.32). Both geographic locations in Phase II were lower than their counterparts in Phase I. Use was highest for waterbirds (0.49), followed by passerines (0.14), corvids (0.12), and raptors and other birds (0.01) (Table 13). Use at the *Water* area was significantly ($p < 0.10$) higher than the *Low* elevation area.

Raptors showed similar use at the two locations with the highest use at the *Water* area (0.02) and the lowest at the *Low* elevation area (<0.01). The highest use for corvids was observed at the *Water* area (0.20), which was significantly higher ($p < 0.10$) than at the *Low* elevation area (0.07). Again, passerine use was highest in the *Water* area (0.31). Significantly ($p < 0.10$) lower use was observed at the *Low* elevation area (0.04). There were no significant differences in use between the geographic locations for other birds. Again, the *Water* area (1.01) was significantly higher ($p < 0.10$) than the *Low* elevation area (0.19) for waterbirds.

9.7.6 Geographic Location: Fatality

Mean fatality by taxonomic groups was calculated for each geographic location (Table 14).

9.7.6.1 Phase I: Near-Turbine Sites

Low elevation area had the highest bird fatality (0.075 carcasses/survey), followed by *Water* area (0.045), and *Medium* elevation area (0.030). No fatalities were observed at the *High* elevation area (Table 14). There were no significant differences between any of the geographic locations.

Very low fatality was observed at all of the geographic locations. For *Water* area, fatalities were only observed for waterbirds (0.027). *Low* elevation area had the largest variation in fatalities rates, but no significant differences existed between the taxonomic groups. Other birds (0.023) and waterbirds (0.020) had the highest observed fatality compared to raptors and passerines (0.007) and corvids (0.004). For *Medium* elevation area, fatality was the same for waterbirds, passerines, and other birds (0.007), and no fatalities were observed for raptors and corvids.

Fatalities were only observed at the *Low* elevation area for raptors and corvids (0.007 carcasses/survey and 0.004, respectively). Passerines showed the same fatality between *Low* and *Medium* elevation areas (0.007). There was no significant difference in fatality between *Low* (0.023) and *Medium* (0.007) elevation areas for other birds. Waterbirds had the highest fatality rate in the water area (0.027) compared to *Low* (0.020) and *Medium* (0.007) elevation areas but were not significantly ($p > 0.10$) different.

9.7.6.2 Phase I: Away-from-Turbine Sites

Water area had the highest bird fatality (0.080 carcasses/survey), followed by *Low* (0.040) and *Medium* (0.020) elevation areas. No fatalities were observed at the *High* elevation area (Table 14). The *Low* and *Medium* elevation areas for AFT sites had lower fatality than the NT sites, but the *Water* area had a higher fatality. There were no significant differences between the geographic locations.

A very low fatality rate was observed at all the geographic locations. Fatalities were only observed at *Water* (0.080 carcasses/survey) and *Low* (0.020) areas for waterbirds and at *Medium* elevation area (0.020) for other birds.

9.7.6.3 Phase II: Near-Turbine Sites

Water area had the highest bird fatality (0.068 carcasses/survey), followed by *Low* elevation area (0.024) (Table 14). There were no significant differences between the geographic locations. The *Water* area had higher fatality for Phase II than Phase I, while *Low* elevation area had lower fatality for Phase II than Phase I.

Fatality was highest for waterbirds (0.032 carcasses/survey), followed by other birds (0.014) and corvids and passerines (0.005). No raptor fatalities were observed in the *Water* area. *Low* elevation area had a very low fatality for all avian groups. Passerines (0.008) had the “highest” observed fatality compared to raptors and others (0.005) and waterbirds and corvids (0.003, Table 14).

Fatalities were only observed at the *Low* elevation area for raptors (0.005 carcasses/survey). Corvids had the highest fatality at the *Water* area (0.005), compared to the *Low* elevation area (0.003). Passerines had the opposite pattern of corvids with *Low* elevation area (0.008) followed by *Water* area (0.005). Fatality was highest at *Water* area (0.032), followed by *Low* elevation area (0.003) for waterbirds, but the difference was not significant. There was no significant difference in fatality between *Water* (0.014) and *Low* (0.005) areas for other birds.

9.7.7 Geographic Location: Risk Index

The average risk index by taxonomic groups was calculated for each geographic location (Table 15).

9.7.7.1 Phase I: Near-Turbine Sites

Medium elevation area had the highest bird risk index (0.073 carcasses/bird), followed by *Low* elevation area (0.028) and *Water* area (0.007) (Table 15). Patterns of the risk index for individual groups of birds varied by geographic location. For *Water* area, waterbirds had the only risk index (0.006 carcasses/bird unit). The most variation occurred at the *Low* elevation area. Risk index was highest for other birds (1.667), followed by raptors (0.632), corvids (0.027), waterbirds (0.018), and passerines (0.005). None of the observed risk index estimates by avian groups were significantly different from one another. For *Medium* elevation area, risk index was highest for other birds (2.000), followed by passerines (0.023), but not significantly. No fatalities were observed at *High* elevation area resulting in a risk index of 0 for all avian groups.

Raptors only had a risk index at *Low* elevation area (0.632 carcasses/bird). The *Low* elevation area was the only geographic location with any risk index for corvids (0.027). Passerines showed no significant differences in risk index between *Medium* elevation area (0.023) and *Low* elevation area (0.005). *Low* elevation area (0.018) had the highest risk index for waterbirds compared to *Water* area (0.006), but the difference was not significant. The highest risk index observed for other birds was at *Medium* elevation area (2.000) compared to the *Low* elevation area (1.667). There were no significant differences in risk index by geographic location for other birds.

9.7.7.2 Phase I: Away-from-Turbine Sites

Medium elevation area had the highest bird risk index (0.019 carcasses/bird), followed by *Low* elevation area (0.014) and *Water* area (0.003) (Table 15). AFT sites had lower risk indices for all geographic locations compared to the NT sites. For *Water* area, waterbirds had the only risk index (0.003). Again, waterbirds had the only risk index for *Low* elevation area (0.010). For *Medium* elevation area, the only risk index was for other birds (0.500). No fatalities were observed at *High* elevation area. There were no significant differences in risk index between avian groups or geographic locations.

9.7.7.3 Phase II: Near-Turbine Sites

Low elevation area had the highest bird risk index (0.074 carcasses/bird), followed by *Water* area (0.044) (Table 15). Both geographic locations had higher risk indices for Phase II than for Phase I. Patterns of risk index for individual groups of birds varied by geographic location. For *Water* area, other birds had the highest risk index (1.110), followed by waterbirds (0.031), corvids (0.023), and passerines (0.014). For *Low* elevation area, risk index was highest for raptors (1.488), followed by other birds (0.673), passerines (0.192), corvids (0.036), and waterbirds (0.014). None of the observed risk index estimates by taxonomic groups was significantly different from another.

Raptors only had a risk index at the *Low* elevation area (1.488 carcasses/bird). Corvids had the highest risk index at *Low* elevation area (0.036) compared to *Water* area (0.023), but the difference was not significant. Passerines showed no significant differences in risk index between *Low* elevation area (0.192) and *Water* area (0.014). *Water* area (0.031) was the highest risk index for waterbirds compared to *Low* elevation area (0.014), but the difference was not significant. The highest risk index observed for other birds was at *Water* area (1.110) compared to *Low* elevation area (0.673). There were no significant differences in risk index by location for other birds.

9.7.8 Turbine Size: Utilization

Mean use, fatality, and risk index for large ($\geq$26-m rotor diameter) and small (<26-m rotor diameter) turbines were standardized only to a per-turbine basis. Fatality and risk index were expected to be higher for larger turbines because of their larger rotor diameter.

Mean utilization rates by taxonomic groups were calculated for each turbine size and geographic location (Table 16).

9.7.8.1 Phase I: Near-Turbine Sites

Low and *High* elevation areas were the only geographic locations with both large and small turbines, containing large and small tubular and small lattice structures (Table 2). *Water* and *Medium* areas contained only small lattice and tubular structures. Small turbines had higher use

(2.430 birds/survey) compared to large turbines (1.779) (Table 16). Use was highest for both *Low* (3.021) and *High* (0.612) elevation areas for the small turbines compared to *Low* (1.955) and *High* (0.606) elevation areas for the large turbines (Table 16).

9.7.8.2 Phase II: Near-Turbine Sites

Both *Water* and *Low* areas contained large and small tubular structures. Large turbines had higher use (1.056 birds/survey) compared to small turbines (0.629) (Table 16). Use was highest for *Water* (1.998) and *Low* (0.446) areas for the large turbines compared to *Water* (1.134) and *Low* (0.259) for the small turbines (Table 16). These results will be the same as the Turbine Type section below, given only tubular structures exist at Phase II.

9.7.9 Turbine Size: Fatality

Mean fatality by taxonomic groups was calculated for each turbine size and geographic location (Table 17).

9.7.9.1 Phase I: Near-Turbine Sites

Large turbines had higher bird fatality rates (0.087/search) than small turbines (0.035), although the difference was not statistically significant ($p > 0.10$, Table 17). Within all taxonomic groups, except corvids for which no fatalities were observed at the large turbines, the fatality rate at large turbines was higher than at small turbines, although none of the differences were statistically significant. The influence of more than a single turbine in a plot could have affected the results of this study.

Comparisons of bird fatality rates of the turbines in *Low* elevation area show slightly higher fatality rates at larger turbines compared to smaller turbines for all avian groups, except corvids for which no fatalities were observed at the large turbines (Table 17). None of the differences was statistically significant ($p > 0.10$). No fatalities were observed at the *High* elevation area. Rotor swept area of the larger turbines in this comparison are two to three times larger than the rotor swept area of the smaller turbines.

9.7.9.2 Phase II: Near-Turbine Sites

Large turbines had a slightly higher bird fatality rate (0.046/search) than small turbines (0.042), although the difference was not statistically significant ($p > 0.10$, Table 17). The fatality rate at large turbines was only higher than at small turbines for waterbirds, was lower for passerines and other birds, and was the same for raptors and corvids. None of the differences was statistically significant. The influence of more than a single turbine in a plot could have affected the results of this study.

Comparisons of fatality rates at *Water* area show that at larger turbines (0.082), fatality rates were higher compared to smaller turbines (0.055), and no distinct pattern existed between the fatality rates for the avian groups (Table 17). The differences between the avian groups were not statistically significant. Fatality rates at *Low* elevation area were higher for small turbines (0.033) compared to large turbines (0.024). Comparisons of fatality rates for the avian groups show that when fatalities were observed for both turbine types, the fatality rate was higher for the smaller turbines but not statistically significant ($p > 0.10$, Table 17). Rotor swept area of the larger turbines in this comparison are two to three times larger than the rotor swept area of the smaller turbines. These results will be the same as the Turbine Type section below, given only tubular structures exist at Phase II.

9.7.10 Turbine Size: Risk Index

The average risk index by taxonomic groups was calculated for each turbine size and geographic location (Table 18).

9.7.10.1 Phase I: Near-Turbine Sites

Larger turbines had a higher risk index (0.049) than smaller turbines (0.015), although the difference was not statistically significant ($p > 0.10$, Table 18). The raptor risk index was higher for large turbines (0.800 versus 0.093) but not statistically significant. Within the *Low* elevation area, which contains both large and small turbines, larger turbines (0.051) had a larger risk than smaller turbines (0.020) and for avian groups with a risk index at both turbine sizes. None of the differences was statistically significant.

9.7.10.2 Phase II: Near-Turbine Sites

Smaller turbines had a higher risk index (0.067) than larger turbines (0.044), although the difference was not statistically significant ($p > 0.10$, Table 18). The raptor risk index was slightly higher for small turbines (0.464 versus 0.411) but not significantly different.

For *Water* area, smaller turbines had a slightly higher risk index (0.048) than larger turbines (0.041), which was also true for all avian groups, except other birds (Table 18). Within *Low* elevation area, smaller turbines (0.129) had a larger risk index than larger turbines (0.053) and for passerines and other birds. Raptors had a higher risk index at the large turbines (3.700) compared to the small turbines (1.244). No significant differences existed between risk index for either geographic location ($p > 0.10$, Table 18). These results will be the same as the Turbine Type section below, given only tubular structures exist at Phase II.

9.7.11 Turbine Types: Utilization

Mean utilization rates by taxonomic groups were calculated for each geographic location and turbine style (Table 19).

9.7.11.1 Phase I: Near-Turbine Sites

Low and *High* elevation areas contained LTT, stt, and slt, while *Water* and *Medium* areas contained only slt and stt (Table 2). Higher use occurred at the stt (3.804 birds/survey) compared to LTT (1.779) and slt (0.765) (Table 19). Overall use was statistically higher at the stt than at the slt ($p < 0.10$, Table 19). LTT were not significantly different than either stt or slt. Use was highest for stt for all geographic locations, except *High* elevation area where stt had the lowest use. The only significant difference that existed between turbine types occurred at *High* elevation area, where the slt (0.755) were significantly higher than the stt (0.238) ($p < 0.10$, Table 19).

9.7.11.2 Phase II: Near-Turbine Sites

Both *Water* and *Low* areas only contained LTT and stt (Table 2); therefore the results are the same as the Turbine Size section above. Higher overall use occurred at the LTT (1.056 birds/survey) compared to stt (0.629) (Table 19). The difference was not statistically different ($p > 0.10$, Table 19). Use was highest for LTT for both geographic locations. No significant differences existed between turbine types at the geographic locations ($p > 0.10$, Table 19).

9.7.12 Turbine Types: Fatality

Mean fatality for each taxonomic group was calculated for each turbine type and geographic location (Table 20).

9.7.12.1 Phase I: Near-Turbine Sites
Fatality rates were highest for LTT (0.087/search), followed by stt (0.042) and slt (0.027), although confidence intervals for all estimates overlapped one another, indicating no statistically significant differences (Table 20). A similar pattern existed for raptors, with the highest fatality rate occurring with LTT (0.009), followed only by stt (0.003) (slt had no observed raptor fatalities). None of the differences was statistically significant ($p > 0.10$, Table 20).

No fatalities were observed at the *High* elevation area. For the other geographic location with LTT, *Low* elevation area, the fatality rates mimicked the overall results with LTT having the highest rate (0.100/search), followed by stt (0.075) and slt (0.033). For *Water* and *Medium* areas, the higher fatality rates were at the slt (0.086 and 0.033, respectively), followed by stt (0.027, for both areas). No differences between the geographic locations or turbine types were statistically significant ($p > 0.10$). Fatalities rates among avian groups showed no consistent pattern among geographic locations and turbine types.

9.7.12.2 Phase II: Near-Turbine Sites
Fatality rates were only slightly higher for LTT (0.046/search) compared to stt (0.042) (Table 20). A similar pattern existed for raptors, with the same fatality rate occurring at LTT and stt (0.004). None of the differences was statistically significant ($p > 0.10$, Table 20).

For *Water* area, the higher fatality rate occurred at LTT (0.082/search), followed by stt (0.055). For *Low* elevation area, the higher fatality rate was at the stt (0.033) compared to LTT (0.024). No differences between the geographic locations or turbine types were statistically significant ($p > 0.10$). Similar to Phase I, fatality rates among avian groups showed no consistent pattern among geographic locations and turbine types.

9.7.13 Turbine Types: Risk Index

9.7.13.1 Phase I: Near-Turbine Sites
Overall, the average risk index was highest for LTT (0.049), followed by slt (0.035) and stt (0.011), although confidence intervals for all estimates overlapped one another, indicating no statistically significant differences (Table 21). Raptor risk index was highest at LTT (0.800) compared to stt (0.196), with no raptor fatalities and subsequently 0 for an estimate of risk index at the slt (Table 21).

No fatalities were observed at *High* elevation area, resulting in 0 for all estimated risk indices. Within *Low* elevation area, mean overall risk index was highest for the LTT (0.051), followed by slt (0.048) and stt (0.018). Mean raptor risk index was highest for the stt (1.091) compared to estimates for LTT (0.800). For *Water* and *Medium* areas, the average risk index results followed the same pattern as the fatalities rates with slt (0.050 and 0.109, respectively) having the highest risk index over stt (0.003 and 0.055, respectively, Table 21). No significant differences existed between the average risk indices for the geographic locations and turbine types.

9.7.13.2 Phase II: Near-Turbine Sites
Overall, the average risk index was highest for stt (0.067), followed by LTT (0.044), although confidence intervals for the estimates overlapped one another, indicating no statistically significant differences (Table 21). Raptor risk index was slightly higher at stt (0.464) compared to LTT (0.411) (Table 21).

For *Water* area, the average risk index was slightly higher for stt (0.048) compared to LTT (0.041). Within *Low* elevation area, the average overall risk index was again highest for the stt (0.129) followed by LTT (0.053). The average raptor risk index was highest for the LTT (3.700) compared to estimates for stt (1.244) but was not significantly different ($p > 0.10$, Table 21). The average passerine risk index followed the same pattern as *Low* elevation area with stt (0.247) having the highest risk index compared to LTT (0.185, Table 21). No significant differences existed between the average risk indices for the geographic locations and turbine types.

9.8 Observer Detection Rates

Two observer efficiency experiments were conducted: September 22, 1997 and March 31, 1998. A total of 396 native birds or bird parts were placed in the field for observers to either detect or not detect, and then detection rates of placed birds/parts were determined (Table 22). During the first experiment, detection rates of small carcasses was lower than detection rates of large birds/parts, and detection rates in small shrub habitat were lower than detection rates in both large shrub and open habitats. Detection rates of small birds in small shrub habitat were significantly lower ($p < 0.10$) than detection rates of large carcasses in both large shrub and open habitat. Similar trends existed during the second study. Small birds/parts in small shrub habitat were significantly less detectable than large birds within open habitats.

Overall, observers detected 64% of the carcasses/parts placed in the field. Large birds/parts were detected 84% of the time in open habitat, 73% in large shrub habitat, and 55% in small shrub habitat. Small carcasses/parts were detected 60% of the time in open habitat, 64% in large shrub habitat, and 53% in small shrub habitat. Overall, small birds/parts were significantly less detectable than large birds in open habitats ($p < 0.10$) but not in the other two habitats. Large birds/parts were significantly more detectable in open habitat than small shrub habitat. There were no significant differences in detectability between the other two habitats for either small or large birds/parts.

9.9 Scavenging Rates

Two scavenging experiments were conducted, one in April 1997 and one in December 1997. A total of 215 carcasses were used to estimate scavenging rates (Table 23). Primary analysis variables compared include placement (within 100 m of turbines, between 100 and 400 m from turbines, and greater than 400 m from turbines), season (two dates), study area, carcass size (small and large), and carcass color (cryptic vs. non-cryptic). Overall, 90% of the carcasses were removed 8 days after placement, and 96% at day 10. The estimated proportion of fatalities removed by day 8 varied little by the primary analysis variables. The mean time to removal estimate was 3.92 days (95% confidence interval (3.56, 4.29).

9.9.1 Proximity to Turbines

The mean removal time for carcasses near turbines was similar to those far from turbines (4.13 and 3.97).

9.9.2 Geographic Location

The mean removal time was lowest in the *Water* areas (2.59 days), with very similar estimates for the *Low*, *Medium*, and *High* elevation areas (4.26, 4.05, and 4.29). The mean in the *Water* area was significantly lower than *High* and *Medium* elevation areas ($p < 0.10$).

9.9.3 Season

Mean removal time was significantly lower during the April trial (3.21) compared to the December trial (4.31, $p<0.10$).

9.9.4 Size of Carcass

Mean removal time was lower for small carcasses compared to large carcasses but not significantly different ($p > 0.10$). It should be noted that all small carcasses were white or yellow, while all large carcasses were brown.

9.9.5 Color

Mean removal time was higher for cryptic-colored carcasses (4.08 days) compared with non-cryptic-colored carcasses (3.62 days), although this difference was not statistically significant ($p > 0.10$).

10.0 Discussion/Conclusions

This study was not specifically designed to provide standardized estimates of avian fatalities. The wide interval between searches (90 days) led to a high level of uncertainty in the fatality estimates. The unknown impact of scavenging on the fatality estimates could greatly impact them. With these obvious caveats in mind, the unadjusted estimate of raptor fatalities for the wind resource area is 0.006 per turbine per year. The average nameplate output of the turbines in our sample was 155 kW during Phase I and approximately 800 kW during Phase II, yielding an estimate of approximately 0.03 raptor fatalities per MW per year unadjusted for searcher efficiency and scavenging bias. These estimated fatality rates are much lower than the unadjusted estimates from the Altamont Pass WRA (Smallwood and Thelander 2004) and Tehachapi Pass (Anderson *et al.* 2004).

The lack of random assignment of treatments to experimental units may have caused some variables to be confounded. For example, there were no lattice structures in the Phase II geographic locations, possibly confounding the effect of turbine type with geographic location. Differences in overall fatality rates or risk index between tubular towers and lattice towers may be due to differences in geographic location and not differences due to turbine type.

Scavengers, predators, and other removal sources (e.g., oiled carcass sinking in water, carcasses plowed into field) may remove carcasses between the time the casualty occurs and the time the next search is conducted. Estimating scavenging rates is vital to providing good fatality rates (Erickson *et al.* 2000). It is less vital in a study like this when comparing indices among levels of several factors. We did need to assume similar average scavenging rates among the levels of the factors studied. The estimated scavenging rates were higher than those recorded at several other wind projects (Morrison 2002). At the newly constructed Vansycle windplant, located primarily in wheat fields, small carcasses lasted on average 15.0 days, and large carcasses lasted on average greater than the search interval of 28 days (Erickson *et al.* 2000). At the Buffalo Ridge windplant, small carcasses persisted on average 4.7 days, whereas small birds at Foote Creek Rim persisted 12.2 days. Some other scavenging studies have observed high rates of scavenging, such as those estimated at San Gorgonio. Wobeser and Wobeser (1992) reported that nearly 80% (79.2) of the chicks placed in a mixed grazed pasture were removed within 24 hours of being placed. In France, Pain (1991) estimated duck carcasses lasted an average of 1.5 days in open habitats, whereas those concealed by vegetation or those in water lasted between 3.3 and 7.6 days. In one orchard, scavengers removed all 25 of the placed carcasses within 24 hours, with lower rates in the other orchards studied.

It is likely that disappearance rates also vary by species or avian group. For example, it is speculated that raptor carcasses last longer than other large bird carcasses such as gamebirds and waterfowl, although limited empirical data exist to test this hypothesis. Although not tested experimentally, chickens are also likely scavenged at higher rates than raptors.

Observed fatality rates during the Phase I and Phase II components of this study were very low. Due to the low fatality rates, strong patterns in comparison results of fatality and the risk index among levels of factors such as geographic location and type of turbine were not very apparent.

Some fatalities observed during carcass searches at San Gorgonio and other wind projects may not have been caused by the wind facility. Given the large interval between searches on the sites, many of the carcasses were old and desiccated, which makes it difficult to assign cause of death. We used a conservative approach in which we included all observed fatalities unless cause could be determined to not be wind-facility related.

Bird use was estimated to be similar within 200 m of turbines compared to AFT sites, suggesting no measurable displacement impact at this project.

Rock doves were the most common fatality observed during the study and contributed to the "other bird" category being most at risk. Raptor fatality was very low, but our risk index suggested they still were more at risk than other groups, such as corvids and waterbirds. This was consistent with studies at the Altamont (Thelander *et al.* 2003) and Tehachapi (Anderson *et al.* 2004).

In any future studies at San Gorgonio, we recommend additional scavenging trials be conducted, using bird species that are more representative of the species/groups targeted for monitoring. We also recommend that searches be conducted more frequently and include rows of turbines. Initial scavenging studies should be used to direct how often a plot is to be searched.

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Table 1. Vegetation types documented during Phase I and Phase II studies at San Gorgonio Pass WRA based on vegetation observed within 50 m of the sample site center

Vegetation Structure	Dominant Group/Species	
	Phase I	Phase II
Grass		
	Burned Annual Grassland	Mixed Annuals
	California Annual Grassland	
Subshrub		
	Brittlebush	Crinkled Mats
	California Dalea	Rabbit Brush
	Cheese Bush	Sandpaper Plant
	Rabbit Brush	Scalebroom
	Russian Thistle	White Bur Sage
	Saltbush (Atriplex spp.)	
	Scale Broom	
	White Bur Sage	
	Other	
Large Shrub		
	Creosote Bush	Creosote Bush
		Desert Willow
Wooded		
	Tamarisk	Tamarisk

Table 2. Description of turbines within the Phase I and Phase II studies at San Gorgonio Pass WRA and the turbines selected for the study

MODEL	Tower Type	Tower Height (m)	# blades	Rotor Height (m) max	min	Rotor Length(m)	RSA[a] m	# in WRA	# in sample[b]
Phase I									
***Water* area**									
Entertech 40	slt	24.4	3	31.1	17.7	6.7	141.03	85	7
Micon 108	stt	24.4	3	33.9	14.9	9.5	283.53	107	3
Micon 65	stt	24.4	3	32	16.8	7.6	181.46	136	12
***Low* elevation area**									
Entertech 40	slt	24.4	3	31.1	17.7	6.7	141.03	143	12
Micon 108	stt	24.4	3	33.9	14.9	9.5	283.53	353	22
Micon 65	stt	24.4	3	32	16.8	7.6	181.46	104	3
Micon M-1500	LTT		3			21.7	1479.34	7	7
Nedwind	LTT	38.5	2	58.1	18.1	20	1256.64	20	13
***Medium* elevation area**									
Bonus 120	stt	24.4	3	33.4	15.4	9	254.47	119	1
Bonus 65	stt	24.4	3	31.9	16.9	7.5	176.71	65	3
Micon 108	stt	24.4	3	34.1	14.6	9.7	295.59	61	2
Micon 65	stt	24.4	3	32.6	16.1	8.3	216.42	97	5
Nordtank 65	stt	24.4	3	32.6	16.1	8.3	216.42	83	3
Vestas 15	slt	24.4	3	32	16.7	7.7	186.26	65	4
Vestas 17	slt	24.4	3	32.9	15.9	8.5	226.98	164	8
Wincon 110	stt	24.4	3	35.2	13.6	10.8	366.44	85	1
***High* elevation area**									
Danwin 160	stt	24.4	3	36	12.8	11.6	422.73	115	8
Vestas 15A	slt	24.4	3	32	16.7	7.7	186.26	385	20
Vestas 15B	slt	42.7	3	50.3	35	7.7	186.26	77	1
Vestas V-27	LTT	42.7	3	56.2	29.2	13.5	572.55	41	3
							Subtotal	2312	138
Phase II									
***Water* area**									
Micon 108 and 65	stt								11
Micon M-1500	LTT								11
***Low* elevation area**									
Micon 108 and 65	stt								15
Micon M-1500	LTT								17
Nedwind	L2TT	38.5	2	58.1	18.1	20	1256.64	20	6
							Subtotal		60
							Total		198

[a] Rotor swept area
[b] All sample sites included multiple turbines

Table 3. Sample sizes for each factor used in comparison of fatality rates, use, and collision risk

Measure/Category	Overall		Phase I		Phase II	
	n	%	n	%	n	%
Phases	238		178		60	
Proximity to Turbine						
Near	198	83.2	138	77.5	60	100.0
Away	40	16.8	40	22.5	0	0
Turbine Type						
L2TT	6	3.0	0	0.0	6	10.0
LTT	27	13.6	23	16.7	28	46.7
slt	52	26.3	52	37.7	0	0
stt	102	51.5	63	45.7	26	43.3
Turbine Size						
Large	57	28.8	23	16.7	34	9.3
Small	141	71.2	115	83.3	26	90.7

Table 4. Number of groups and individuals of avian groups observed during bird utilization surveys during Phase I and Phase II studies at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II

	Phase I: NT Site		Phase I: AFT Site		Phase II	
Species	# Groups	# Indivs.	# Groups	# Indivs.	# Groups	# Indivs.
Waterbirds						
Western Grebe	0	0	4	7	1	1
Unidentified Grebe	0	0	0	0	1	1
Double-Crested Cormorant	26	357	52	930	25	288
Red-Breasted Merganser	0	0	0	0	2	3
Brown Pelican	0	0	2	2	0	0
Common Merganser	0	0	5	27	0	0
Mallard	30	92	21	68	52	164
Gadwall	2	20	2	8	3	14
American Green-Winged Teal	0	0	2	150	2	4
Cinnamon Teal	3	14	0	0	4	7
Northern Shoveler	1	1	2	8	0	0
Northern Pintail	0	0	4	12	0	0
Redhead	0	0	15	439	10	80
Canvasback	0	0	2	16	1	2
Greater Scaup	0	0	0	0	1	1
Unidentified Scaup	0	0	0	0	1	1
Ring-Necked Duck	1	1	7	28	7	52
Bufflehead	3	6	4	10	3	6
Ruddy Duck	6	38	21	290	6	12
Unidentified Duck	16	1130	8	606	4	22
Canada Goose	1	27	0	0	0	0
Unknown Light Goose	0	0	0	0	1	1
Black Brant	2	2	0	0	2	27
Great Blue Heron	11	13	4	5	43	50
Great Egret	24	35	24	52	30	55
Snowy Egret	0	0	0	0	2	2
Black-Crowned Night Heron	1	1	0	0	0	0
Tri-Colored Heron	0	0	0	0	4	4
American Coot	54	1183	64	2053	30	257
American Avocet	0	0	0	0	1	1
Black-Necked Stilt	0	0	0	0	3	5
Least Sandpiper	0	0	0	0	9	22
Western Sandpiper	0	0	0	0	3	48
Unidentified Sandpiper	1	6	1	14	10	53
Greater Yellowlegs	2	4	2	2	5	9
Lesser Yellowlegs	0	0	0	0	1	1
Killdeer	9	97	7	11	40	84

Table 4 (continued)

Species		Phase I: NT Site # Groups	# Indivs.	Phase I: AFT Site # Groups	# Indivs.	Phase II # Groups	# Indivs.
Eared Grebe		3	3	6	13	1	1
Glaucous-Wing gull		0	0	0	0	1	1
California Gull				4	164	11	24
Unidentified Gull		114	2643	63	1703	63	1577
Ring-Billed Gull		9	99	38	469	0	0
Pied-Billed Grebe		3	8	4	8	3	3
Bonaparte’s Gull		2	2	0	0	0	0
Caspian Tern		14	57	24	75	7	23
Common Loon		0	0	8	9	1	6
Unknown Tern		0	0	0	0	1	2
Unidentified Waterbird		0	0	0	0	6	15
	Subtotal	338	5839	400	7179	401	2929
Raptors							
Northern Harrier		1	1	2	2	0	0
Red-Tailed Hawk		25	26	12	12	2	2
Unidentified Buteo		1	1	0	0	0	0
Golden Eagle		10	13	1	1	0	0
Bald Eagle		0	0	2	2	0	0
Prairie Falcon		4	4	2	3	9	9
Peregrine Falcon		4	4	0	0	0	0
American Kestrel		27	28	4	4	10	10
Osprey		0	0	1	1	1	1
Common Barn Owl		0	0	0	0	1	1
Burrowing Owl		0	0	5	5	0	0
Unidentified Raptor		3	3	0	0	0	0
	Subtotal	75	80	29	30	23	23
Corvids							
Scrub Jay		1	1	0	0	0	0
Common Raven		328	489	123	196	301	440
American Crow		0	0	0	0	2	3
	Subtotal	329	490	123	196	303	443
Passerines							
White-Throated Swift		5	44	10	61	0	0
Anna’s Hummingbird		0	0	2	3	0	0
Broad-Tailed Hummingbird		0	0	0	0	1	1
Unidentified Hummingbird		4	4	7	7	0	0
Western Kingbird		0	0	3	3	1	1
Say’s Phoebe		0	0	2	3	10	10
Black Phoebe		0	0	1	1	6	6
Unidentified Flycatcher		0	0	0	0	3	3

Table 4 (continued)

Species	Phase I: NT Site # Groups	Phase I: NT Site # Indivs.	Phase I: AFT Site # Groups	Phase I: AFT Site # Indivs.	Phase II # Groups	Phase II # Indivs.
Horned Lark	6	12	25	43	3	6
European Starling	81	134	3	10	2	3
Brown-Headed Cowbird	0	0	0	0	10	24
Red-Winged Blackbird	5	35	1	1	11	14
Western Meadowlark	18	25	9	24	0	0
Brewer's Blackbird	18	36	34	70	24	130
House Finch	103	1946	24	277	5	12
American Goldfinch	0	0	0	0	1	3
Lesser Goldfinch	1	12	1	1	0	0
Lawrence's Goldfinch	3	5	1	1	0	0
Savannah Sparrow	4	13	2	2	4	5
Lark Sparrow	1	1	2	3	0	0
White-Crowned Sparrow	21	82	20	46	0	0
Black-Throated Sparrow	4	11	7	8	0	0
Sage Sparrow	0	0	2	2	0	0
Rufous-Crowned Sparrow	0	0	1	1	0	0
Unidentified Sparrow	16	24	38	60	14	26
Abert's Towhee	0	0	6	6	0	0
Western Tanager	0	0	0	0	1	1
Cliff Swallow	2	16	2	10	0	0
Barn Swallow	0	0	6	34	0	0
Violet-Green Swallow	0	0	1	1	2	3
Northern Rough-Winged Swallow	0	0	2	10	0	0
Unidentified Swallow	0	0	6	9	5	12
Phainopepla	1	1	1	1	0	0
Loggerhead Shrike	29	30	12	15	26	27
Yellow Warbler	0	0	2	4	0	0
Yellow-Rumped Warbler	12	43	1	5	4	4
Black-Throated Gray Warbler	2	2	0	0	0	0
Wilson's Warbler	0	0	3	3	0	0
Unidentified Warbler	0	0	0	0	1	2
Sage Thrasher	0	0	3	3	0	0
Northern Mockingbird	3	3	1	1	0	0
California Thrasher	1	1	0	0	0	0
Le Conte's Thrasher	2	2	4	9	0	0
Cactus Wren	4	5	0	0	0	0
Rock Wren	28	29	26	32	0	0
Bewick's Wren	2	2	3	4	0	0
Black-Tailed Gnatcatcher	0	0	1	2	0	0
Mountain Bluebird	0	0	1	1	0	0
Unidentified Passerine	91	236	70	175	26	34
Subtotal	467	2754	346	952	160	327

Table 4 (continued)

Species	Phase I: NT Site		Phase I: AFT Site		Phase II	
	# Groups	# Indivs.	# Groups	# Indivs.	# Groups	# Indivs.
Others						
Rock Dove	8	79	0	0	7	10
Mourning Dove	10	11	19	72	1	5
Gambel's Quail	1	1	4	21	0	0
Greater Roadrunner	5	5	1	1	8	8
Unidentified Bird	22	132	17	19	11	19
Subtotal	46	228	41	113	27	42
Total	1255	9391	939	8470	914	3764

Table 5. Avian abundance and richness by season during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II, calculated based on observations within 200 m of site center

Season / Metric	Study Area				
	Overall	*Water*	*Low*	*Medium*	*High*
Phase I – NT Sites					
Spring					
No. Species	25	11	8	8	13
Mean No. / Survey[a]	1.94	3.45	2.40	1.02	0.85
Mean No. Species / Survey	0.38	0.49	0.27	0.32	0.56
Summer					
No. Species	33	19	12	8	14
Mean No. / Survey[a]	0.54	2.24	0.20	0.14	0.28
Mean No. Species / Survey	0.17	0.45	0.09	0.10	0.18
Fall					
No. Species	31	21	7	8	7
Mean No. / Survey[a]	3.40	10.58	2.84	0.38	0.61
Mean No. Species / Survey	0.32	0.85	0.13	0.19	0.26
Winter					
No. Species	29	18	9	6	13
Mean No. / Survey[a]	5.39	13.01	7.18	0.38	0.81
Mean No. Species / Survey	0.44	1.06	0.39	0.26	0.25
Phase I - AFT Sites					
Spring					
No. Species	35	18	13	10	11
Mean No. / Survey[a]	4.67	11.31	5.77	0.89	1.68
Mean No. Species / Survey	0.88	1.44	0.70	0.57	0.92
Summer					
No. Species	39	19	10	9	18
Mean No. / Survey[a]	4.18	13.56	1.54	0.55	1.35
Mean No. Species / Survey	0.55	1.16	0.22	0.32	0.52
Fall					
No. Species	29	20	3	9	5
Mean No. / Survey[a]	19.43	61.94	1.91	1.59	0.62
Mean No. Species / Survey	1.04	2.24	0.41	0.72	0.42
Winter					
No. Species	39	25	10	11	8
Mean No. / Survey[a]	10.43	34.55	3.48	1.79	1.48
Mean No. Species / Survey	1.06	2.35	0.60	0.63	0.63

Table 5 (continued)

Phase II – NT Sites					
Season	Study Area				
	Overall	*Water*	*Low*	*Medium*	*High*
Spring					
No. Species	26	24	6		
Mean No. / Survey[a]	2.90	5.17	1.59		
Mean No. Species / Survey	0.40	0.82	0.17		
Summer					
No. Species	30	28	9		
Mean No. / Survey[a]	0.50	1.23	0.09		
Mean No. Species / Survey	0.18	0.36	0.07		
Fall					
No. Species	17	15	6		
Mean No. / Survey[a]	0.21	0.43	0.09		
Mean No. Species / Survey	0.13	0.24	0.07		
Winter					
No. Species	14	12	5		
Mean No. / Survey[a]	0.41	0.85	0.14		
Mean No. Species / Survey	0.17	0.31	0.08		

[a] Mean No. / Survey defined as the mean number of individuals observed per 5-minute utilization survey

Table 6. Mean abundance, percent composition, and percent frequency of occurrence of avian groups observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II, calculated based on observations within 200 m of site center

Phase I – NT Sites												
Geographic Locations / Taxonomic Group	Mean Abundance				% Composition				% Freq. of Occurrence			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Overall												
Waterbirds	1.26	0.35	1.81	2.02	64.97	65.38	53.32	37.40	4.54	3.32	4.10	5.98
Raptors	0.02	0.02	0.01	0.02	0.92	3.18	0.38	0.44	1.58	1.43	1.28	2.19
Corvids	0.20	0.06	0.09	0.13	10.39	11.87	2.64	2.44	10.26	4.21	6.15	7.97
Passerines	0.45	0.09	1.47	3.20	23.01	17.39	43.14	59.28	17.16	5.02	11.79	22.31
Other	0.01	0.01	0.01	0.02	0.41	1.17	0.38	0.44	0.79	0.54	0.77	1.00
Unidentified	0.01	0.01	0.01	0	0.31	1.00	0.15	0	0.59	0.54	0.51	0
Total	1.94	0.54	3.40	5.39	100	100	100	100				
Water area												
Waterbirds	2.72	1.89	8.28	6.43	78.76	84.16	78.25	49.39	17.33	17.22	16.25	25.61
Raptors	0.07	0.03	0.03	0.04	1.93	1.24	0.24	0.28	5.33	2.78	2.50	3.66
Corvids	0.19	0.13	0.10	0.23	5.41	5.94	0.95	1.78	12.00	10.00	8.75	13.41
Passerines	0.48	0.19	2.11	6.30	13.90	8.42	19.98	48.45	13.33	6.67	18.75	39.02
Other	0	0.01	0.05	0.01	0	0.25	0.47	0.09	0	0.56	2.50	1.22
Unidentified	0	0	0.01	0	0	0	0.12	0	0	0	1.25	0
Total	3.45	2.24	10.58	13.01	100	100	100	100				
Low elevation area												
Waterbirds	1.99	0.10	0.32	2.31	82.82	48.11	11.34	32.16	4.59	1.13	2.14	4.29
Raptors	0.00	0.01	0.02	0.02	0.19	2.83	0.76	0.33	0.46	0.56	2.14	1.90
Corvids	0.31	0.06	0.06	0.18	12.79	29.25	2.02	2.52	13.76	3.57	4.29	10.48
Passerines	0.09	0.04	2.44	4.62	3.82	17.92	85.89	64.32	6.88	3.20	4.29	20.48
Other	0.00	0.00	0	0.05	0.19	0.94	0	0.66	0.46	0.19	0	1.43
Unidentified	0.00	0.00	0	0	0.19	0.94	0	0	0.46	0.19	0	0
Total	2.40	0.20	2.84	7.18	100	100	100	100				

Table 6 (continued)

Geographic Locations / Taxonomic Group	Mean Abundance				% Composition				% Freq. of Occurrence			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Medium elevation area												
Waterbirds	0	0	0	0	0	0	0	0	0	0	0	0
Raptors	0.02	0.03	0	0.03	2.00	25.00	0	8.82	2.04	2.84	0	3.33
Corvids	0.11	0.01	0.03	0.07	11.00	8.33	9.09	17.65	5.10	1.14	3.41	4.44
Passerines	0.88	0.09	0.32	0.27	86.00	62.50	84.85	70.59	21.43	5.11	13.64	15.56
Other	0	0	0.01	0.01	0	0	3.03	2.94	0	0	1.14	1.11
Unidentified	0.01	0.01	0.01	0	1	4.17	3.03	0	1.02	0.57	1.14	0
Total	1.02	0.14	0.38	0.38	100	100	100	100				
High elevation area												
Waterbirds	0	0	0	0	0	0	0	0	0	0	0	0
Raptors	0.01	0.02	0	0.01	1.01	7.81	0	1.03	0.86	1.32	0	0.83
Corvids	0.09	0.06	0.20	0.03	10.10	21.88	32.00	3.09	6.90	3.51	9.76	2.50
Passerines	0.72	0.16	0.41	0.78	84.85	56.25	68.00	95.88	35.34	7.89	15.85	19.17
Other	0.03	0.02	0	0	3.03	7.81	0	0	2.59	1.75	0	0
Unidentified	0.01	0.02	0	0	1.01	6.25	0	0	0.86	1.75	0	0
Total	0.85	0.28	0.61	0.81	100	100	100	100				

Table 6 (continued)

Geographic Locations/ Taxonomic Group	Mean Abundance				% Composition				% Freq. of Occurrence			
Phase I - AFT Sites												
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Overall												
Waterbirds	3.24	3.46	18.27	7.27	69.45	82.63	94.04	69.72	14.63	12.15	22.81	17.72
Raptors	0.02	0.01	0.03	0.03	0.39	0.26	0.14	0.24	1.22	1.10	1.75	1.90
Corvids	0.18	0.05	0.11	0.23	3.79	1.19	0.54	2.25	11.59	3.31	7.02	8.86
Passerines	1.15	0.44	1.03	2.86	24.67	10.57	5.28	27.43	38.41	20.72	31.58	35.44
Other	0.07	0.21	0	0.03	1.44	5.09	0	0.30	4.27	2.76	0	2.53
Unidentified	0.01	0.01	0	0.01	0.26	0.26	0	0.06	1.22	1.10	0	0.63
Total	4.67	4.18	19.43	10.43	100	100	100	100				
Water area												
Waterbirds	8.94	12.84	60.35	26.63	79.12	94.72	97.44	77.06	52.78	42.05	67.65	62.50
Raptors	0	0	0.09	0	0	0	0.14	0	0	0	5.88	0
Corvids	0.28	0.13	0.26	0.25	2.46	0.92	0.43	0.72	16.67	9.09	14.71	10.00
Passerines	2.08	0.51	1.24	7.55	18.43	3.77	1.99	21.85	36.11	27.27	26.47	32.50
Other	0	0.08	0	0.1	0	0.59	0	0.29	0	1.14	0	7.50
Unidentified	0	0	0	0.03	0	0	0	0.07	0	0	0	2.50
Total	11.31	13.56	61.94	34.55	100	100	100	100				
Low elevation area												
Waterbirds	4.77	1.29	1.41	1.48	82.68	83.45	73.81	42.45	11.36	7.45	13.64	5.00
Raptors	0.07	0	0	0.03	1.18	0	0	0.72	4.55	0	0	2.50
Corvids	0.14	0.05	0	0.05	2.36	3.45	0	1.44	9.09	2.13	0	2.50
Passerines	0.75	0.19	0.50	1.93	12.99	12.41	26.19	55.40	31.82	10.64	27.27	37.50
Other	0.02	0.01	0	0	0.39	0.69	0	0	2.27	1.06	0	0
Unidentified	0.02	0	0	0	0.39	0	0	0	2.27	0	0	0
Total	5.77	1.54	1.91	3.48	100	100	100	100				

Table 6 (continued)

Geographic Locations/ Taxonomic Group	Mean Abundance				% Composition				% Freq. of Occurrence			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Medium elevation area												
Waterbirds	0	0	0	0.66	0	0	0	36.76	0	0	0	2.63
Raptors	0	0.04	0	0.05	0	6.52	0	2.94	0	3.57	0	2.63
Corvids	0.04	0.01	0.06	0.32	4.88	2.17	3.92	17.65	4.35	1.19	6.25	15.79
Passerines	0.70	0.46	1.53	0.74	78.05	84.78	96.08	41.18	34.78	20.24	43.75	31.58
Other	0.15	0	0	0.03	17.07	0	0	1.47	8.70	0	0	2.63
Unidentified	0	0.04	0	0	0	6.52	0	0	0	3.57	0	0
Total	0.89	0.55	1.59	1.79	100	100	100	100				
High elevation area												
Waterbirds	0	0	0	0	0	0	0	0	0	0	0	0
Raptors	0	0.01	0	0.03	0	0.77	0	1.69	0	1.04	0	2.50
Corvids	0.29	0.01	0.04	0.33	17.19	0.77	6.25	22.03	18.42	1.04	3.85	7.50
Passerines	1.29	0.60	0.58	1.13	76.56	44.62	93.75	76.27	52.63	25.00	26.92	40.00
Other	0.08	0.72	0	0	4.69	53.08	0	0	5.26	8.33	0	0
Unidentified	0.03	0.01	0	0	1.56	0.77	0	0	2.63	1.04	0	0
Total	1.68	1.35	0.62	1.48	100	100	100	100				

Table 6 (continued)

Geographic Locations/ Taxonomic Group	Mean Abundance				% Composition				% Freq. of Occurrence			
Phase II – NT Sites												
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Overall												
Waterbirds	2.45	0.28	0.03	0.03	84.41	55.60	15.29	7.46	11.84	2.78	1.01	1.61
Raptors	0.00	0.00	0.02	0.01	0.11	0.98	7.06	2.99	0.31	0.40	1.26	1.01
Corvids	0.34	0.08	0.05	0.10	11.61	16.11	22.35	25.87	13.71	4.96	3.28	5.85
Passerines	0.11	0.12	0.12	0.23	3.76	22.99	54.12	57.71	5.30	4.76	6.31	4.84
Other	0	0.02	0.00	0.01	0	3.34	1.18	1.49	0	0.89	0.25	0.60
Unidentified	0.00	0.00	0	0.02	0.11	0.98	0	4.48	0.31	0.10	0	1.01
Total	2.90	0.50	0.21	0.41	100	100	100	100				
Water area												
Waterbirds	4.39	0.77	0.09	0.08	84.96	62.61	20.97	9.49	25.64	7.61	2.76	4.32
Raptors	0	0.01	0.03	0.03	0	0.66	6.45	3.80	0	0.54	2.07	2.70
Corvids	0.51	0.17	0.06	0.15	9.92	13.94	12.90	17.72	19.66	9.51	4.14	7.03
Passerines	0.26	0.25	0.26	0.53	4.96	20.13	59.68	62.03	11.11	7.34	12.41	8.65
Other	0	0.02	0	0.02	0	1.55	0	1.90	0	0.82	0	1.62
Unidentified	0.01	0.01	0	0.04	0.17	1.11	0	5.06	0.85	0.27	0	2.16
Total	5.17	1.23	0.43	0.85	100	100	100	100				
Low elevation area												
Waterbirds	1.33	0	0	0	83.38	0	0	0	3.92	0	0	0
Raptors	0.00	0.00	0.01	0	0.31	3.51	8.70	0	0.49	0.31	0.80	0
Corvids	0.24	0.03	0.04	0.08	14.77	33.33	47.83	55.81	10.29	2.34	2.79	5.14
Passerines	0.02	0.04	0.04	0.06	1.54	45.61	39.13	41.86	1.96	3.28	2.79	2.57
Other	0	0.02	0.00	0	0	17.54	4.35	0	0	0.94	0.40	0
Unidentified	0	0	0	0.00	0	0	0	2.33	0	0	0	0.32
Total	1.59	0.09	0.09	0.14	100	100	100	100				

Mean abundance = mean number of individuals observed per 5-minute utilization survey; percent composition = percent of all observations comprised of species i; percent frequency of occurrence = percent of all surveys where species i was recorded.

Table 7. Five most abundant avian species (based on mean number per 5-minute utilization survey) observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II, calculated based on observations within 200 m of site center

Phase I – NT Sites

Geographic Locations	Spring Species	Spring Use	Summer Species	Summer Use	Fall Species	Fall Use	Winter Species	Winter Use
Overall								
	Unidentified Gull	0.97	Unidentified Gull	0.20	American Coot	1.45	House Finch	2.60
	Common Raven	0.20	Common Raven	0.06	House Finch	1.20	Unidentified Gull	1.12
	European Starling	0.18	Double-Crested Cormorant	0.06	Unidentified Gull	0.13	American Coot	0.67
	Killdeer	0.17	Caspian Tern	0.04	Ruddy Duck	0.09	Common Raven	0.13
	Unidentified Duck	0.08	Mallard	0.02	Common Raven	0.09	White-Crowned Sparrow	0.09
Water area								
	Killdeer	1.15	Unidentified Gull	1.16	American Coot	7.08	House Finch	4.73
	Unidentified Gull	0.77	Caspian Tern	0.22	House Finch	1.63	American Coot	4.09
	Unidentified Duck	0.55	Mallard	0.14	Ruddy Duck	0.45	Unidentified Gull	1.33
	European Starling	0.24	Common Raven	0.13	Mallard	0.26	Ring-Billed Gull	0.46
	Cliff Swallow	0.21	Double-Crested Cormorant	0.13	Yellow-Rumped Warbler	0.15	White-Crowned Sparrow	0.38
Low elevation area								
	Unidentified Gull	1.99	Double-Crested Cormorant	0.08	House Finch	2.41	House Finch	4.30
	Common Raven	0.31	Common Raven	0.06	Unidentified Gull	0.32	Unidentified Gull	2.15
	European Starling	0.06	Unidentified Gull	0.02	Common Raven	0.06	Common Raven	0.18
	Loggerhead Shrike	0.01	Loggerhead Shrike	0.02	American Kestrel	0.02	Double-Crested Cormorant	0.16
	American Kestrel	0.00	European Starling	0.01	Loggerhead Shrike	0.01	European Starling	0.05
	Northern Mockingbird	0.00						
	Rock Dove	0.00						
	Unidentified Hummingbird	0.00						

Table 7 (continued)

Geographic Locations	Season							
	Spring		Summer		Fall		Winter	
	Species	Use	Species	Use	Species	Use	Species	Use
Medium elevation area								
	White-Throated Swift	0.31	Horned Lark	0.03	White-Crowned Sparrow	0.20	House Finch	0.13
	European Starling	0.27	Red-Tailed Hawk	0.02	Common Raven	0.03	Common Raven	0.07
	Common Raven	0.11	European Starling	0.02	Loggerhead Shrike	0.03	Red-Tailed Hawk	0.03
	White-Crowned Sparrow	0.09	American Kestrel	0.01	Bewick's Wren	0.02	European Starling	0.02
	House Finch	0.04	Common Raven	0.01	Black-Throated Gray Warbler	0.02	Rock Dove	0.01
			Le Conte's Thrasher	0.01	Black-Throated Sparrow	0.02	Unidentified Sparrow	0.01
							White-Crowned Sparrow	0.01
High elevation area								
	European Starling	0.32	Common Raven	0.06	Yellow-Rumped Warbler	0.24	Western Meadowlark	0.13
	Common Raven	0.09	European Starling	0.06	Common Raven	0.20	White-Crowned Sparrow	0.11
	Unidentified Sparrow	0.06	Mourning Dove	0.02	Rock Wren	0.07	Lesser Goldfinch	0.10
	White-Crowned Sparrow	0.06	Golden Eagle	0.01	Unidentified Sparrow	0.02	White-Throated Swift	0.08
	Western Meadowlark	0.06	Loggerhead Shrike	0.01	California Thrasher	0.01	Lawrence's Goldfinch	0.04
			Rock Wren	0.01	House Finch	0.01		
					Western Meadowlark	0.01		

Table 7 (continued)

	Phase I - AFT Sites							
	Season							
Geographic Locations	Spring		Summer		Fall		Winter	
	Species	Use	Species	Use	Species	Use	Species	Use
Overall								
	Unidentified Gull	1.41	Unidentified Gull	1.73	American Coot	13.70	Unidentified Gull	2.93
	California Gull	1.00	Double-Crested Cormorant	1.08	American Green-Winged Teal	1.32	House Finch	1.64
	American Coot	0.33	Redhead	0.30	Ruddy Duck	1.15	American Coot	1.63
	Common Raven	0.18	Mourning Dove	0.17	Unidentified Gull	0.70	Ring-Billed Gull	1.37
	Unidentified Sparrow	0.17	Brewer’s Blackbird	0.10	Ring-Billed Gull	0.57	Ruddy Duck	0.46
Water area								
	California Gull	4.56	Unidentified Gull	6.58	American Coot	45.94	Unidentified Gull	10.95
	Unidentified Gull	1.53	Double-Crested Cormorant	3.67	American Green-Winged Teal	4.41	American Coot	6.45
	American Coot	1.50	Redhead	1.25	Ruddy Duck	3.85	House Finch	5.65
	Barn Swallow	0.67	Brewer’s Blackbird	0.43	Ring-Billed Gull	1.79	Ring-Billed Gull	3.93
	Brewer’s Blackbird	0.47	Caspian Tern	0.36	Unidentified Gull	1.56	Ruddy Duck	1.80
Low elevation area								
	Unidentified Gull	4.02	Double-Crested Cormorant	0.72	Unidentified Gull	1.23	Ring-Billed Gull	1.48
	Caspian Tern	0.48	Unidentified Gull	0.52	White-Crowned Sparrow	0.23	House Finch	0.58
	White-Throated Swift	0.30	Common Raven	0.05	Ring-Billed Gull	0.18	White-Crowned Sparrow	0.28
	Double-Crested Cormorant	0.27	Caspian Tern	0.04	Say’s Phoebe	0.09	Unidentified Sparrow	0.10
	Common Raven	0.14	European Starling	0.04			Common Raven	0.05
			Loggerhead Shrike	0.04			Lark Sparrow	0.05

Table 7 (continued)

Geographic Locations	Season							
	Spring		Summer		Fall		Winter	
	Species	Use	Species	Use	Species	Use	Species	Use
Medium elevation area								
	Le Conte's Thrasher	0.15	Barn Swallow	0.08	Western Meadowlark	0.47	Unidentified Gull	0.66
	Unidentified Sparrow	0.13	Horned Lark	0.08	House Finch	0.19	Common Raven	0.32
	Gambel's Quail	0.11	Unidentified Sparrow	0.08	Rock Wren	0.16	House Finch	0.24
	White-Crowned Sparrow	0.11	Burrowing Owl	0.04	Unidentified Sparrow	0.13	Horned Lark	0.13
	Black-Throated Sparrow	0.04	Western Kingbird	0.04	Horned Lark	0.09	European Starling	0.08
	Common Raven	0.04						
	Horned Lark	0.04						
	Mourning Dove	0.04						
High elevation area								
	Unidentified Sparrow	0.47	Mourning Dove	0.55	Unidentified Sparrow	0.12	Common Raven	0.33
	Common Raven	0.29	Gambel's Quail	0.16	Loggerhead Shrike	0.08	White-Crowned Sparrow	0.10
	Horned Lark	0.21	Horned Lark	0.11	Rock Wren	0.08	Bewick's Wren	0.08
	White-Crowned Sparrow	0.16	Rock Wren	0.09	Abert's Towhee	0.04	Rock Wren	0.08
	Mourning Dove	0.08	Unidentified Sparrow	0.07	Black-Throated Sparrow	0.04	Anna's Hummingbird	0.05
	Rock Wren	0.08			Common Raven	0.04		
	White-Throated Swift	0.08						

Table 7 (continued)

Geographic Locations	Phase II – NT Sites							
	Season							
	Spring		Summer		Fall		Winter	
	Species	Use	Species	Use	Species	Use	Species	Use
Overall								
	Unidentified Gull	2.07	Common Raven	0.08	Common Raven	0.05	Brewer’s Blackbird	0.13
	Common Raven	0.34	American Coot	0.06	House Finch	0.03	Common Raven	0.10
	California Gull	0.06	Brewer’s Blackbird	0.05	Killdeer	0.02	Unidentified Sparrow	0.04
	Redhead	0.06	Unidentified Sandpiper	0.05	Loggerhead Shrike	0.02	Unidentified Swallow	0.02
	Mallard	0.05	Mallard	0.05	American Kestrel	0.01	Mallard	0.02
							Say’s Phoebe	0.02
Water area								
	Unidentified Gull	3.41	American Coot	0.17	House Finch	0.07	Brewer’s Blackbird	0.35
	Common Raven	0.51	Common Raven	0.17	Common Raven	0.06	Common Raven	0.15
	Redhead	0.17	Brewer’s Blackbird	0.15	Killdeer	0.05	Unidentified Sparrow	0.10
	Mallard	0.14	Unidentified Sandpiper	0.13	American Goldfinch	0.02	Mallard	0.04
	California Gull	0.13	Mallard	0.13	American Kestrel	0.02	Say’s Phoebe	0.03
					Loggerhead Shrike	0.02		
					Unidentified Sparrow	0.02		
Low elevation area								
	Unidentified Gull	1.30	Common Raven	0.03	Common Raven	0.04	Common Raven	0.08
	Common Raven	0.24	Loggerhead Shrike	0.02	Loggerhead Shrike	0.02	Unidentified Swallow	0.04
	California Gull	0.02	Rock Dove	0.01	American Kestrel	0.00	Say’s Phoebe	0.01
	Loggerhead Shrike	0.01	European Starling	0.00	Common Barn Owl	0.00	Loggerhead Shrike	0.01
	Savannah Sparrow	0.01	Greater Roadrunner	0.00	Say’s Phoebe	0.00	Unidentified Sparrow	0.00
					Rock Dove	0.00		
					Unidentified Flycatcher	0.00		

Table 8. Five most frequently occurring avian species during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II, calculated based on observations within 200 m of site center

Geographic Locations	**Phase I** – NT Sites							
	Season							
	Spring		Summer		Fall		Winter	
	Species	%	Species	%	Species	%	Species	%
Overall								
	Common Raven	10.26	Common Raven	4.21	Common Raven	6.15	House Finch	9.56
	European Starling	8.48	Loggerhead Shrike	1.25	American Coot	2.31	Common Raven	7.77
	Unidentified Gull	2.96	Unidentified Gull	1.08	House Finch	2.31	Unidentified Gull	2.59
	Western Meadowlark	1.58	European Starling	0.99	Yellow-Rumped Warbler	1.54	European Starling	1.79
	Rock Wren	1.18	Brewer's Blackbird	0.81	Great Egret	1.28	White-Crowned Sparrow	1.79
	Unidentified Sparrow	1.18			Loggerhead Shrike	1.28		
					Rock Wren	1.28		
					Ruddy Duck	1.28		
					Unidentified Gull	1.28		
Water elevation area								
	Common Raven	12.00	Common Raven	10.00	American Coot	11.25	House Finch	19.51
	European Starling	8.00	Brewer's Blackbird	4.44	Common Raven	8.75	Common Raven	13.41
	Unidentified Gull	6.67	Double-Crested Cormorant	3.89	House Finch	7.50	American Coot	8.54
	Unidentified Duck	4.00	Mallard	3.89	Great Egret	6.25	Ring-Billed Gull	7.32
	American Coot	2.67	American Coot	3.33	Ruddy Duck	6.25	White-Crowned Sparrow	7.32
	American Kestrel	2.67	Unidentified Gull	3.33				
	Brewer's Blackbird	2.67						
	Cliff Swallow	2.67						
	Killdeer	2.67						
	Ring-Billed Gull	2.67						
Low elevation area								
	Common Raven	13.76	Common Raven	3.57	Common Raven	4.29	House Finch	12.38
	Unidentified Gull	4.59	Loggerhead Shrike	2.07	American Kestrel	2.14	Common Raven	10.48
	European Starling	3.67	Unidentified Gull	1.13	Unidentified Gull	2.14	Unidentified Gull	3.81
	Loggerhead Shrike	1.38	European Starling	0.56	House Finch	1.43	European Starling	2.38
	American Kestrel	0.46	American Kestrel	0.19	Loggerhead Shrike	1.43	American Kestrel	1.90
	Northern Mockingbird	0.46	Brewer's Blackbird	0.19				
	Rock Dove	0.46	Double-Crested Cormorant	0.19				

Table 8 (continued)

Geographic Locations	**Phase I** – NT Sites							
	Season							
	Spring		Summer		Fall		Winter	
	Species	%	Species	%	Species	%	Species	%
Low elevation area (continued)								
	Unidentified Hummingbird	0.46	Mourning Dove	0.19				
			Prairie Falcon	0.19				
			Red-Tailed Hawk	0.19				
			Unidentified Hummingbird	0.19				
			White-Throated Swift	0.19				
Medium elevation area								
	European Starling	12.24	European Starling	1.70	Common Raven	3.41	House Finch	5.56
	Common Raven	5.10	Red-Tailed Hawk	1.70	Loggerhead Shrike	3.41	Common Raven	4.44
	House Finch	2.04	American Kestrel	1.14	White-Crowned Sparrow	3.41	Red-Tailed Hawk	3.33
	Red-Tailed Hawk	2.04	Common Raven	1.14	Bewick’s Wren	2.27	European Starling	1.11
	White-Crowned Sparrow	2.04	Le Conte’s Thrasher	1.14	Black-Throated Gray Warbler	2.27	Rock Dove	1.11
							Unidentified Sparrow	1.11
							White-Crowned Sparrow	1.11
High elevation area								
	European Starling	14.66	Common Raven	3.51	Common Raven	9.76	Rock Wren	3.33
	Common Raven	6.90	European Starling	1.32	Rock Wren	6.10	Western Meadowlark	2.50
	Western Meadowlark	6.03	Mourning Dove	1.32	Yellow-Rumped Warbler	2.44	Common Raven	1.67
	Rock Wren	5.17	Rock Wren	1.32	California Thrasher	1.22	Lawrence’s Goldfinch	1.67
	Unidentified Sparrow	4.31	Loggerhead Shrike	0.88	House Finch	1.22	White-Crowned Sparrow	1.67
			Red-Tailed Hawk	0.88	Unidentified Sparrow	1.22	White-Throated Swift	1.67
			Unidentified Hummingbird	0.88	Western Meadowlark	1.22		
			Unidentified Sparrow	0.88				

Table 8 (continued)

Geographic Locations	Phase I - AFT Sites							
	Season							
	Spring		Summer		Fall		Winter	
	Species	%	Species	%	Species	%	Species	%
Overall								
	Common Raven	11.59	Brewer's Blackbird	5.25	American Coot	14.91	Common Raven	8.86
	Unidentified Sparrow	9.15	Double-Crested Cormorant	4.14	Ring-Billed Gull	10.53	House Finch	8.86
	Unidentified Gull	5.49	Unidentified Gull	3.59	Common Raven	7.02	American Coot	6.96
	Horned Lark	4.27	Common Raven	3.31	Great Egret	5.26	Unidentified Gull	6.96
	White-Crowned Sparrow	4.27	Caspian Tern	3.04	Ruddy Duck	5.26	Ring-Billed Gull	4.43
					Unidentified Sparrow	5.26	Ruddy Duck	4.43
Water area								
	Common Raven	16.67	Brewer's Blackbird	21.59	American Coot	50.00	American Coot	27.50
	American Coot	16.67	Double-Crested Cormorant	15.91	Ring-Billed Gull	29.41	Unidentified Gull	25.00
	Mallard	16.67	Caspian Tern	11.36	Great Egret	17.65	Ruddy Duck	17.50
	Unidentified Gull	13.89	American Coot	10.23	Ruddy Duck	17.65	Caspian Tern	15.00
	Brewer's Blackbird	8.33	Common Raven	9.09	Common Raven	14.71	Mallard	12.50
	Great Egret	8.33	Unidentified Gull	9.09			Ring-Billed Gull	12.50
Low elevation area								
	Common Raven	9.09	Unidentified Gull	5.32	White-Crowned Sparrow	9.09	House Finch	15.00
	Unidentified Gull	9.09	Loggerhead Shrike	4.26	Ring-Billed Gull	9.09	Ring-Billed Gull	5.00
	Sage Thrasher	6.82	Common Raven	2.13	Say's Phoebe	4.55	Anna's Hummingbird	2.50
	Horned Lark	4.55	Unidentified Hummingbird	2.13	Unidentified Gull	4.55	Common Raven	2.50
	Red-Tailed Hawk	4.55	Caspian Tern	1.06			Lark Sparrow	2.50
	Unidentified Sparrow	4.55	Double-Crested Cormorant	1.06			Northern Harrier	2.50
	Unidentified Swallow	4.55	European Starling	1.06			Rock Wren	2.50
	White-Crowned Sparrow	4.55	Horned Lark	1.06			Say's Phoebe	2.50
	White-Throated Swift	4.55	Mourning Dove	1.06			Unidentified Sparrow	2.50
			White-Throated Swift	1.06			Western Meadowlark	2.50

Table 8 (continued)

Geographic Locations	Spring Species	%	Summer Species	%	Fall Species	%	Winter Species	%
	Phase I - AFT Sites							
Medium elevation area								
	Unidentified Sparrow	8.70	Burrowing Owl	3.57	Rock Wren	9.38	Common Raven	15.79
	Le Conte's Thrasher	6.52	Unidentified Sparrow	3.57	Unidentified Sparrow	9.38	House Finch	10.53
	Black-Throated Sparrow	4.35	Western Kingbird	3.57	Brewer's Blackbird	6.25	American Kestrel	2.63
	Common Raven	4.35	Horned Lark	2.38	Common Raven	6.25	European Starling	2.63
	Gambel's Quail	4.35	Loggerhead Shrike	2.38	House Finch	6.25	Horned Lark	2.63
	Horned Lark	4.35					Mountain Bluebird	2.63
	Mourning Dove	4.35					Mourning Dove	2.63
	White-Crowned Sparrow	4.35					Red-Tailed Hawk	2.63
							Rock Wren	2.63
							Unidentified Gull	2.63
							Unidentified Sparrow	2.63
High elevation area								
	Common Raven	18.42	Mourning Dove	7.29	Rock Wren	7.69	Common Raven	7.50
	Unidentified Sparrow	18.42	Horned Lark	5.21	Unidentified Sparrow	7.69	Rock Wren	7.50
	Horned Lark	7.89	Rock Wren	5.21	Abert's Towhee	3.85	White-Crowned Sparrow	7.50
	Rock Wren	7.89	Abert's Towhee	4.17	Black-Throated Sparrow	3.85	Bewick's Wren	5.00
	White-Crowned Sparrow	7.89	Loggerhead Shrike	4.17	Common Raven	3.85	Anna's Hummingbird	2.50
					Loggerhead Shrike	3.85	House Finch	2.50
							Prairie Falcon	2.50
							Sage Sparrow	2.50
							Unidentified Sparrow	2.50

Table 8 (continued)

Geographic Locations	**Phase II** – NT Sites							
	Season							
	Spring		Summer		Fall		Winter	
	Species	%	Species	%	Species	%	Species	%
Overall								
	Common Raven	13.71	Common Raven	4.86	Common Raven	3.28	Common Raven	5.85
	Unidentified Gull	5.61	Loggerhead Shrike	1.49	Loggerhead Shrike	1.52	Say's Phoebe	1.61
	California Gull	2.80	Killdeer	1.39	American Kestrel	1.01	Unidentified Sparrow	1.61
	Mallard	2.80	Brewer's Blackbird	1.19	Killdeer	0.76	Brewer's Blackbird	0.81
	Killdeer	1.56	Mallard	1.19	House Finch	0.51	Mallard	0.81
					Say's Phoebe	0.51		
					Unidentified Sparrow	0.51		
Water area								
	Common Raven	19.66	Common Raven	9.24	Common Raven	4.14	Common Raven	7.03
	Unidentified Gull	10.26	Killdeer	3.80	American Kestrel	2.07	Unidentified Sparrow	3.78
	Mallard	7.69	Brewer's Blackbird	3.26	Killdeer	2.07	Say's Phoebe	2.70
	California Gull	5.98	Mallard	3.26	Loggerhead Shrike	2.07	Brewer's Blackbird	2.16
	Killdeer	4.27	American Coot	2.45	House Finch	1.38	Mallard	2.16
					Unidentified Sparrow	1.38		
Low elevation area								
	Common Raven	10.29	Common Raven	2.34	Common Raven	2.79	Common Raven	5.14
	Unidentified Gull	2.94	Loggerhead Shrike	2.03	Loggerhead Shrike	1.20	Say's Phoebe	0.96
	California Gull	0.98	Greater Roadrunner	0.47	American Kestrel	0.40	Loggerhead Shrike	0.64
	Loggerhead Shrike	0.98	Rock Dove	0.47	Common Barn Owl	0.40	Unidentified Swallow	0.64
	Prairie Falcon	0.49	European Starling	0.31	Unidentified Flycatcher	0.40	Unidentified Sparrow	0.32
	Savannah Sparrow	0.49			Rock Dove	0.40		
	Unidentified Swallow	0.49			Say's Phoebe	0.40		

Table 9. Flight height characteristics by avian group observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II

Geographic Locations Group	# Flocks Flying	# Birds Flying	Mean Flight Height (m)	% flying	% in Height (m) Categories			
					< 10	10 – 35	36 – 60	> 60
Overall								
Waterbirds	518	7610	35.59	47.7	18.8	34.2	21.7	25.3
Raptors	121	127	40.95	95.5	14.2	51.2	17.3	17.3
Corvids	693	1041	21.53	92.2	31.5	52.1	11.2	5.2
Passerines	815	3524	9.73	87.4	60.6	36.9	2.4	0.0
Other	45	139	9.69	65.3	74.1	25.9	0.0	0.0
Unidentified	39	157	23.00	92.4	16.6	9.6	47.1	26.8
Total	2231	12598	21.32	58.3	32.1	36.2	15.5	16.2
***High* elevation area**								
Waterbirds	2	36	425.00	100.0	0.0	0.0	0.0	100.0
Raptors	14	16	96.07	100.0	0.0	25.0	25.0	50.0
Corvids	45	64	45.42	98.5	6.3	65.6	20.3	7.8
Passerines	112	198	7.88	72.3	61.1	38.9	0.0	0.0
Other	6	7	3.67	70.0	85.7	14.3	0.0	0.0
Unidentified	7	7	22.86	100.0	57.1	28.6	0.0	14.3
Total	186	328	28.51	80.4	41.2	38.4	5.2	15.2
***Medium* elevation area**								
Waterbirds	0	0	0.00	0.0	N/A	N/A	N/A	N/A
Raptors	16	17	32.31	100.0	5.9	52.9	29.4	11.8
Corvids	44	68	21.61	98.6	20.6	61.8	14.7	2.9
Passerines	67	152	13.16	86.9	45.4	32.9	21.7	0.0
Other	2	2	13.50	66.7	50.0	50.0	0.0	0.0
Unidentified	3	3	13.33	75.0	66.7	33.3	0.0	0.0
Total	132	242	18.31	90.3	36.0	42.6	19.8	1.7
***Low* elevation area**								
Waterbirds	70	1829	82.53	100.0	0.5	6.6	45.6	47.3
Raptors	33	33	25.88	100.0	21.2	63.6	6.1	9.1
Corvids	242	355	20.03	91.7	31.5	51.5	10.4	6.5
Passerines	160	1368	10.48	86.0	52.3	47.7	0.1	0.0
Other	13	85	13.85	96.6	76.5	23.5	0.0	0.0
Unidentified	10	14	18.30	100.0	14.3	64.3	21.4	0.0
Total	528	3684	25.60	93.5	24.7	27.3	23.8	24.2

Table 9 (continued)

Geographic Locations Group	# Flocks Flying	# Birds Flying	Mean Flight Height (m)	% flying	% in Height (m) Categories < 10	10 – 35	36 – 60	> 60
***Water* area**								
Waterbirds	262	2678	31.47	38.8	21.4	38.6	18.3	21.6
Raptors	34	36	42.59	97.3	19.4	52.8	11.1	16.7
Corvids	251	372	17.59	90.3	30.9	57.5	7.3	4.3
Passerines	177	919	8.45	88.3	54.8	42.8	2.4	0.0
Other	7	13	19.14	72.2	7.7	92.3	0.0	0.0
Unidentified	11	125	14.73	99.2	9.6	2.4	56.0	32.0
Total	742	4143	21.43	48.5	29.3	40.5	14.8	15.5
Away from Turbine								
Waterbirds	184	3067	19.38	42.7	27.7	47.1	10.8	14.4
Raptors	24	25	32.96	83.3	12.0	48.0	28.0	12.0
Corvids	111	182	23.96	92.9	45.6	33.5	16.5	4.4
Passerines	299	887	10.00	93.2	82.1	14.4	3.4	0.1
Other	17	32	4.29	34.0	93.8	6.3	0.0	0.0
Unidentified	8	8	44.00	42.1	75.0	0.0	12.5	12.5
Total	643	4201	16.22	49.6	40.5	39.2	9.5	10.8

Table 10. Characteristics of perching locations for Phase I only

	All Birds		Raptors	
Perch Type	n	%	n	%
small lattice turbine	57	11.9	4	9.1
small tubular turbine	36	7.5	2	4.5
large tubular turbine	0	0.0	0	0.0
meteorological tower (wire or tower)	17	3.6	7	15.9
powerline/pole/conductor	60	12.6	23	52.3
fence	9	1.9	0	0.0
ground	111	23.2	5	11.4
vegetation	117	24.5	3	6.8
water	9	1.9	0	0.0
shoreline	43	9.0	0	0.0
other	19	4.0	0	0.0
Subtotal	478	100.0	44	100.0

Table 11. Number of avian fatalities observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II

Phase I

Geographic Locations/ Group	Overall[1]		NT Sites		AFT Sites	
	Total	Carcass Search	Total	Carcass Search	Total	Carcass Search
Overall[1]						
Waterbirds	20	14	9	9	5	5
Raptors	8	2	2	2	0	0
Corvids	3	1	1	1	0	0
Passerines	4	3	3	3	0	0
Other	15	8	10	7	1	1
Unidentified	11	8	7	7	1	1
Total	61	36	32	29	7	7
Water area						
Waterbirds	7	7	3	3	4	4
Raptors	0	0	0	0	0	0
Corvids	0	0	0	0	0	0
Passerines	0	0	0	0	0	0
Other	0	0	0	0	0	0
Unidentified	2	2	2	2	0	0
Total	9	9	5	5	4	4
Low elevation area						
Waterbirds	6	6	5	5	1	1
Raptors	2	2	2	2	0	0
Corvids	1	1	1	1	0	0
Passerines	2	2	2	2	0	0
Other	8	6	8	6	0	0
Unidentified	5	5	4	4	1	1
Total	24	22	22	20	2	2
Medium elevation area						
Waterbirds	1	1	1	1	0	0
Raptors	0	0	0	0	0	0
Corvids	0	0	0	0	0	0
Passerines	1	1	1	1	0	0
Other	2	2	1	1	1	1
Unidentified	1	1	1	1	0	0
Total	5	5	4	4	1	1

Table 11 (continued)

Geographic Locations/ Group	Overall[1]		NT Sites		AFT Sites	
	Total	Carcass Search	Total	Carcass Search	Total	Carcass Search
High elevation area						
Waterbirds	0	0	0	0	0	0
Raptors	0	0	0	0	0	0
Corvids	0	0	0	0	0	0
Passerines	0	0	0	0	0	0
Other	1	0	1	0	0	0
Unidentified	0	0	0	0	0	0
Total	1	0	1	0	0	0

Table 11 (continued)

Phase II						
Geographic Locations/ Group	Overall[1]		NT Sites		AFT Sites	
	Total	Carcass Search	Total	Carcass Search	Total	Carcass Search
Overall[1]						
Waterbirds	9	8	9	8		
Raptors	4	2	2	2		
Corvids	2	2	2	2		
Passerines	6	4	4	4		
Other	5	5	5	5		
Unidentified	5	3	4	3		
Total	31	24	26	24		
Water area						
Waterbirds	7	7	7	7		
Raptors	0	0	0	0		
Corvids	1	1	1	1		
Passerines	1	1	1	1		
Other	3	3	3	3		
Unidentified	4	3	4	3		
Total	16	15	16	15		
Low elevation area						
Waterbirds	2	1	2	1		
Raptors	2	2	2	2		
Corvids	1	1	1	1		
Passerines	3	3	3	3		
Other	2	2	2	2		
Unidentified	0	0	0	0		
Total	10	9	10	9		

[1] includes fatalities found in areas not associated with study sites

Table 12. Composition of avian fatalities observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II

Phase I						
Avian Group/Species	Overall[1]		NT Sites		AFT Sites	
	Number	Percent	Number	Percent	Number	Percent
Waterbirds						
Unidentified Grebe	1	1.6	1	3.1	0	0.0
Mallard	3	4.9	1	3.1	1	14.3
Unidentified Teal	1	1.6	0	0.0	1	14.3
Unidentified Duck	1	1.6	0	0.0	0	0.0
Snow Goose	1	1.6	0	0.0	0	0.0
Unidentified Egret	1	1.6	1	3.1	0	0.0
Sora	1	1.6	1	3.1	0	0.0
American Coot	11	18.0	5	15.6	3	42.9
Raptors						
Red-Tailed Hawk	2	3.3	1	3.1	0	0.0
Golden Eagle	1	1.6	0	0.0	0	0.0
Common Barn Owl	3	4.9	0	0.0	0	0.0
Great Horned Owl	1	1.6	0	0.0	0	0.0
Burrowing Owl	1	1.6	1	3.1	0	0.0
Corvids						
Common Raven	3	4.9	1	3.1	0	0.0
Passerines						
White-Throated Swift	1	1.6	1	3.1	0	0.0
European Starling	2	3.3	1	3.1	0	0.0
Western Meadowlark	1	1.6	1	3.1	0	0.0
Other						
Mourning Dove	3	4.9	1	3.1	0	0.0
Rock Dove	12	19.7	9	28.1	1	14.3
Unidentified						
Unidentified Bird	11	18.0	7	21.9	1	14.3
Total	61	100.0 %	32	100.0 %	7	100.0 %

Table 12 (continued)

Avian Group/Species	Overall[1]		NT Sites		AFT Sites	
	Number	Percent	Number	Percent	Number	Percent
Phase II						
Waterbirds						
Unidentified Gull	4	12.9	4	15.4		
Mallard	2	6.5	2	7.7		
Cinnamon Teal	1	3.2	1	3.8		
Unidentified Duck	1	3.2	1	3.8		
American Coot	1	3.2	1	3.8		
Raptors						
Red-Tailed Hawk	1	3.2	0	0.0		
American Kestrel	1	3.2	0	0.0		
Great Horned Owl	1	3.2	1	3.8		
Unidentified Owl	1	3.2	1	3.8		
Corvids						
Common Raven	2	6.5	2	7.7		
Passerines						
Unidentified Passerine	3	9.7	3	11.5		
Black Phoebe	1	3.2	0	0.0		
Western Meadowlark	1	3.2	1	3.8		
Brewer's Blackbird	1	3.2	0	0.0		
Other						
Rock Dove	5	16.1	5	19.2		
Unidentified						
Unidentified Bird	5	16.1	4	15.4		
Total	31	100.0 %	26	100.0 %		

[1] includes fatalities found in areas not associated with study sites .

Table 13. Mean use observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II, calculated based on observations within 200 m of site center. lcl = 95% lower confidence limit; ucl = 95% upper confidence limit. lcl values less than zero were set to zero

Phase I – NT Sites															
Geographic Locations	Season														
	Overall			Spring			Summer			Fall			Winter		
	mean	lcl	ucl	mean	lcl	ucl	mean	lcl	ucl	mean	lcl	ucl	mean	lcl	ucl
Overall															
Waterbirds	1.09	0.70	1.49	1.26	0.41	2.11	0.35	0	0.72	1.81	0.53	3.10	2.02	0.78	3.25
Raptors	0.02	0.01	0.02	0.02	0.00	0.03	0.02	0.01	0.03	0.01	0.00	0.02	0.02	0.01	0.04
Corvids	0.11	0.09	0.13	0.20	0.13	0.27	0.06	0.04	0.08	0.09	0.04	0.14	0.13	0.09	0.18
Passerines	1.00	0.66	1.33	0.45	0.29	0.60	0.09	0.06	0.12	1.47	0.19	2.74	3.20	1.86	4.53
Other	0.01	0.00	0.02	0.01	0.00	0.02	0.01	0.00	0.01	0.01	0	0.03	0.02	0	0.05
Unidentified	0.00	0.00	0.01	0.01	0	0.01	0.01	0.00	0.01	0.01	0	0.01	0.00	N/A	N/A
Total	2.23	1.71	2.76	1.94	1.07	2.80	0.54	0.16	0.91	3.40	1.60	5.20	5.39	3.55	7.23
Water area															
Waterbirds	4.16	2.45	5.87	2.72	0.68	4.76	1.89	0	4.11	8.28	2.17	14.38	6.43	2.80	10.06
Raptors	0.04	0.02	0.06	0.07	0	0.14	0.03	0.00	0.05	0.03	0	0.06	0.04	0	0.08
Corvids	0.16	0.11	0.21	0.19	0.04	0.33	0.13	0.07	0.20	0.10	0.02	0.18	0.23	0.08	0.38
Passerines	1.81	0.95	2.68	0.48	0.11	0.85	0.19	0.07	0.31	2.11	0.24	3.99	6.30	2.42	10.19
Other	0.01	0	0.03	0.00	N/A	N/A	0.01	0	0.02	0.05	0	0.13	0.01	0	0.04
Unidentified	0.00	0	0.01	0.00	N/A	N/A	0.00	N/A	N/A	0.01	0	0.04	0.00	N/A	N/A
Total	6.18	4.22	8.14	3.45	1.40	5.51	2.24	0	4.50	10.58	4.26	16.89	13.01	7.45	18.57
Low elevation area															
Waterbirds	0.92	0.30	1.54	1.99	0.15	3.84	0.10	0	0.25	0.32	0	0.76	2.31	0	4.89
Raptors	0.01	0.00	0.02	0.00	0	0.01	0.01	0	0.01	0.02	0	0.05	0.02	0	0.05
Corvids	0.13	0.09	0.17	0.31	0.16	0.45	0.06	0.03	0.09	0.06	0.01	0.11	0.18	0.10	0.26
Passerines	1.23	0.54	1.92	0.09	0.04	0.14	0.04	0.02	0.05	2.44	0	5.83	4.62	1.83	7.41
Other	0.01	0	0.02	0.00	0	0.01	0.00	0	0.01	0.00	N/A	N/A	0.05	0	0.11
Unidentified	0.00	0	0.00	0.00	0	0.01	0.00	0	0.01	0.00	N/A	N/A	0.00	N/A	N/A
Total	2.30	1.38	3.23	2.40	0.54	4.27	0.20	0.04	0.36	2.84	0	6.25	7.18	3.43	10.93

Table 13 (continued)

Medium elevation area															
Waterbirds	0.00	N/A	N/A	0.00	N/A	N/A	0.00	N/A	N/A	0.00	N/A	N/A	0.00	N/A	N/A
Raptors	0.02	0.01	0.04	0.02	0	0.05	0.03	0.00	0.07	0.00	N/A	N/A	0.03	0	0.07
Corvids	0.05	0.02	0.08	0.11	0	0.23	0.01	0	0.03	0.03	0	0.07	0.07	0	0.14
Passerines	0.34	0.18	0.50	0.88	0.21	1.54	0.09	0.01	0.16	0.32	0.07	0.56	0.27	0.11	0.42
Other	0.00	0	0.01	0.00	N/A	N/A	0.00	N/A	N/A	0.01	0	0.03	0.01	0	0.03
Unidentified	0.01	0	0.01	0.01	0	0.03	0.01	0	0.02	0.01	0	0.03	0.00	N/A	N/A
Total	0.42	0.26	0.59	1.02	0.34	1.70	0.14	0.04	0.23	0.38	0.13	0.62	0.38	0.20	0.56
High elevation area															
Waterbirds	0.00	N/A	N/A	0.00	N/A	N/A	0.00	N/A	N/A	0.00	N/A	N/A	0.00	N/A	N/A
Raptors	0.01	0	0.03	0.01	0	0.03	0.02	0	0.05	0.00	N/A	N/A	0.01	0	0.02
Corvids	0.08	0.04	0.12	0.09	0.02	0.15	0.06	0.01	0.11	0.20	0	0.40	0.03	0	0.05
Passerines	0.45	0.32	0.58	0.72	0.49	0.95	0.16	0.07	0.25	0.41	0.02	0.81	0.78	0.34	1.21
Other	0.01	0.00	0.03	0.03	0	0.06	0.02	0	0.04	0.00	N/A	N/A	0.00	N/A	N/A
Unidentified	0.01	0.00	0.02	0.01	0	0.03	0.02	0.00	0.03	0.00	N/A	N/A	0.00	N/A	N/A
Total	0.57	0.43	0.70	0.85	0.60	1.11	0.28	0.17	0.39	0.61	0.18	1.04	0.81	0.38	1.24

Table 13 (continued)

Geographic Locations	Phase I – AFT Sites: Season — Overall mean	Overall lcl	Overall ucl	Spring mean	Spring lcl	Spring ucl	Summer mean	Summer lcl	Summer ucl	Fall mean	Fall lcl	Fall ucl	Winter mean	Winter lcl	Winter ucl
Overall															
Waterbirds	6.28	4.40	8.17	3.24	0.86	5.63	3.46	1.43	5.48	18.27	8.73	27.81	7.27	3.51	11.03
Raptors	0.02	0.01	0.03	0.02	0	0.05	0.01	0.00	0.02	0.03	0	0.07	0.03	0	0.06
Corvids	0.12	0.08	0.16	0.18	0.09	0.26	0.05	0.02	0.08	0.11	0.03	0.18	0.23	0.09	0.38
Passerines	1.15	0.71	1.59	1.15	0.69	1.62	0.44	0.33	0.55	1.03	0.57	1.48	2.86	0.73	5.00
Other	0.12	0	0.26	0.07	0.01	0.12	0.21	0	0.52	0.00	N/A	N/A	0.03	0	0.06
Unidentified	0.01	0.00	0.02	0.01	0	0.03	0.01	0.00	0.02	0.00	N/A	N/A	0.01	0	0.02
Total	7.70	5.77	9.63	4.67	2.26	7.08	4.18	2.14	6.22	19.43	9.91	28.95	10.43	6.19	14.67
Water area															
Waterbirds	23.08	16.13	30.02	8.94	1.16	16.73	12.84	4.90	20.78	60.35	32.38	88.32	26.63	13.41	39.84
Raptors	0.02	0	0.04	0.00	N/A	N/A	0.00	N/A	N/A	0.09	0	0.22	0.00	N/A	N/A
Corvids	0.20	0.11	0.29	0.28	0.04	0.52	0.13	0.04	0.21	0.26	0.02	0.51	0.25	0	0.55
Passerines	2.34	0.62	4.07	2.08	0.12	4.04	0.51	0.30	0.72	1.24	0.13	2.35	7.55	0	15.95
Other	0.06	0	0.13	0.00	N/A	N/A	0.08	0	0.24	0.00	N/A	N/A	0.10	0	0.22
Unidentified	0.01	0	0.02	0.00	N/A	N/A	0.00	N/A	N/A	0.00	N/A	N/A	0.03	0	0.08
Total	25.70	18.66	32.73	11.31	3.47	19.14	13.56	5.65	21.46	61.94	34.17	89.71	34.55	20.17	48.93
Low elevation area															
Waterbirds	2.11	0.46	3.75	4.77	0	11.05	1.29	0	2.89	1.41	0	3.96	1.48	0	4.03
Raptors	0.02	0	0.04	0.07	0	0.17	0.00	N/A	N/A	0.00	N/A	N/A	0.03	0	0.08
Corvids	0.07	0.01	0.12	0.14	0	0.28	0.05	0	0.14	0.00	N/A	N/A	0.05	0	0.15
Passerines	0.70	0.41	0.98	0.75	0.28	1.22	0.19	0.06	0.32	0.50	0.05	0.95	1.93	0.70	3.15
Other	0.01	0	0.02	0.02	0	0.07	0.01	0	0.03	0.00	N/A	N/A	0.00	N/A	N/A
Unidentified	0.01	0	0.01	0.02	0	0.07	0.00	N/A	N/A	0.00	N/A	N/A	0.00	N/A	N/A
Total	2.90	1.24	4.56	5.77	0	12.03	1.54	0	3.15	1.91	0	4.45	3.48	0.69	6.26

Table 13 (continued)

Medium elevation area															
Waterbirds	0.13	0	0.37	0.00	N/A	N/A	0.00	N/A	N/A	0.00	N/A	N/A	0.66	0	1.99
Raptors	0.03	0	0.05	0.00	N/A	N/A	0.04	0	0.08	0.00	N/A	N/A	0.05	0	0.16
Corvids	0.09	0.03	0.14	0.04	0	0.10	0.01	0	0.04	0.06	0	0.15	0.32	0.03	0.60
Passerines	0.74	0.50	0.98	0.70	0.34	1.05	0.46	0.19	0.74	1.53	0.48	2.58	0.74	0.26	1.22
Other	0.04	0.00	0.08	0.15	0	0.32	0.00	N/A	N/A	0.00	N/A	N/A	0.03	0	0.08
Unidentified	0.02	0	0.03	0.00	N/A	N/A	0.04	0	0.08	0.00	N/A	N/A	0.00	N/A	N/A
Total	1.03	0.66	1.40	0.89	0.43	1.36	0.55	0.27	0.82	1.59	0.55	2.64	1.79	0.22	3.36
High elevation area															
Waterbirds	0.00	N/A	N/A	0.00	N/A	N/A	0.00	N/A	N/A	0.00	N/A	N/A	0.00	N/A	N/A
Raptors	0.01	0	0.02	0.00	N/A	N/A	0.01	0	0.03	0.00	N/A	N/A	0.03	0	0.08
Corvids	0.13	0.03	0.23	0.29	0.04	0.54	0.01	0	0.03	0.04	0	0.12	0.33	0	0.76
Passerines	0.84	0.61	1.06	1.29	0.73	1.85	0.60	0.35	0.85	0.58	0.12	1.04	1.13	0.39	1.86
Other	0.36	0	0.91	0.08	0	0.20	0.72	0	1.88	0.00	N/A	N/A	0.00	N/A	N/A
Unidentified	0.01	0	0.02	0.03	0	0.08	0.01	0	0.03	0.00	N/A	N/A	0.00	N/A	N/A
Total	1.35	0.75	1.94	1.68	1.03	2.34	1.35	0.18	2.53	0.62	0.16	1.07	1.48	0.63	2.32

Table 13 (continued)

Geographic Locations	Phase II – NT Sites														
	Season														
	Overall			Spring			Summer			Fall			Winter		
	mean	lcl	ucl	mean	lcl	ucl	mean	lcl	ucl	mean	lcl	ucl	mean	lcl	ucl
Overall															
Waterbirds	0.49	0.27	0.72	2.45	0.99	3.90	0.28	0.11	0.45	0.03	0	0.07	0.03	0.00	0.06
Raptors	0.01	0.00	0.01	0.00	0	0.01	0.00	0	0.01	0.02	0.00	0.03	0.01	0.00	0.02
Corvids	0.12	0.09	0.14	0.34	0.22	0.45	0.08	0.06	0.11	0.05	0.02	0.08	0.10	0.06	0.15
Passerines	0.14	0.09	0.19	0.11	0.05	0.17	0.12	0.06	0.18	0.12	0.06	0.17	0.23	0.06	0.41
Other	0.01	0.00	0.02	0.00	N/A	N/A	0.02	0.00	0.03	0.00	0	0.01	0.01	0	0.01
Unidentified	0.01	0.00	0.01	0.00	0	0.01	0.00	0	0.01	0.00	N/A	N/A	0.02	0.00	0.04
Total	0.78	0.54	1.01	2.90	1.43	4.37	0.50	0.31	0.70	0.21	0.13	0.29	0.41	0.21	0.60
Water area															
Waterbirds	1.01	0.49	1.53	4.39	1.12	7.67	0.77	0.31	1.23	0.09	0	0.18	0.08	0.01	0.15
Raptors	0.02	0.01	0.03	0.00	N/A	N/A	0.01	0	0.02	0.03	0	0.06	0.03	0.00	0.06
Corvids	0.20	0.14	0.25	0.51	0.26	0.76	0.17	0.11	0.23	0.06	0.01	0.10	0.15	0.04	0.27
Passerines	0.31	0.18	0.44	0.26	0.09	0.42	0.25	0.09	0.41	0.26	0.12	0.39	0.53	0.08	0.98
Other	0.01	0	0.03	0.00	N/A	N/A	0.02	0	0.05	0.00	N/A	N/A	0.02	0	0.03
Unidentified	0.02	0.00	0.03	0.01	0	0.03	0.01	0	0.04	0.00	N/A	N/A	0.04	0	0.09
Total	1.57	1.02	2.11	5.17	1.87	8.47	1.23	0.71	1.75	0.43	0.23	0.62	0.85	0.36	1.35
Low elevation area															
Waterbirds	0.19	0.00	0.38	1.33	0.01	2.65	0.00	N/A	N/A	0.00	N/A	N/A	0.00	N/A	N/A
Raptors	0.00	0.00	0.01	0.00	0	0.01	0.00	0	0.01	0.01	0	0.02	0.00	N/A	N/A
Corvids	0.07	0.05	0.09	0.24	0.12	0.35	0.03	0.01	0.05	0.04	0.00	0.08	0.08	0.04	0.12
Passerines	0.04	0.02	0.06	0.02	0	0.05	0.04	0.02	0.06	0.04	0.01	0.06	0.06	0	0.12
Other	0.01	0.00	0.01	0.00	N/A	N/A	0.02	0.00	0.03	0.00	0	0.01	0.00	N/A	N/A
Unidentified	0.00	0	0.00	0.00	N/A	N/A	0.00	N/A	N/A	0.00	N/A	N/A	0.00	0	0.01
Total	0.32	0.12	0.51	1.59	0.27	2.92	0.09	0.06	0.12	0.09	0.04	0.15	0.14	0.07	0.21

Table 14. Mean fatality observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II, calculated based on fatalities found during scheduled carcass searches. lcl = 95% lower confidence limit; ucl = 95% upper confidence limit. lcl values less than zero were set to zero

		Phase I – NT Sites		
Geographic Locations/Group		**mean**	**lcl**	**ucl**
Overall				
	Waterbirds	0.014	0.004	0.024
	Raptors	0.003	0	0.007
	Corvids	0.001	0	0.004
	Passerines	0.004	0	0.009
	Other	0.011	0.003	0.019
	Unidentified	0.010	0.003	0.018
	Total	0.044	0.026	0.062
Water area				
	Waterbirds	0.027	0	0.069
	Raptors	0.000	N/A	N/A
	Corvids	0.000	N/A	N/A
	Passerines	0.000	N/A	N/A
	Other	0.000	N/A	N/A
	Unidentified	0.018	0	0.044
	Total	0.045	0	0.092
Low elevation area				
	Waterbirds	0.020	0.002	0.038
	Raptors	0.007	0	0.017
	Corvids	0.004	0	0.011
	Passerines	0.007	0	0.017
	Other	0.023	0.005	0.042
	Unidentified	0.014	0.000	0.028
	Total	0.075	0.039	0.110
Medium elevation area				
	Waterbirds	0.007	0	0.023
	Raptors	0.000	N/A	N/A
	Corvids	0.000	N/A	N/A
	Passerines	0.007	0	0.023
	Other	0.007	0	0.023
	Unidentified	0.007	0	0.023
	Total	0.030	0	0.066
High elevation area				
	Waterbirds	0.000	N/A	N/A
	Raptors	0.000	N/A	N/A
	Corvids	0.000	N/A	N/A
	Passerines	0.000	N/A	N/A
	Other	0.000	N/A	N/A
	Unidentified	0.000	N/A	N/A
	Total	0.000	N/A	N/A

Table 14 (continued)

	Phase I – AFT Sites		
Geographic Locations/Group	**mean**	**lcl**	**ucl**
Overall			
Waterbirds	0.025	0.004	0.046
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.005	0	0.015
Unidentified	0.005	0	0.015
Total	0.035	0.010	0.060
Water area			
Waterbirds	0.080	0.006	0.154
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.080	0.006	0.154
Low elevation area			
Waterbirds	0.020	0	0.065
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.020	0	0.065
Total	0.040	0	0.100
Medium elevation area			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.020	0	0.065
Unidentified	0.000	N/A	N/A
Total	0.020	0	0.065
High elevation area			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A

Table 14 (continued)

	Phase II – NT Sites		
Geographic Locations/Group	**mean**	**lcl**	**ucl**
Overall			
Waterbirds	0.013	0.003	0.023
Raptors	0.003	0	0.008
Corvids	0.003	0	0.008
Passerines	0.007	0.000	0.013
Other	0.008	0.001	0.016
Unidentified	0.005	0	0.011
Total	0.040	0.021	0.059
Water area			
Waterbirds	0.032	0.007	0.057
Raptors	0.000	N/A	N/A
Corvids	0.005	0	0.014
Passerines	0.005	0	0.014
Other	0.014	0	0.029
Unidentified	0.014	0	0.029
Total	0.068	0.029	0.108
Low elevation area			
Waterbirds	0.003	0	0.008
Raptors	0.005	0	0.013
Corvids	0.003	0	0.008
Passerines	0.008	0	0.017
Other	0.005	0	0.013
Unidentified	0.000	N/A	N/A
Total	0.024	0.006	0.041

Table 15. Mean risk observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II, calculated based on observations of use within 200 m of site center and fatalities found during scheduled carcass searches. lcl = 95% lower confidence limit; ucl = 95% upper confidence limit. lcl values less than zero were set to zero

		Phase I – NT Sites	
Geographic Locations/Group	**mean**	**lcl**	**ucl**
Overall			
Waterbirds	0.012	0.000	0.025
Raptors	0.167	0	0.406
Corvids	0.013	0	0.039
Passerines	0.004	0	0.009
Other	0.918	0	1.871
Unidentified	2.287	0.156	4.418
Total	0.019	0.008	0.030
Water area			
Waterbirds	0.006	0	0.017
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	8.000	0	27.051
Total	0.007	0	0.016
Low elevation area			
Waterbirds	0.018	0	0.042
Raptors	0.632	0	1.609
Corvids	0.027	0	0.080
Passerines	0.005	0	0.013
Other	1.667	0	4.287
Unidentified	8.000	0	21.376
Total	0.028	0.007	0.050
Medium elevation area			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.023	0	0.070
Other	2.000	0	7.544
Unidentified	1.333	0	4.322
Total	0.073	0	0.167
High elevation area			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A

Table 15 (continued)

		Phase I – AFT Sites	
Geographic Locations/Group	**mean**	**lcl**	**ucl**
Overall			
Waterbirds	0.004	0.000	0.008
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.043	0	0.142
Unidentified	0.571	0	1.801
Total	0.005	0.000	0.009
Water area			
Waterbirds	0.003	0.000	0.007
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.003	0.000	0.006
Low elevation area			
Waterbirds	0.010	0	0.033
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	4.000	0	15.087
Total	0.014	0	0.038
Medium elevation area			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.500	0	1.605
Unidentified	0.000	N/A	N/A
Total	0.019	0	0.058
High elevation area			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A

Table 15 (continued)

	Phase II – NT Sites		
Geographic Locations/Group	**mean**	**lcl**	**ucl**
Overall			
Waterbirds	0.027	0.002	0.052
Raptors	0.412	0	1.024
Corvids	0.028	0	0.068
Passerines	0.047	0	0.099
Other	0.881	0	1.970
Unidentified	0.740	0	1.783
Total	0.052	0.019	0.084
Water area			
Waterbirds	0.031	0.000	0.063
Raptors	0.000	N/A	N/A
Corvids	0.023	0	0.069
Passerines	0.014	0	0.044
Other	1.110	0	2.780
Unidentified	0.793	0	1.892
Total	0.044	0.011	0.076
Low elevation area			
Waterbirds	0.014	0	0.043
Raptors	1.488	0	3.866
Corvids	0.036	0	0.109
Passerines	0.192	0	0.417
Other	0.673	0	2.010
Unidentified	0.000	N/A	N/A
Total	0.074	0.005	0.144

Table 16. Mean use observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II, calculated based on fatalities found during scheduled carcass searches. lcl = 95% lower confidence limit; ucl = 95% upper confidence limit. lcl values less than zero were set to zero

		Phase I		
Geographic Locations/Turbine Size/Group		**mean**	**lcl**	**ucl**
Overall/Large				
	Waterbirds	0.239	0	0.508
	Raptors	0.011	0	0.024
	Corvids	0.070	0.030	0.110
	Passerines	1.457	0	3.059
	Other	0.000	N/A	N/A
	Unidentified	0.002	0	0.007
	Total	1.779	0.194	3.364
Overall/Small				
	Waterbirds	1.305	0.382	2.228
	Raptors	0.019	0.011	0.026
	Corvids	0.117	0.088	0.147
	Passerines	0.970	0.391	1.548
	Other	0.015	0.004	0.025
	Unidentified	0.005	0.002	0.008
	Total	2.430	1.306	3.554
Water area/Large				
	Waterbirds	0.000	N/A	N/A
	Raptors	0.000	N/A	N/A
	Corvids	0.000	N/A	N/A
	Passerines	0.000	N/A	N/A
	Other	0.000	N/A	N/A
	Unidentified	0.000	N/A	N/A
	Total	0.000	N/A	N/A
Water area/Small				
	Waterbirds	4.214	0.306	8.122
	Raptors	0.036	0.017	0.055
	Corvids	0.162	0.101	0.223
	Passerines	1.887	0.708	3.067
	Other	0.016	0	0.033
	Unidentified	0.002	0	0.007
	Total	6.318	2.117	10.518
Low elevation area/Large				
	Waterbirds	0.275	0	0.585
	Raptors	0.013	0	0.027
	Corvids	0.075	0.030	0.120
	Passerines	1.593	0	3.448
	Other	0.000	N/A	N/A
	Unidentified	0.000	N/A	N/A
	Total	1.955	0.126	3.784

Table 16 (continued)

	Phase I		
Geographic Locations/Turbine Size/Group	**mean**	**lcl**	**ucl**
Low elevation area/Small			
Waterbirds	1.550	0	3.247
Raptors	0.010	0.000	0.020
Corvids	0.161	0.094	0.229
Passerines	1.275	0	2.956
Other	0.022	0	0.052
Unidentified	0.003	0	0.007
Total	3.021	0.688	5.355
Medium elevation area/Large			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A
Medium elevation area/Small			
Waterbirds	0.000	N/A	N/A
Raptors	0.020	0	0.042
Corvids	0.052	0.013	0.091
Passerines	0.323	0.124	0.521
Other	0.004	0	0.011
Unidentified	0.006	0	0.012
Total	0.404	0.173	0.636
High elevation area/Large			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.033	0	0.177
Passerines	0.556	0	1.773
Other	0.000	N/A	N/A
Unidentified	0.017	0	0.088
Total	0.606	0	1.912
High elevation area/Small			
Waterbirds	0.000	N/A	N/A
Raptors	0.014	0.001	0.028
Corvids	0.088	0.036	0.140
Passerines	0.487	0.274	0.699
Other	0.015	0.002	0.028
Unidentified	0.009	0.000	0.018
Total	0.612	0.405	0.820

Table 16 (continued)

Geographic Locations/Turbine Size/Group	Phase II mean	lcl	ucl
Overall/Large			
Waterbirds	0.788	0.207	1.368
Raptors	0.009	0.002	0.016
Corvids	0.112	0.058	0.166
Passerines	0.135	0.028	0.242
Other	0.004	0	0.009
Unidentified	0.009	0	0.020
Total	1.056	0.372	1.739
Overall/Small			
Waterbirds	0.289	0.056	0.522
Raptors	0.008	0.000	0.016
Corvids	0.137	0.094	0.180
Passerines	0.172	0.032	0.313
Other	0.017	0	0.036
Unidentified	0.006	0	0.013
Total	0.629	0.285	0.974
Water area/Large			
Waterbirds	1.464	0.097	2.831
Raptors	0.020	0.003	0.036
Corvids	0.189	0.064	0.314
Passerines	0.295	0.028	0.562
Other	0.007	0	0.019
Unidentified	0.022	0	0.052
Total	1.998	0.396	3.599
Water area/Small			
Waterbirds	0.557	0.031	1.084
Raptors	0.012	0	0.031
Corvids	0.201	0.134	0.268
Passerines	0.334	0	0.668
Other	0.017	0	0.044
Unidentified	0.012	0	0.029
Total	1.134	0.392	1.876
Low elevation area/Large			
Waterbirds	0.350	0	0.774
Raptors	0.002	0	0.005
Corvids	0.062	0.030	0.094
Passerines	0.032	0.011	0.053
Other	0.002	0	0.005
Unidentified	0.000	N/A	N/A
Total	0.446	0.020	0.873
Low elevation area/Small			
Waterbirds	0.092	0	0.222
Raptors	0.005	0	0.012
Corvids	0.090	0.043	0.137
Passerines	0.054	0.017	0.091
Other	0.016	0	0.047
Unidentified	0.002	0	0.006
Total	0.259	0.099	0.420

Table 17. Mean fatality observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II, calculated based on fatalities found during scheduled carcass searches. lcl = 95% lower confidence limit; ucl = 95% upper confidence limit. lcl values less than zero were set to zero

		Phase I		
Geographic Locations/Turbine Size/Group		**mean**	**lcl**	**ucl**
Overall/Large				
	Waterbirds	0.026	0	0.056
	Raptors	0.009	0	0.027
	Corvids	0.000	N/A	N/A
	Passerines	0.017	0	0.042
	Other	0.026	0	0.056
	Unidentified	0.009	0	0.027
	Total	0.087	0.036	0.138
Overall/Small				
	Waterbirds	0.012	0.001	0.022
	Raptors	0.002	0	0.005
	Corvids	0.002	0	0.005
	Passerines	0.002	0	0.005
	Other	0.008	0.000	0.016
	Unidentified	0.010	0.002	0.019
	Total	0.035	0.016	0.054
Water area/Large				
	Waterbirds	0.000	N/A	N/A
	Raptors	0.000	N/A	N/A
	Corvids	0.000	N/A	N/A
	Passerines	0.000	N/A	N/A
	Other	0.000	N/A	N/A
	Unidentified	0.000	N/A	N/A
	Total	0.000	N/A	N/A
Water area/Small				
	Waterbirds	0.027	0	0.069
	Raptors	0.000	N/A	N/A
	Corvids	0.000	N/A	N/A
	Passerines	0.000	N/A	N/A
	Other	0.000	N/A	N/A
	Unidentified	0.018	0	0.044
	Total	0.045	0	0.092
Low elevation area/Large				
	Waterbirds	0.030	0	0.064
	Raptors	0.010	0	0.031
	Corvids	0.000	N/A	N/A
	Passerines	0.020	0	0.049
	Other	0.030	0	0.064
	Unidentified	0.010	0	0.031
	Total	0.100	0.043	0.157

Table 17 (continued)

	Phase I		
Geographic Locations/Turbine Size/Group	**mean**	**lcl**	**ucl**
Low elevation area/Small			
Waterbirds	0.014	0	0.035
Raptors	0.005	0	0.016
Corvids	0.005	0	0.016
Passerines	0.000	N/A	N/A
Other	0.020	0	0.043
Unidentified	0.016	0	0.035
Total	0.061	0.015	0.108
Medium elevation area/Large			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A
Medium elevation area/Small			
Waterbirds	0.007	0	0.023
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.007	0	0.023
Other	0.007	0	0.023
Unidentified	0.007	0	0.023
Total	0.030	0	0.066
High elevation area/Large			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A
High elevation area/Small			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A

Table 17 (continued)

	Phase II		
Geographic Locations/Turbine Size/Group	**mean**	**lcl**	**ucl**
Overall/Large			
Waterbirds	0.021	0.002	0.041
Raptors	0.004	0	0.011
Corvids	0.004	0	0.011
Passerines	0.004	0	0.011
Other	0.004	0	0.011
Unidentified	0.011	0	0.023
Total	0.046	0.014	0.079
Overall/Small			
Waterbirds	0.008	0	0.019
Raptors	0.004	0	0.012
Corvids	0.004	0	0.012
Passerines	0.012	0	0.025
Other	0.015	0.001	0.030
Unidentified	0.000	N/A	N/A
Total	0.042	0.016	0.068
Water area/Large			
Waterbirds	0.045	0	0.092
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.009	0	0.029
Unidentified	0.027	0	0.059
Total	0.082	0.009	0.154
Water area/Small			
Waterbirds	0.018	0	0.045
Raptors	0.000	N/A	N/A
Corvids	0.009	0	0.029
Passerines	0.009	0	0.029
Other	0.018	0	0.045
Unidentified	0.000	N/A	N/A
Total	0.055	0.008	0.101
Low elevation area/Large			
Waterbirds	0.006	0	0.018
Raptors	0.006	0	0.018
Corvids	0.006	0	0.018
Passerines	0.006	0	0.018
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.024	0	0.052
Low elevation area/Small			
Waterbirds	0.000	N/A	N/A
Raptors	0.007	0	0.021
Corvids	0.000	N/A	N/A
Passerines	0.013	0	0.033
Other	0.013	0	0.033
Unidentified	0.000	N/A	N/A
Total	0.033	0	0.068

Table 18. Mean risk observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II, calculated based on observations of use within 200 m of site center and fatalities found during scheduled carcass searches. lcl = 95% lower confidence limit; ucl = 95% upper confidence limit. lcl values less than zero were set to zero

		Phase I	
Geographic Locations/Turbine Size/Group	**mean**	**lcl**	**ucl**
Overall/Large			
Waterbirds	0.109	0	0.274
Raptors	0.800	0	2.609
Corvids	0.000	N/A	N/A
Passerines	0.012	0	0.032
Other	0.000	N/A	N/A
Unidentified	4.000	0	15.087
Total	0.049	0.000	0.098
Overall/Small			
Waterbirds	0.009	0	0.019
Raptors	0.093	0	0.280
Corvids	0.015	0	0.044
Passerines	0.002	0	0.005
Other	0.559	0	1.247
Unidentified	2.135	0.012	4.258
Total	0.015	0.004	0.025
Water area/Large			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A
Water area/Small			
Waterbirds	0.006	0	0.017
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	8.000	0	27.051
Total	0.007	0	0.016
Low elevation area/Large			
Waterbirds	0.109	0	0.273
Raptors	0.800	0	2.606
Corvids	0.000	N/A	N/A
Passerines	0.013	0	0.034
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.051	0	0.104

Table 18 (continued)

	Phase I		
Geographic Locations/Turbine Size/Group	**mean**	**lcl**	**ucl**
Low elevation area/Small			
Waterbirds	0.009	0	0.026
Raptors	0.522	0	1.656
Corvids	0.034	0	0.101
Passerines	0.000	N/A	N/A
Other	0.917	0	2.539
Unidentified	6.000	0	16.525
Total	0.020	0	0.042
Medium elevation area/Large			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A
Medium elevation area/Small			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.023	0	0.070
Other	2.000	0	7.544
Unidentified	1.333	0	4.322
Total	0.073	0	0.167
High elevation area/Large			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A
High elevation area/Small			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A

Table 18 (continued)

	Phase II		
Geographic Locations/Turbine Size/Group	**mean**	**lcl**	**ucl**
Overall/Large			
Waterbirds	0.027	0	0.057
Raptors	0.411	0	1.277
Corvids	0.032	0	0.096
Passerines	0.026	0	0.082
Other	0.925	0	3.033
Unidentified	1.233	0	3.284
Total	0.044	0.004	0.084
Overall/Small			
Waterbirds	0.027	0	0.068
Raptors	0.464	0	1.469
Corvids	0.028	0	0.084
Passerines	0.067	0	0.156
Other	0.925	0	2.274
Unidentified	0.000	N/A	N/A
Total	0.067	0.015	0.120
Water area/Large			
Waterbirds	0.031	0	0.069
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	1.233	0	4.205
Unidentified	1.233	0	3.170
Total	0.041	0	0.084
Water area/Small			
Waterbirds	0.033	0	0.083
Raptors	0.000	N/A	N/A
Corvids	0.045	0	0.135
Passerines	0.027	0	0.086
Other	1.057	0	3.083
Unidentified	0.000	N/A	N/A
Total	0.048	0.003	0.093
Low elevation area/Large			
Waterbirds	0.017	0	0.055
Raptors	3.700	0	13.956
Corvids	0.095	0	0.287
Passerines	0.185	0	0.566
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.053	0	0.129
Low elevation area/Small			
Waterbirds	0.000	N/A	N/A
Raptors	1.244	0	4.010
Corvids	0.000	N/A	N/A
Passerines	0.247	0	0.611
Other	0.822	0	2.626
Unidentified	0.000	N/A	N/A
Total	0.129	0	0.269

Table 19. Mean use observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II, calculated based on fatalities found during scheduled carcass searches. lcl = 95% lower confidence limit; ucl = 95% upper confidence limit. lcl values less than zero were set to zero

			Phase I	
Geographic Locations/Turbine Style/Group		**mean**	**lcl**	**ucl**
Overall/slt				
	Waterbirds	0.203	0.009	0.398
	Raptors	0.022	0.010	0.033
	Corvids	0.077	0.045	0.110
	Passerines	0.446	0.279	0.613
	Other	0.010	0.001	0.020
	Unidentified	0.006	0.001	0.011
	Total	0.765	0.522	1.009
Overall/LTT				
	Waterbirds	0.239	0	0.508
	Raptors	0.011	0	0.024
	Corvids	0.070	0.030	0.110
	Passerines	1.457	0	3.059
	Other	0.000	N/A	N/A
	Unidentified	0.002	0	0.007
	Total	1.779	0.194	3.364
Overall/stt				
	Waterbirds	2.214	0.550	3.878
	Raptors	0.016	0.006	0.027
	Corvids	0.150	0.104	0.196
	Passerines	1.402	0.354	2.450
	Other	0.018	0.000	0.036
	Unidentified	0.004	0.001	0.007
	Total	3.804	1.803	5.806
Water area/slt				
	Waterbirds	0.840	0	2.088
	Raptors	0.044	0.001	0.086
	Corvids	0.101	0.031	0.172
	Passerines	0.693	0	1.654
	Other	0.023	0	0.078
	Unidentified	0.000	N/A	N/A
	Total	1.700	0.388	3.013
Water area/LTT				
	Waterbirds	0.000	N/A	N/A
	Raptors	0.000	N/A	N/A
	Corvids	0.000	N/A	N/A
	Passerines	0.000	N/A	N/A
	Other	0.000	N/A	N/A
	Unidentified	0.000	N/A	N/A
	Total	0.000	N/A	N/A

Table 19 (continued)

	Phase I		
Geographic Locations/Turbine Style/Group	**mean**	**lcl**	**ucl**
Water area/stt			
Waterbirds	5.789	0.050	11.528
Raptors	0.033	0.008	0.057
Corvids	0.191	0.107	0.275
Passerines	2.445	0.774	4.115
Other	0.012	0	0.027
Unidentified	0.003	0	0.010
Total	8.472	2.453	14.492
Low elevation area/slt			
Waterbirds	0.392	0	0.979
Raptors	0.017	0	0.045
Corvids	0.058	0.014	0.103
Passerines	0.217	0.109	0.324
Other	0.004	0	0.013
Unidentified	0.008	0	0.021
Total	0.696	0.123	1.269
Low elevation area/LTT			
Waterbirds	0.275	0	0.585
Raptors	0.013	0	0.027
Corvids	0.075	0.030	0.120
Passerines	1.593	0	3.448
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	1.955	0.126	3.784
Low elevation area/stt			
Waterbirds	2.106	0	4.632
Raptors	0.007	0	0.016
Corvids	0.211	0.117	0.305
Passerines	1.783	0	4.303
Other	0.030	0	0.075
Unidentified	0.000	N/A	N/A
Total	4.137	0.706	7.569
Medium elevation area/slt			
Waterbirds	0.000	N/A	N/A
Raptors	0.017	0	0.037
Corvids	0.035	0	0.087
Passerines	0.254	0	0.525
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.306	0	0.615
Medium elevation area/LTT			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A

Table 19 (continued)

	Phase I		
Geographic Locations/Turbine Style/Group	**mean**	**lcl**	**ucl**
Medium elevation area/stt			
Waterbirds	0.000	N/A	N/A
Raptors	0.023	0	0.061
Corvids	0.066	0.005	0.126
Passerines	0.378	0.066	0.690
Other	0.007	0	0.021
Unidentified	0.010	0	0.021
Total	0.483	0.119	0.848
High elevation area/slt			
Waterbirds	0.000	N/A	N/A
Raptors	0.020	0.001	0.038
Corvids	0.105	0.033	0.176
Passerines	0.605	0.326	0.884
Other	0.016	0	0.033
Unidentified	0.010	0	0.022
Total	0.755	0.493	1.018
High elevation area/LTT			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.033	0	0.177
Passerines	0.556	0	1.773
Other	0.000	N/A	N/A
Unidentified	0.017	0	0.088
Total	0.606	-0.701	1.912
High elevation area/stt			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.044	0.009	0.079
Passerines	0.175	0.070	0.280
Other	0.013	0	0.032
Unidentified	0.006	0	0.021
Total	0.238	0.118	0.357

Table 19 (continued)

	Phase II		
Geographic Locations/Turbine Style/Group	**mean**	**lcl**	**ucl**
Overall/LTT			
Waterbirds	0.788	0.207	1.368
Raptors	0.009	0.002	0.016
Corvids	0.112	0.058	0.166
Passerines	0.135	0.028	0.242
Other	0.004	0	0.009
Unidentified	0.009	0	0.020
Total	1.056	0.372	1.739
Overall/stt			
Waterbirds	0.289	0.056	0.522
Raptors	0.008	0.000	0.016
Corvids	0.137	0.094	0.180
Passerines	0.172	0.032	0.313
Other	0.017	0	0.036
Unidentified	0.006	0	0.013
Total	0.629	0.285	0.974
Water area/LTT			
Waterbirds	1.464	0.097	2.831
Raptors	0.020	0.003	0.036
Corvids	0.189	0.064	0.314
Passerines	0.295	0.028	0.562
Other	0.007	0	0.019
Unidentified	0.022	0	0.052
Total	1.998	0.396	3.599
Water area/stt			
Waterbirds	0.557	0.031	1.084
Raptors	0.012	0	0.031
Corvids	0.201	0.134	0.268
Passerines	0.334	0	0.668
Other	0.017	0	0.044
Unidentified	0.012	0	0.029
Total	1.134	0.392	1.876
Low elevation area/LTT			
Waterbirds	0.350	0	0.774
Raptors	0.002	0	0.005
Corvids	0.062	0.030	0.094
Passerines	0.032	0.011	0.053
Other	0.002	0	0.005
Unidentified	0.000	N/A	N/A
Total	0.446	0.020	0.873
Low elevation area/stt			
Waterbirds	0.092	0	0.222
Raptors	0.005	0	0.012
Corvids	0.090	0.043	0.137
Passerines	0.054	0.017	0.091
Other	0.016	0	0.047
Unidentified	0.002	0	0.006
Total	0.259	0.099	0.420

Table 20. Mean fatality observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II, calculated based on fatalities found during scheduled carcass searches. lcl = 95% lower confidence limit; ucl = 95% upper confidence limit. lcl values less than zero were set to zero

		Phase I		
Geographic Locations/Turbine Style/Group		**mean**	**lcl**	**ucl**
Overall/slt				
	Waterbirds	0.012	0	0.029
	Raptors	0.000	N/A	N/A
	Corvids	0.000	N/A	N/A
	Passerines	0.004	0	0.012
	Other	0.000	N/A	N/A
	Unidentified	0.012	0	0.025
	Total	0.027	0.005	0.049
Overall/LTT				
	Waterbirds	0.026	0	0.056
	Raptors	0.009	0	0.027
	Corvids	0.000	N/A	N/A
	Passerines	0.017	0	0.042
	Other	0.026	0	0.056
	Unidentified	0.009	0	0.027
	Total	0.087	0.036	0.138
Overall/stt				
	Waterbirds	0.012	0	0.025
	Raptors	0.003	0	0.010
	Corvids	0.003	0	0.010
	Passerines	0.000	N/A	N/A
	Other	0.015	0.000	0.030
	Unidentified	0.010	0	0.020
	Total	0.042	0.012	0.073
Water area/slt				
	Waterbirds	0.057	0	0.197
	Raptors	0.000	N/A	N/A
	Corvids	0.000	N/A	N/A
	Passerines	0.000	N/A	N/A
	Other	0.000	N/A	N/A
	Unidentified	0.029	0	0.098
	Total	0.086	0	0.231
Water area/LTT				
	Waterbirds	0.000	N/A	N/A
	Raptors	0.000	N/A	N/A
	Corvids	0.000	N/A	N/A
	Passerines	0.000	N/A	N/A
	Other	0.000	N/A	N/A
	Unidentified	0.000	N/A	N/A
	Total	0.000	N/A	N/A

Table 20 (continued)

	Phase I		
Geographic Locations/Turbine Style/Group	**mean**	**lcl**	**ucl**
Water area/stt			
Waterbirds	0.013	0	0.042
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.013	0	0.042
Total	0.027	0	0.066
Low elevation area/slt			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.033	0	0.083
Total	0.033	0	0.083
Low elevation area/LTT			
Waterbirds	0.030	0	0.064
Raptors	0.010	0	0.031
Corvids	0.000	N/A	N/A
Passerines	0.020	0	0.049
Other	0.030	0	0.064
Unidentified	0.010	0	0.031
Total	0.100	0.043	0.157
Low elevation area/stt			
Waterbirds	0.021	0	0.053
Raptors	0.008	0	0.025
Corvids	0.008	0	0.025
Passerines	0.000	N/A	N/A
Other	0.029	0	0.064
Unidentified	0.008	0	0.025
Total	0.075	0.008	0.141
Medium elevation area/slt			
Waterbirds	0.017	0	0.053
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.017	0	0.053
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.033	0	0.083

Table 20 (continued)

	Phase I		
Geographic Locations/Turbine Style/Group	**mean**	**lcl**	**ucl**
Medium elevation area/LTT			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A
Medium elevation area/stt			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.013	0	0.042
Unidentified	0.013	0	0.042
Total	0.027	0	0.084
High elevation area/slt			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A
High elevation area/LTT			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A
High elevation area/stt			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A

Table 20 (continued)

		Phase II	
Geographic Locations/Turbine Style/Group	**mean**	**lcl**	**ucl**
Overall/LTT			
Waterbirds	0.021	0.002	0.041
Raptors	0.004	0	0.011
Corvids	0.004	0	0.011
Passerines	0.004	0	0.011
Other	0.004	0	0.011
Unidentified	0.011	0	0.023
Total	0.046	0.014	0.079
Overall/stt			
Waterbirds	0.008	0	0.019
Raptors	0.004	0	0.012
Corvids	0.004	0	0.012
Passerines	0.012	0	0.025
Other	0.015	0.001	0.030
Unidentified	0.000	N/A	N/A
Total	0.042	0.016	0.068
Water area/LTT			
Waterbirds	0.045	0	0.092
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.009	0	0.029
Unidentified	0.027	0	0.059
Total	0.082	0.009	0.154
Water area/stt			
Waterbirds	0.018	0	0.045
Raptors	0.000	N/A	N/A
Corvids	0.009	0	0.029
Passerines	0.009	0	0.029
Other	0.018	0	0.045
Unidentified	0.000	N/A	N/A
Total	0.055	0.008	0.101
Low elevation area/LTT			
Waterbirds	0.006	0	0.018
Raptors	0.006	0	0.018
Corvids	0.006	0	0.018
Passerines	0.006	0	0.018
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.024	0	0.052
Low elevation area/stt			
Waterbirds	0.000	N/A	N/A
Raptors	0.007	0	0.021
Corvids	0.000	N/A	N/A
Passerines	0.013	0	0.033
Other	0.013	0	0.033
Unidentified	0.000	N/A	N/A
Total	0.033	0	0.068

Table 21. Mean risk observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II, calculated based on observations of use within 200 m of site center and fatalities found during scheduled carcass searches. lcl = 95% lower confidence limit; ucl = 95% upper confidence limit. lcl values less than zero were set to zero

		Phase I		
Geographic Locations/Turbine Style/Group		**mean**	**lcl**	**ucl**
Overall/slt				
	Waterbirds	0.057	0	0.155
	Raptors	0.000	N/A	N/A
	Corvids	0.000	N/A	N/A
	Passerines	0.009	0	0.026
	Other	0.000	N/A	N/A
	Unidentified	1.922	0	4.639
	Total	0.035	0.005	0.065
Overall/LTT				
	Waterbirds	0.109	0	0.274
	Raptors	0.800	0	2.609
	Corvids	0.000	N/A	N/A
	Passerines	0.012	0	0.032
	Other	0.000	N/A	N/A
	Unidentified	4.000	0	15.087
	Total	0.049	0.000	0.098
Overall/stt				
	Waterbirds	0.005	0	0.012
	Raptors	0.196	0	0.599
	Corvids	0.021	0	0.063
	Passerines	0.000	N/A	N/A
	Other	0.824	0	1.972
	Unidentified	2.400	0	5.758
	Total	0.011	0.001	0.021
Water area/slt				
	Waterbirds	0.068	0	0.224
	Raptors	0.000	N/A	N/A
	Corvids	0.000	N/A	N/A
	Passerines	0.000	N/A	N/A
	Other	0.000	N/A	N/A
	Unidentified	0.000	N/A	N/A
	Total	0.050	0	0.126
Water area/LTT				
	Waterbirds	0.000	N/A	N/A
	Raptors	0.000	N/A	N/A
	Corvids	0.000	N/A	N/A
	Passerines	0.000	N/A	N/A
	Other	0.000	N/A	N/A
	Unidentified	0.000	N/A	N/A
	Total	0.000	N/A	N/A

Table 21 (continued)

		Phase I	
Geographic Locations/Turbine Style/Group	**mean**	**lcl**	**ucl**
Water area/stt			
Waterbirds	0.002	0	0.007
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	4.000	0	15.087
Total	0.003	0	0.008
Low elevation area/slt			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	4.000	0	11.475
Total	0.048	0	0.120
Low elevation area/LTT			
Waterbirds	0.109	0	0.273
Raptors	0.800	0	2.606
Corvids	0.000	N/A	N/A
Passerines	0.013	0	0.034
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.051	0	0.104
Low elevation area/stt			
Waterbirds	0.010	0	0.028
Raptors	1.091	0	3.555
Corvids	0.038	0	0.114
Passerines	0.000	N/A	N/A
Other	0.978	0	2.761
Unidentified	0.000	N/A	N/A
Total	0.018	0	0.039
Medium elevation area/slt			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.066	0	0.208
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.109	0	0.284
Medium elevation area/LTT			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A

Table 21 (continued)

	Phase I		
Geographic Locations/Turbine Style/Group	**mean**	**lcl**	**ucl**
Medium elevation area/stt			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	2.000	0	7.544
Unidentified	1.333	0	4.297
Total	0.055	0	0.170
High elevation area/slt			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A
High elevation area/LTT			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A
High elevation area/stt			
Waterbirds	0.000	N/A	N/A
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.000	N/A	N/A

Table 21 (continued)

	Phase II		
Geographic Locations/Turbine Style/Group	**mean**	**lcl**	**ucl**
Overall/LTT			
Waterbirds	0.027	0	0.057
Raptors	0.411	0	1.277
Corvids	0.032	0	0.096
Passerines	0.026	0	0.082
Other	0.925	0	3.033
Unidentified	1.233	0	3.284
Total	0.044	0.004	0.084
Overall/stt			
Waterbirds	0.027	0	0.068
Raptors	0.464	0	1.469
Corvids	0.028	0	0.084
Passerines	0.067	0	0.156
Other	0.925	0	2.274
Unidentified	0.000	N/A	N/A
Total	0.067	0.015	0.120
Water area/LTT			
Waterbirds	0.031	0	0.069
Raptors	0.000	N/A	N/A
Corvids	0.000	N/A	N/A
Passerines	0.000	N/A	N/A
Other	1.233	0	4.205
Unidentified	1.233	0	3.170
Total	0.041	0	0.084
Water area/stt			
Waterbirds	0.033	0	0.083
Raptors	0.000	N/A	N/A
Corvids	0.045	0	0.135
Passerines	0.027	0	0.086
Other	1.057	0	3.083
Unidentified	0.000	N/A	N/A
Total	0.048	0.003	0.093
Low elevation area/LTT			
Waterbirds	0.017	0	0.055
Raptors	3.700	0	13.956
Corvids	0.095	0	0.287
Passerines	0.185	0	0.566
Other	0.000	N/A	N/A
Unidentified	0.000	N/A	N/A
Total	0.053	0	0.129
Low elevation area/stt			
Waterbirds	0.000	N/A	N/A
Raptors	1.244	0	4.010
Corvids	0.000	N/A	N/A
Passerines	0.247	0	0.611
Other	0.822	0	2.626
Unidentified	0.000	N/A	N/A
Total	0.129	0	0.269

Table 22. Results of the searcher efficiency trials at San Gorgonio by size of carcass and vegetation type

Size of Carcass/Part	Vegetation Type	Estimated Probability of Detection	Std.Error	N Carcasses/ Parts	95% C.I.LL	95% C.I.UL
Study 1 (September 22, 1997)						
Small	Small Shrub	0.64	0.09	28	0.46	0.82
Small	Large Shrub	0.67	0.10	24	0.47	0.86
Small	Open	0.68	0.10	22	0.48	0.88
Large	Small Shrub	0.71	0.12	14	0.47	0.96
Large	Large Shrub	0.94	0.05	18	0.84	1.05
Large	Open	0.94	0.05	18	0.84	1.05
Study 2 (March 31, 1998)						
Small	Small Shrub	0.46	0.07	48	0.31	0.60
Small	Large Shrub	0.63	0.06	56	0.50	0.75
Small	Open	0.56	0.07	48	0.42	0.71
Large	Small Shrub	0.50	0.08	44	0.35	0.65
Large	Large Shrub	0.64	0.07	44	0.49	0.78
Large	Open	0.78	0.07	32	0.64	0.93
Overall						
Small	Small Shrub	0.53	0.06	76	0.41	0.64
Small	Large Shrub	0.64	0.05	80	0.53	0.74
Small	Open	0.60	0.06	70	0.48	0.72
Large	Small Shrub	0.55	0.07	58	0.42	0.68
Large	Large Shrub	0.73	0.06	62	0.61	0.84
Large	Open	0.84	0.05	50	0.74	0.94
Total	Total	0.64	0.02	396	0.59	0.68

Table 23. Results of the scavenging trials at San Gorgonio by proximity to turbine, geographic location, size of carcass, and coloration

		Proportion Removed				95% CI	
Comparisons	N	Day 8	Day 10	Mean	SE	LL	UL
Proximity to Turbine							
Near: <100 m From Turbine	112	0.90	0.96	4.13	0.24	3.65	4.61
Mid: 100-400 m From Turbine	39	0.92	0.97	3.26	0.41	2.43	4.08
Far: > 400 m From Turbine	64	0.88	0.97	3.97	0.37	3.23	4.70
Geographic Location							
High elevation area	59	0.85	0.95	4.29	0.37	3.55	5.03
Medium elevation area	50	0.90	0.94	4.05	0.37	3.30	4.80
Low elevation area	68	0.90	0.99	4.26	0.31	3.63	4.89
Water area	38	0.97	0.97	2.59	0.36	1.86	3.32
Season							
April 1997	76	0.93	0.95	3.21	0.29	2.64	3.78
December 1997	139	0.88	0.97	4.31	0.23	3.85	4.77
Size							
Small	83	0.90	0.93	3.68	0.30	3.08	4.28
Large	132	0.89	0.98	4.08	0.23	3.62	4.54
Coloration							
Non-Cryptic	83	0.90	0.93	3.68	0.30	3.08	4.28
Cryptic	132	0.89	0.98	4.08	0.23	3.62	4.54
Total	215	0.90	0.96	3.92	0.18	3.56	4.29

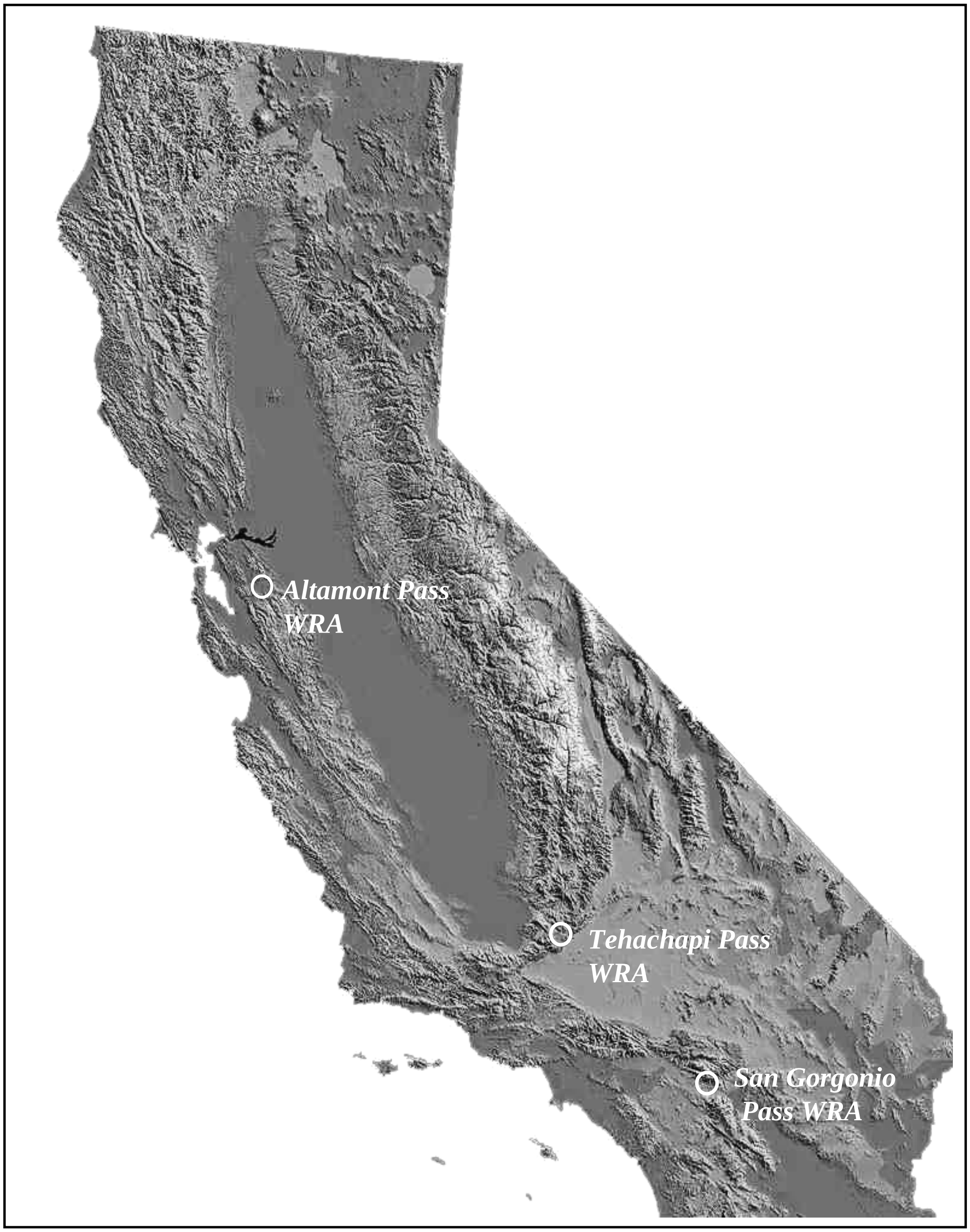

Figure 1. Major developed wind resources areas (WRAs) of California

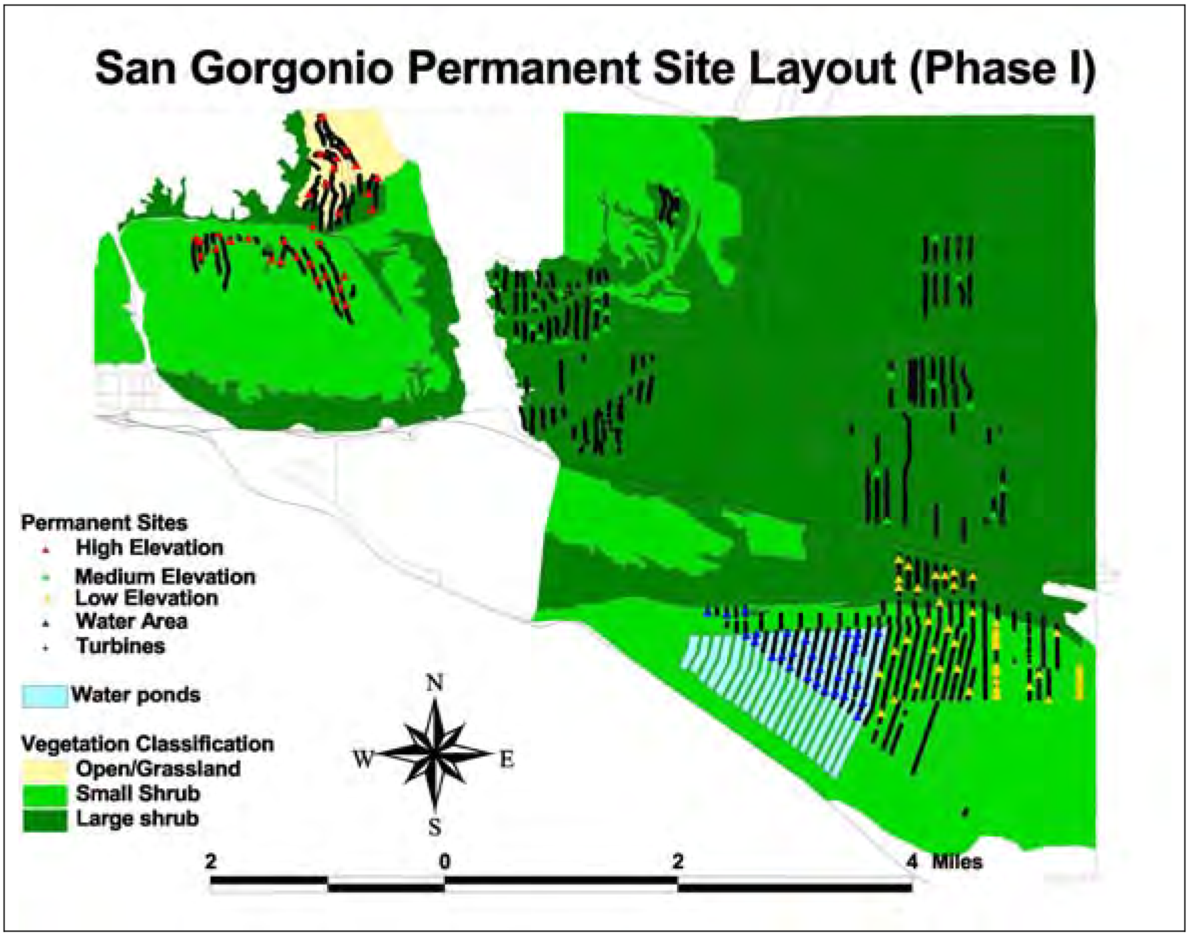

Figure 2. Location of geographic regions and sample site locations at San Gorgonio

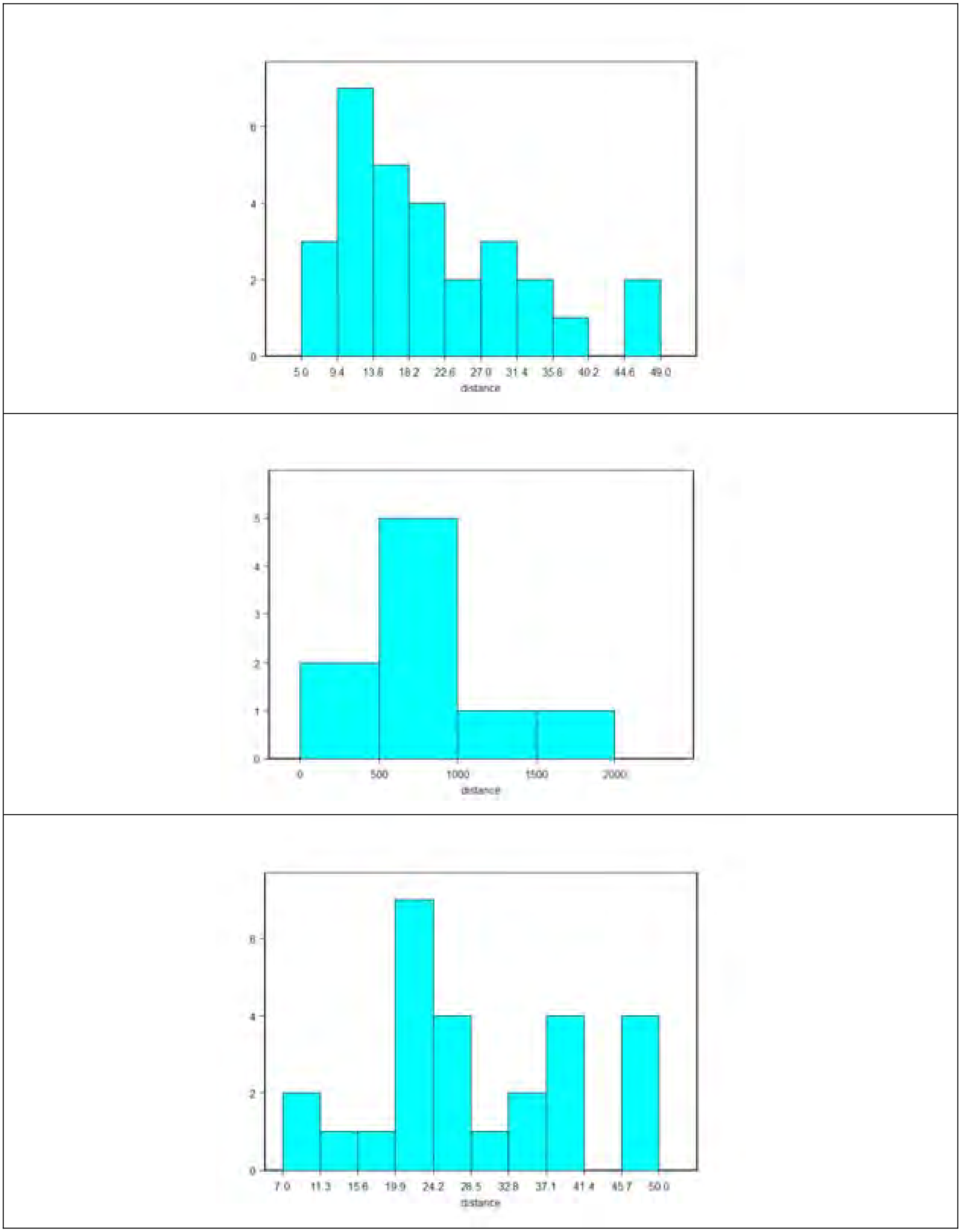

Figure 3. Horizontal distribution of dead birds surrounding the closest turbine observed during Phase I, near and away from turbines, and Phase II studies at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II. Calculated without regard to other structures and whether the turbine is the closest structure

Appendix A. List of birds observed during Phase I and Phase II utilization surveys at San Gorgonio Pass WRA, 3 March 1997 to 29 May 1998 for Phase I and 19 August 1999 to 7 August 2000 for Phase II

Taxonomic Group/ Common Name	Scientific Name	Phase I	Phase II
Waterbirds			
Western Grebe	*Aechmophorus*	I	II
Double-Crested Cormorant	*Phalacrocorax auritus*	I	II
Brown Pelican	*Pelecanus occidentalis*	I	
Common Merganser	*Mergus merganser*	I	
Red-Breasted Merganser	*Mergus serrator*		II
Mallard	*Anas platyrhynchos*	I	II
Gadwall	*Anas strepera*	I	II
American Green-Winged Teal	*Anas crecca*	I	II
Cinnamon Teal	*Anas cyanoptera*	I	II
Northern Shoveler	*Anas clypeata*	I	
Northern Pintail	*Anas acuta*	I	
Redhead	*Aythya americana*	I	II
Canvasback	*Aythya valisineria*	I	II
Greater Scaup	*Aythya marila*		II
Ring-Necked Duck	*Aythya collaris*	I	II
Bufflehead	*Bucephala albeola*	I	II
Ruddy Duck	*Oxyura jamaicensis*	I	II
Unknown Light Goose			II
Canada Goose	*Branta canadensis*	I	
Black Brant	*Branta bernicla*	I	II
Great Blue Heron	*Ardea herodias*	I	II
Great Egret	*Ardea alba*	I	II
Snowy Egret	*Egretta thula*		II
Tri-Colored Heron	*Egretta tricolor*		II
Black-Crowned Night Heron	*Nycticorax nycticorax*	I	
American Coot	*Fulica americana*	I	II
American Avocet	*Recurvirostra americana*		II
Black-Necked Stilt	*Himantopus mexicanus*		II
Least Sandpiper	*Calidris pusilla*		II
Western Sandpiper	*Calidris mauri*		II
Greater Yellowlegs	*Tringa melanoleuca*	I	II
Lesser Yellowlegs	*Tringa flavipes*		II
Killdeer	*Charadrius vociferus*	I	II
Eared Grebe	*Podiceps nigricollis*	I	II
Glaucous-Wing gull	*Larus glaucescens*		II
California Gull	*Larus californicus*	I	II
Ring-Billed Gull	*Larus delawarensis*	I	
Pied-Billed Grebe	*Podilymbus podiceps*	I	II
Bonaparte's Gull	*Larus philadelphia*	I	
Caspian Tern	*Sterna caspia*	I	II
Common Loon	*Gavia immer*	I	II

Appendix A (continued)

Taxonomic Group/ Common Name	Scientific Name	Phase I	Phase II
Raptors			
Northern Harrier	*Circus cyaneus*	I	
Red-Tailed Hawk	*Buteo jamaicensis*	I	II
Golden Eagle	*Aquila chrysaetos*	I	
Bald Eagle	*Haliaeetus leucocephalus*	I	
Prairie Falcon	*Falco mexicanus*	I	II
Peregrine Falcon	*Falco peregrinus*	I	
American Kestrel	*Falco sparverius*	I	II
Osprey	*Pandion haliaetus*	I	II
Common Barn Owl	*Tyto alba*		II
Burrowing Owl	*Athene cunicularia*	I	
Corvids			
Scrub Jay	*Aphelocoma californica*	I	
Common Raven	*Corvus corax*	I	II
American Crow	*Corvus brachyrhynchos*		II
Passerines			
White-Throated Swift	*Aeronautes saxatalis*	I	
Anna's Hummingbird	*Calypte anna*	I	
Broad-Tailed Hummingbird	*Selasphorus platycercus*		II
Western Kingbird	*Tyrannus verticalis*	I	II
Say's Phoebe	*Sayornis saya*	I	II
Black Phoebe	*Sayornis nigricans*	I	II
Horned Lark	*Eremophila alpestris*	I	II
European Starling	*Sturnus vulgaris*	I	II
Brown-Headed cowbird	*Molothrus ater*		II
Red-Winged Blackbird	*Agelaius phoeniceus*	I	II
Western Meadowlark	*Sturnella neglecta*	I	
Brewer's Blackbird	*Euphagus cyanocephalus*	I	II
House Finch	*Carpodacus mexicanus*	I	II
American Goldfinch	*Carduelis tristis*		II
Lesser Goldfinch	*Carduelis psaltria*	I	
Lawrence's Goldfinch	*Carduelis lawrencei*	I	
Savannah Sparrow	*Passerculus sandwichensis*	I	II
Lark Sparrow	*Chondestes grammacus*	I	
White-Crowned Sparrow	*Zonotrichia leucophrys*	I	
Black-Throated Sparrow	*Amphispiza bilineata*	I	
Sage Sparrow	*Amphispiza belli*	I	
Rufous-Crowned Sparrow	*Aimophila ruficeps*	I	
Abert's Towhee	*Pipilo aberti*	I	
Western Tanager	*Piranga ludoviciana*		II

Appendix A (continued)

Taxonomic Group/ Common Name	Scientific Name	Phase I	Phase II
Cliff Swallow	*Petrochelidon pyrrhonota*	I	
Barn Swallow	*Hirundo rustica*	I	
Violet-Green Swallow	*Tachycineta thalassina*	I	II
Northern Rough-Winged	*Stelgidopteryx serripennis*	I	
Phainopepla	*Phainopepla nitens*	I	
Loggerhead Shrike	*Lanius ludovicianus*	I	II
Yellow Warbler	*Dendroica petechia*	I	
Yellow-Rumped Warbler	*Dendroica coronata*	I	II
Black-Throated Gray Warbler	*Dendroica nigrescens*	I	
Wilson's Warbler	*Wilsonia pusilla*	I	
Sage Thrasher	*Oreoscoptes montanus*	I	
Northern Mockingbird	*Mimus polyglottos*	I	
California Thrasher	*Toxostoma redivivum*	I	
Le Conte's Thrasher	*Toxostoma lecontei*	I	
Cactus Wren	*Campylorhynchus brunneicapillus*	I	
Rock Wren	*Salpinctes obsoletus*	I	
Bewick's Wren	*Thryomanes bewickii*	I	
Black-Tailed Gnatcatcher	*Polioptila melanura*	I	
Mountain Bluebird	*Sialia currucoides*	I	
Other Birds			
Rock Dove	*Columba livia*	I	II
Mourning Dove	*Zenaida macroura*	I	II
Gambel's Quail	*Callipepla gambelii*	I	
Greater Roadrunner	*Geococcyx californianus*	I	II

Appendix B. Feathers and fatalities found during Phase I and Phase II studies at San Gorgonio WRA. LLT = large lattice turbine; LTT = large tubular turbine; slt = small lattice turbine; stt = small tubular turbine; L2TT = large 2-blade tubular turbine

Phase I

Species	Geographic Location	Site Type	Site[1]	Found during Fatality Search	Date	Condition	Distance from Closest Turbine (m)	Closest Structure	Comments
Common Raven	*Low*	Near	LN34	Yes	03/18/97	Feather spot and/or bones	37	stt	Only skull. Portion exposed to the sun is bleached. Feathers retained on portion buried in sand.
Mexican Free-Tailed Bat	*Low*	Near	LN26	Yes	03/26/97	Intact	41	Meteorological tower	Dried and covered with ants.
Rock Dove	*Medium*	Away	MA06	Yes	03/28/97	Feather spot	500	Transmission line	Probably an adult killed after site was set up. Most fthrs good cond., not all coll. (4 remiges, few coverts, contour and downy body fthrs).
European Starling	*Medium*	Near	MN02	Yes	04/01/97	Dismembered	19	slt	Body remains, head gone. Flesh dried. May have been scavenged by small mammals and insects.
American Coot	*Water*	Near	WN11	Yes	04/04/97	Feather spot and/or bones	10	stt	Left wing only.
Unidentified Bird	*Water*	Near	WN02	Yes	04/04/97	Feather spot and/or bones	9	slt	Two attached rib bones.
Golden Eagle[2]				No	04/17/97	Intact	3	slt	Injured eagle taken to Cochella Wild Bird Center where it was identified (immature female) and euthanized.
Mourning Dove				No	05/03/97	Intact	52	Elevated transformer box	Back of skull and windpipe exposed, missing flesh & fthrs. Few maggots and red ants. <= couple days old. Body still relatively heavy (water weight).
Unidentified Grebe	*Low*	Near	LN10	Yes	05/14/97	Feather spot and/or bones	29	LTT	3' X 7' patch of body feathers remaining intact w/ skin. Some bone.

Appendix B (continued)

Species	Geographic Location	Site Type	Site[1]	Found during Fatality Search	Date	Condition	Distance from Closest Turbine (m)	Closest Structure	Comments
Mourning Dove	*High*	Near	HN19	No	05/15/97	Feather spot	21	Main road (traveled > 56 kph)	Found 4 or 5 flight feathers (includes retrices) very close together and approx. 20 body feathers. Found within a square meter.
Mallard	*Water*	Away	WA03	Yes	05/19/97	Feather spot and/or bones	750	Main road (traveled > 56 kph)	Spinal column, fused pelvic girdle, skin and svrl coverts att. to 2 consecutive L-primaries, >50 contour and downy fthrs, marrow-filled humerus connected to clavicle and coracoid, partial keel.
Mallard	*Low*	Near	LN25	Yes	05/20/97	Intact	15	L2TT	Chest cavity is fairly clean and dried, but 60% of bird remains. Bird partially covered w/ drifting sand. Prob occurred w/in last 10 days. Ants scavenging.
Unidentified Bird	*Low*	Near	LN41	Yes	05/26/97	Feather spot and/or bones	5	slt	Single stout bone (pneumatic humerus w/ internal struts).
Unidentified Teal	*Low*	Away	LA02	Yes	05/28/97	Feather spot and/or bones	2000		Single right wing, dried out.
Greater Roadrunner				No	06/04/97	Feather spot and/or bones	400	Minor dirt road	Bird lying on road, most likely a road kill. >75% scavenged. Scavenged by ants and maggots.
Mallard	*Water*	Away	WA08	Yes	06/10/97	Dismembered	500	Distribution line	Possibly poached. Still flightless, must have been caught by neck, head missing. Found 2 neck pieces, keel removed, entrails spread around.
Unidentified Bird	*Water*	Near	WN12	Yes	06/18/97	Feather spot and/or bones	11	stt	One wing, another humerus, and 1 leg bone. Bones are short and stout.
Burrowing Owl	*Low*	Near	LN26	Yes	07/08/97	Intact	22	L2TT	Fresh, good condition. Slight smell. Eyes slightly dried. Could feel no broken bones, no obvious signs of injury.

Appendix B (continued)

Species	Geographic Location	Site Type	Site[1]	Found during Fatality Search	Date	Condition	Distance from Closest Turbine (m)	Closest Structure	Comments
Unidentified Bird	*Medium*	Away	MA09	Yes	07/08/97	Feather spot	500	Transmission line	Caught in creosote bush. Approx. 20 contour and 5 wing feathers.
Mallard				No	07/09/97	Dismembered	17	Distribution line	Very fresh (< 1 day old). Cut cleanly in two. Torso half and tail end 18m apart. Impact may have been with either 5-8 or 5-9.
Rock Dove	*Low*	Near	LN28	Yes	08/01/97	Intact	30	L2TT	Carcass intact, no feather loss.
Rock Dove	*Low*	Near	LN23	Yes	08/25/97	Feather spot and/or bones	35	L2TT	Somewhat fresh, still some sticky blood and flesh on bone. Scavenged by ants.
Red-Tailed Hawk				No	08/29/97	Feather spot and/or bones	156	slt (non-operational)	Skull, leg bones, vertebra, and right wing.
Rock Dove				No	08/30/97	Feather spot and/or bones	155	slt (non-operational)	Approx. 30 fthrs w/ dk brown-white shading (6 primaries, 7 secondaries, other wing fthrs almost all from L-wing, wing bones, coracoid, and clavicle.
Red-Tailed Hawk	*Low*	Near	LN37	Yes	09/01/97	Feather spot and/or bones	14	stt	Old and tattered, may have blown or washed in from elsewhere.
Rock Dove	*Low*	Near	LN03	Yes	09/12/97	Feather spot and/or bones	14	stt	Only wings, both w/o meat and fthrs except for sevl primaries attached at each tip. Probably scavenged; sharp breaks suggest crushing by teeth.
Rock Dove	*Low*	Near	LN13	Yes	09/16/97	Dismembered	27	LTT	Fairly fresh kill, flesh drying out. Feathers intact. Ants scavenging carcass. Tail end sheared off.

Appendix B (continued)

Species	Geographic Location	Site Type	Site[1]	Found during Fatality Search	Date	Condition	Distance from Closest Turbine (m)	Closest Structure	Comments
Rock Dove	*Low*	Near	LN28	No	09/23/97	Intact	31	L2TT	Looks very fresh, high water content in body. Hole in side of body under left wing. Some intestines protruding from cloaca. Scavenged by ants.
Rock Dove	*Low*	Near	LN28	No	09/23/97	Intact	10	L2TT	Tail feathers damaged, one found next to body, very fresh carcass, eye still moist and clear. Body with high water content.
Unidentified Bird				No	10/07/97	Feather spot and/or bones	700	Transmission line	Large wing only. Fthrs and bone. Scavenged; broken bones and 1 wing. Most likely some sort of waterbird.
Rock Dove	*Low*	Near	LN31	Yes	10/21/97	Feather spot and/or bones	12	stt	Prob. collided w/ 38-7, then was carried and scav. near turbine 38-6 where found. Only wings and feathers, meat chewed off.
Common Barn Owl				No	10/30/97	Dismembered	35	Fence	Wings, tail, head, breast bone missing. Desiccated.
American Coot	*Water*	Near	WN05	Yes	10/31/97	Feather spot	8	slt	Three dark grey/brown consecutive flt fthrs in a clump bound by dried flesh, 5+ tiny fthrs attached to skin at base of clump.
Western Meadowlark	*Low*	Near	LN11	Yes	11/07/97	Feather spot	20	LTT	Feathers scattered in large area, >50 body feathers and ~5 wing feathers, but no primaries or secondaries.
Rock Dove	*Medium*	Near	MN14	Yes	11/11/97	Feather spot and/or bones	18	Other human-made structure	Bones of neck and part of skull, upper bill att. to front of skull w/ intack fthrs. Bones covered w/ dried blood and flesh.
Unidentified Bird	*Low*	Near	LN40	Yes	11/14/97	Feather spot and/or bones	10	Transformer building	One leg bone w/ black-scaled foot and wing bone under nacelle cone in bldg near 17-28. Small bones (mammal) found in same area.

Appendix B (continued)

Species	Geographic Location	Site Type	Site[1]	Found during Fatality Search	Date	Condition	Distance from Closest Turbine (m)	Closest Structure	Comments
American Coot				No	11/17/97	Dismembered	40	Distribution line	Lying on main road near pond A RTHA was seen in area <5 min. before, likely had scavenged bird. Coot's breast removed and head is gone. Entrails still inside body cavity. Numerous fthrs, some stuck together w/ blood, scattered about.
American Coot				No	11/19/97	Dismembered	174	stt	Fresh kill; 15% of flesh remains. Body torn apart by possible mammal scavenger. Wings, tail, and many body feathers found.
Unidentified Duck				No	11/19/97	Dismembered	4	Transformer box	On top of transformer box. Head, wings and upper body intact. Flesh dried, possible avian scavenging. Possibly a GWTE.
American Coot				No	12/05/97	Feather spot	900	Transmission line	Many fthrs, collected majority of larger fthrs. Most likely scav. by canine. Fresh because not seen previously.
Mourning Dove				No	12/07/97	Feather spot	1000	Fence	Collected 100+ fthrs. Remains of tissue and a few fthrs on top of post where small bird was eaten by another bird. Most likely scav. by raptor.
European Starling				No	12/08/97	Intact	12	slt	Cut under L-eye, bled through mouth and nose. Fresh kill today, not here yesterday.
Snow Goose				No	12/08/97	Feather spot	900	Transmission line	Many white fthrs; collected majority of larger fthrs. Most likely scav by a canine. Fresh fatality. RTHA seen near spot 2 days ago.
Unidentified Bird				No	12/10/97	Feather spot	900	Transmission Line	Fresh - not seen before. 6 chestnut brn flt and ~10 body fthrs. Prob scav by canine.

Appendix B (continued)

Species	Geographic Location	Site Type	Site[1]	Found during Fatality Search	Date	Condition	Distance from Closest Turbine (m)	Closest Structure	Comments
Common Raven				No	12/11/97	Intact	17	Distribution line	Body somewhat dried, not fresh, but still in good condition. Prob < 2 wks old. Signs of insect scav. Body intact but a bit contorted.
Unidentified Bird	*Low*	Near	LN22	Yes	12/12/97	Feather spot and/or bones	49	L2TT	Wing bones, radius, ulna, and carpometacarpus connected by dry tissue. Wing w/ primary and secondary shafts only intact. No contour feathers. No meat on wing - old fat.
American Coot	*Water*	Away	WA02	Yes	12/16/97	Feather spot	450	LTT	Approx. 50 blk/dk grey fthrs (9 remiges, others - contour and other body fthrs; one clump of ~10 cont fthrs attached together w/ skin). Mamm scav sign (fthrs chewed at site of att. to body).
White-Throated Swift	*Low*	Near	LN15	Yes	12/22/97	Intact	46	Blockhouse	Carcass fresh, very flexible and in good condition. Prob <2 days old. No obvious injury, possibly slammed into blockhouse by recent strong winds.
American Coot	*Low*	Near	LN53	Yes	12/30/97	Feather spot and/or bones	10	Meteorological tower	Coll ~25 fthrs (3 remiges, ~5 tertiaries, and dk grey/black body fthrs). Possibly eaten by RTHA on nearby MET tower (also found one possible RTHA fthr).
Rock Dove	*Low*	Near	LN53	Yes	12/30/97	Feather spot			Collected at least 10 fthrs (2 retrices, 1 primary, 3 secondaries, grey contours, and 1 white w/ red mottled contour).
American Coot	*Water*	Away	WA08	Yes	12/30/97	Feather spot	400	Distribution line	>75 fthrs (10+ primaries/secondaries, clump of 25+ plumalaceous fthrs-bases attached with dried skin, down, and body fthrs. Scav: fther broken off at attachment site.

Appendix B (continued)

Species	Geographic Location	Site Type	Site[1]	Found during Fatality Search	Date	Condition	Distance from Closest Turbine (m)	Closest Structure	Comments
Common Barn Owl				No	01/06/98	Feather spot and/or bones	2	stt	Only left rapt leg- bleached and dried. Turbine base surrounded by many small twigs - most likely remains of nest in open nacelle. Leg possibly part of nest or bird using nest.
American Coot	*Water*	Near	WN05	Yes	01/15/98	Feather spot	35	slt	R-wing tip of 3 consecutive primaries and some small coverts att. together. 2 contour/coverts and 1 white fthr. Fair cond. Most likely scav by a canine, wing tip appears chewed off.
American Coot	*Water*	Away	WA05	Yes	01/28/98	Feather spot	790	Main road (traveled > 56 kph)	~50 fthrs, includes 15 remiges w/ <10 AMCO fthrs w/in search area.
Unidentified Bird				No	01/28/98	Feather spot	790	Main road (traveled > 56 kph)	~10 white breast fthrs connected by dried skin, ~20+ loose white fthrs ~3m beyond WA05 search area. Possible SNGO.
Unidentified Egret	*Medium*	Near	MN07	Yes	02/05/98	Feather spot	25	slt	Very clean feathers, it had just rained, so recent fat. 12 remiges and 15 contours. Fthr shafts broken or torn - scav by raptor?
Unidentified Bird	*Medium*	Near	MN14	Yes	02/10/98	Feather spot	10	stt	Found clusters of primaries attached w/ skin. Collected majority of fthrs, but >20 fthrs still in rabbitbrush. Scav = some fthers still have skin attached.
American Coot	*Low*	Near	LN23	Yes	02/18/98	Feather spot and/or bones	26	L2TT	Dk. brown/grey fthers, inc 1 clump of 10 wing fthers bound by flesh and 3 individual flt. fthers. Slightly dried, but prob. < 3 weeks old.

Appendix B (continued)

Species	Geographic Location	Site Type	Site[1]	Found during Fatality Search	Date	Condition	Distance from Closest Turbine (m)	Closest Structure	Comments
Rock Dove				No	03/10/98	Intact	34	L2TT	Unknown cause of death, found lying on back w/ rt wing sticking up, neck curved back, head hidden, still fresh, not completely stiff, eyes sunk in. Had tar on feet.
Great Horned Owl				No	03/11/98	Dismembered	3	slt	Only found face and 2 clumps of 10-15 bod fthers. Possible mammal or avian scavenger.
Common Raven				No	03/24/98	Feather spot and/or bones	150	Fence	Only wing w/ ~6 primaries and ~2 inch length of bone. Scav - most likely chewed on by feral dog/coyote.
Common Barn Owl				No	04/02/98	Intact	13	stt	Time is not likely > 1week (bit dried but in good cond). Scav by insects. Injury -left wing broken, breast damaged, some flattening (possibly run over after death).
Unidentified Bird	*Low*	Away	LA08	Yes	04/07/98	Feather spot and/or bones	1465	Fence	Approx. 75-100 body fthrs left scattered around. Wind blowing hard, fthrs blowing out of bag. Scavenged possibly by a raptor or raven.
Sora	*Low*	Near	LN38	Yes	04/21/98	Intact	15	Transformer box	Carcass on elevated platform of transformer box, where eaten. Skeleton intact w/ 1 wing missing. Rib cage broken on 1 side. Bones mostly picked clean. Appear <couple days old.
Hoary Bat				No	04/21/98	Intact	3	slt	Very fresh, no drying/rigomortis, possibly died night before. Scav by a few ants.

Appendix B (continued)

Species	Geographic Location	Site Type	Site[1]	Found during Fatality Search	Date	Condition	Distance from Closest Turbine (m)	Closest Structure	Comments
Unidentified Bird	*Low*	Near	LN31	Yes	05/04/98	Feather spot and/or bones	11	stt	At least 2 weeks, fthrs dried but in good cond. Scav - broken fthrs and bones possibly from scav or impact w/ turbine. L-wing only, dried flesh on bone, most fthrs sheared at lower shaft.

Appendix B (continued)

Phase II									
Species	Geographic Location	Site Type	Site[1]	Found during Fatality Search	Date	Condition	Distance from Closest Turbine (m)	Closest Structure	Comments
Rock Dove	*Low*	Near	33-2	Yes	08/24/99	Feather spot	7	stt	2 tail feathers connected by skin, 1 more tail feather, 20 body feathers.
Common Raven	*Water*	Near	3-3	Yes	08/26/99	Dismembered	38	stt	CORA found half buried in the sand. Missing feet.
Rock Dove	*Water*	Near	3-3	Yes	08/26/99	Feather spot	22	stt	4 feathers.
Cinnamon Teal	*Low*	Near	49-6	Yes	09/09/99	Intact	46	LTT	Fresh kill, entire bird found intact, with a broken neck. No signs of deterioration or depredation.
Great Horned Owl	*Low*	Near	95-1	Yes	09/10/99	Feather spot	9	Fence	5 remiges, 19 body feathers, 1 tail feather.
Mallard	*Water*	Near	5-10	Yes	09/17/99	Feather spot	21	stt	7 remiges, and 25 body feathers.
Unidentified Bird	*Water*	Near	11-8	Yes	09/17/99	Feather spot	35	LTT	Approximately 15 body feathers in mud, possible waterfowl.
Unidentified Owl	*Low*	Near	33-2	Yes	09/30/99	Feather spot	15	stt	Pygmy or Flammulated? Clump of 8-9 body feathers connected with skin, plus 3 feathers.
Rock Dove	*Water*	Near	11-10	Yes	10/07/99	Feather spot and/or bones	32	LTT	Right wing flight feathers connected by skin, various other RODO feathers collected at site.
Unidentified Gull	*Water*	Near	11-10	Yes	10/07/99	Feather spot and/or bones	20	LTT	Right wing
Rock Dove	*Low*	Near	32-1	Yes	10/07/99	Feather spot	48	stt	Approx. 200 various feathers from all parts of the body, some held together by skin, and 4-5 bones.

Appendix B (continued)

Species	Geographic Location	Site Type	Site[1]	Found during Fatality Search	Date	Condition	Distance from Closest Turbine (m)	Closest Structure	Comments
Rock Dove	*Water*	Near	8-1	Yes	10/19/99	Feather spot and/or bones	40	stt	Left wing - 4 primaries, 3 secondaries held together by cartilage. 2 body feathers.
Unidentified Passerine	*Low*	Near	54-4	Yes	12/03/99	Intact	27	stt	Vireo or warbler. Basically intact, in a bush. Some decomposition or depredation by insects in body cavity.
Western Meadowlark	*Water*	Near	6-4	Yes	12/09/99	Feather spot	26	stt	Approx. 50 body feathers and right wing primary feather.
American Kestrel				No	12/16/99	Dismembered	56	Distribution line	American kestrel, no head and no tail. Depredation by CORA.
Unidentified Bird	*Water*	Near	11-4	Yes	12/20/99	Feather spot and/or bones	21	LTT	Right wing. Probably from a GULL or DUCK.
Unidentified Bird	*Water*	Near	14-9	Yes	02/07/00	Feather spot and/or bones	28	Distribution line	Connected skin and bones.
American Coot	*Water*	Near	4-7	Yes	02/23/00	Dismembered	50	Distribution line	1 right foot, separated just above tarsometatarsus, missing part of third digit.
Unidentified Gull	*Water*	Near	11-6	No	02/28/00	Feather spot	19	LTT	Approximately 50 body feathers scattered in bushes along the edge of the pond.
Unidentified Gull	*Low*	Near	19-36	Yes	02/29/00	Feather spot	41	stt	12 body feathers caught in bushes, apparently blown from the west.
Unidentified Gull	*Water*	Near	11-10	No	03/02/00	Feather spot and/or bones	15	LTT	142 body feathers collected from bushes. Hundreds of gulls utilizing south end of pond.
Unidentified Bird				No	03/02/00	Feather spot and/or bones	31	stt	GULL or DUCK. 1 right wing, all brown. 4 connected primaries, 2 secondaries, and bones.

Appendix B (continued)

Species	Geographic Location	Site Type	Site[1]	Found during Fatality Search	Date	Condition	Distance from Closest Turbine (m)	Closest Structure	Comments
Unidentified Bird	*Water*	Near	17-36	No	03/02/00	Feather spot and/or bones	24	stt	3 bones and 9 feathers collected. Bones and feathers probably unrelated.
Unidentified Gull	*Water*	Near	16-39	No	03/02/00	Feather spot	18	stt	Approx. 30 feathers collected throughout the site.
Brewer's Blackbird				No	03/10/00	Feather spot and/or bones	53	Meteorological tower	Scapula, with feathers, skin and bone. Near TWIN-3.
Unidentified Gull	*Water*	Near	14-9	Yes	03/13/00	Feather spot	26	Distribution line	Approx 30 feathers throughout site.
Mallard	*Water*	Near	11-8	Yes	03/30/00	Intact	21	LTT	Carcass partially decomposed, found in water. L and R wings, head, and body cavity.
Unidentified Bird	*Water*	Near	11-10	Yes	03/30/00	Feather spot	19	LTT	Approx. 110 body feathers caught in bushes; many submerged in the water.
Unidentified Duck	*Water*	Near	11-2	Yes	04/20/00	Feather spot and/or bones	23	LTT	DUCK skull, no feathers, no other bones.
Red-Tailed Hawk				No	04/21/00	Feather spot and/or bones			RTHA wing collected near a turbine on the ridge, northwest of the study area.
Black Phoebe				No	05/08/00	Dismembered	66	stt	Fresh kill, missing head. Depredation by CORA.
Unidentified Gull	*Water*	Near	11-10	Yes	05/09/00	Feather spot and/or bones	39	LTT	Bones, feathers, and skin of right foot and body cavity.
Unidentified Passerine	*Low*	Near	95-1	Yes	05/12/00	Feather spot and/or bones	46	Fence	4 flight feathers and 1 feather connected to bone.
Common Raven	*Low*	Near	59-3	Yes	05/19/00	Intact	36	LTT	CORA, entire body. 12 head feathers held together by skin caught in bush 1m from body.
Common Raven				No	05/23/00	Intact	6	stt	Immature, from nest in 5-7. Death by exposure, starvation, and/or internal injuries.

Appendix B (continued)

Species	Geographic Location	Site Type	Site[1]	Found during Fatality Search	Date	Condition	Distance from Closest Turbine (m)	Closest Structure	Comments
Common Raven				No	05/30/00	Intact	109	slt	Imm CORA, probably fell from nest in 5-7. Probably died of exposure or starvation.
Unidentified Passerine	*Low*	Near	31-10	Yes	06/16/00	Feather spot and/or bones	20	stt	Warbler? Right wing - 9 flight feathers attached by skin and bone.
Common Raven				No	06/23/00	Intact	34	Transmission line	Electrocuted 6-22-00 AM. Male adult CORA from nest in 5-7.

[1] Null value for site indicates fatality found outside of permanent sites

[2] Found alive but euthanized due to injuries

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14. ABSTRACT *(Maximum 200 Words)*
The primary objective of this study at the San Gorgonio Wind Resource Area was to estimate and compare bird utilization, fatality rates, and the risk index among factors including bird taxonomic groups, wind turbine and reference areas, wind turbine sizes and types, and geographic locations. The key questions addressed to meet this objective include: 1) Are there any differences in the level of bird activity, called “utilization rate” or “use”, with the operating wind plant and within the surrounding undeveloped areas (reference area)?; 2) Are there any differences in the rate of bird fatalities (or avian fatality) within the operating wind plant or the surrounding undeveloped areas (reference area)?; 3) Does bird use, fatality rates, or bird risk index vary according to the geographic location, type and size of wind turbine, and/or type of bird within the operating wind plant and surrounding undeveloped areas (reference area)?; and 4) How do raptor fatality rates at San Gorgonio compare to other wind projects with comparable data?

15. SUBJECT TERMS
wind energy; wind turbine; wind farm; San Gorgonio; avian; bird; raptor; bird deaths; avian deaths

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APPENDIX F

JURISDICTIONAL DELINEATION

JURISDICTIONAL DELINEATION REPORT

DESERT HOT SPRINGS WIND ENERGY REPOWERING PROJECT

CITY OF DESERT HOT SPRINGS & UNINCORPORATED AREA

RIVERSIDE COUNTY, CALIFORNIA

LSA

April 2018

JURISDICTIONAL DELINEATION REPORT

DESERT HOT SPRINGS WIND ENERGY REPOWERING PROJECT

CITY OF DESERT HOT SPRINGS & UNINCORPORATED AREA

RIVERSIDE COUNTY, CALIFORNIA

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LSA Project No. DUD1701.01

April 2018

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INTRODUCTION

Dudek & Associates retained LSA Associates, Inc. to conduct a jurisdictional waters study and delineation in support of the Desert Hot Springs Wind Energy Repowering Project (Project). The Project is located within Section 31 of Township 2 South, Range 4 East, Section 6 of Township 3 South, Range 4 East, and Section 1 of Township 3 South, Range 3 East in the City of Desert Hot Springs and portions of unincorporated Riverside County, California, as shown on the *Desert Hot Springs, California* and *Whitewater, California* 7.5-minute series U.S. Geological Survey (USGS) topographic maps (Figure 1).

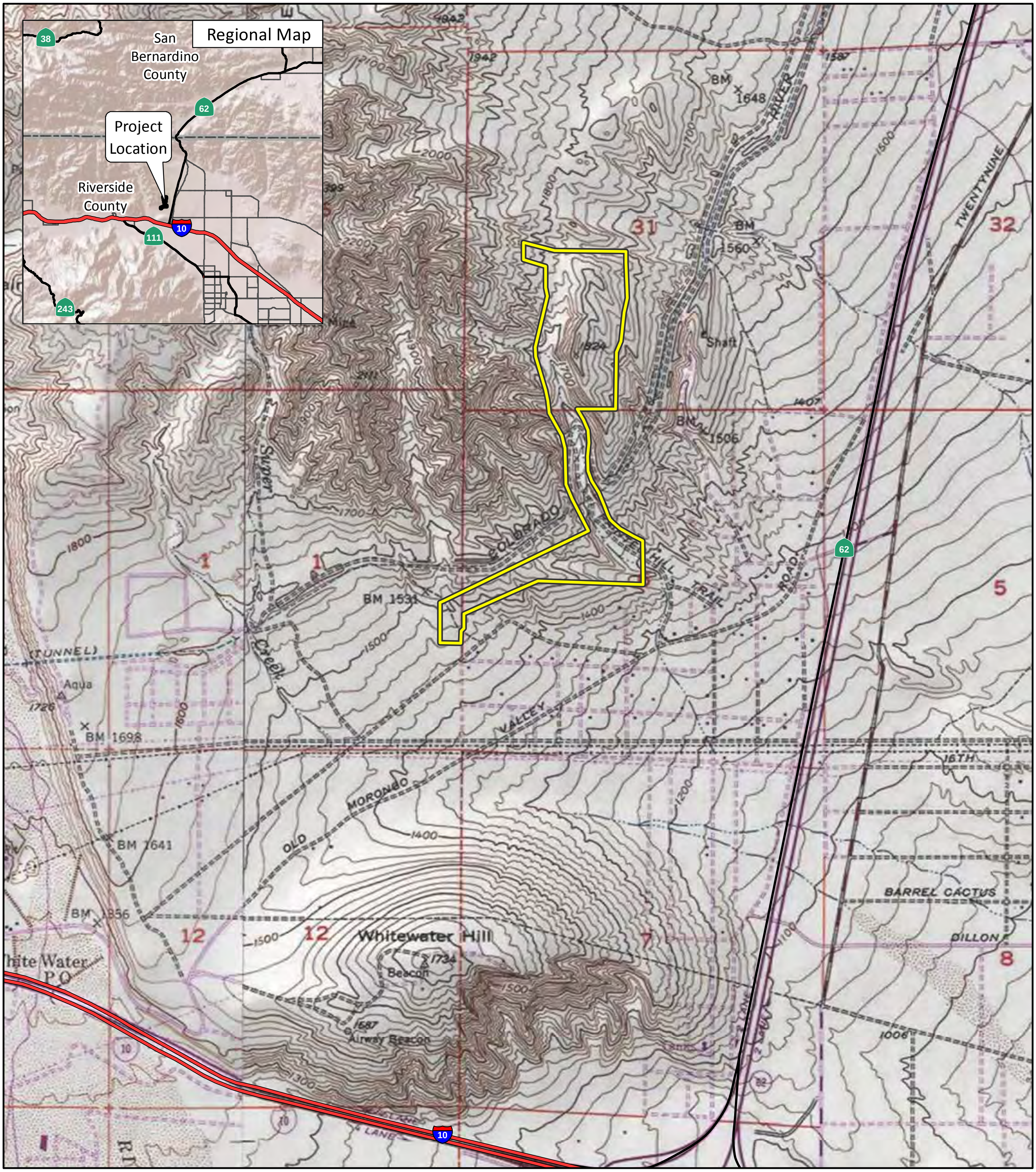
The Project proposes to redevelop an existing windfarm through the removal and replacement of approximately 69 old wind turbines with four new, modern wind turbines. This report presents the results of a delineation of potential wetland and non-wetland waters of the United States subject to jurisdiction of the United States Army Corps of Engineers (USACE) and the Regional Water Quality Control Board (RWQCB) as part of the evaluation for potential permit requirements under Section 404 of the Federal Clean Water Act (CWA) and certification under Section 401 of the CWA, and streambeds and associated riparian habitat subject to the jurisdiction of the California Department of Fish and Wildlife (CDFW) for Streambed Alteration Agreement processing under Section 1600 et seq. of the California Fish and Game Code. This jurisdictional delineation is also an important source of information for the evaluation of potential impacts associated with the Project for California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) analysis.

The findings and conclusions presented in this report, including the locations and extent of waters of the United States and CDFW jurisdictional streambeds and associated riparian habitat, represent the professional opinion of the consultant biologists. These findings and conclusions should be considered preliminary until verified by the USACE, CDFW, and RWQCB.

SITE DESCRIPTION

The Project area contains an existing wind farm comprised of approximately 69 wind turbines, access roads, and associated infrastructure. The Project is situated north of Interstate 10, east of State Route 62, and west of Whitewater Canyon between Whitewater and Painted Hills (Figure 1). The Project lies within the boundaries of the Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP). The northern portion of the Project lies outside of a CVMSHCP Conservation Area, while the southern portion of the Project lies within the Upper Mission Creek/Big Morongo Canyon Conservation Area. An access road associated with the Project lies on Metropolitan Water District land. Topography varies with elevations ranging from approximately 1,400 to 2,000 feet above mean sea level. Vegetation within the Survey Area is best described as *Larrea tridentata* Shrubland Alliance (Creosote Bush Scrub) (Sawyer et al. 2009). Dominant species include creosote bush, white bur-sage (*Ambrosia dumosa*), and brittle bush (*Encelia farinosa*).

Although no surface water was present onsite during the site surveys, evidence of surface water flows from previous rainfall events was observed in the numerous ephemeral desert washes occurring throughout the Survey Area. This is typical of alluvial fans, or bajadas, where ephemeral runoff is conveyed through these myriad of ephemeral drainage channels extending generally northwest to



LSA

FIGURE 1

LEGEND

Survey Area

0 1000 2000
FEET

Desert Hot Springs Wind Energy Repowering Project

Survey Area Map

SOURCE: USGS 7.5' Quad - White Water (1988); Desert Hot Springs (1978)

I:\DUD1801\GIS\MXD\DesertHotSprings\ProjectLocationDHS.mxd (8/24/2018) southeast across the entire study area. These ephemeral drainage channels, or ephemeral desert washes, sustain surface runoff only during or immediately following rainfall events. The majority of the surface runoff percolates into the sandy soils and the rest evaporates.

REGULATORY BACKGROUND

United States Army Corps of Engineers

The USACE regulates discharges of dredged or fill material into waters of the United States. These waters include wetland and non-wetland bodies of water that meet specific criteria. USACE regulatory jurisdiction pursuant to Section 404 of the CWA is founded on a connection, or nexus, between the water body in question and interstate commerce. This connection may be direct (through a tributary system linking a stream channel with traditional navigable waters (TNWs) used in interstate or foreign commerce) or may be indirect (through a nexus identified in USACE regulations). The following definition of waters of the U.S. is taken from the discussion provided at 33 Code of Federal Regulations (CFR) 328.3:

> "The term waters of the United States means:
>
> (1) All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce …;
>
> (2) All interstate waters including interstate wetlands;
>
> (3) All other waters such as intrastate lakes, rivers, streams (including intermittent streams) … the use, degradation or destruction of which could affect interstate or foreign commerce …;
>
> (4) All impoundments of waters otherwise defined as waters of the United States under the definition; and
>
> (5) Tributaries of waters defined in paragraphs (a) (1)–(4) of this section."

The USACE typically considers any body of water displaying an ordinary high-water mark (OHWM) for designation as waters of the U.S., subject to guidance derived from Supreme Court decisions. USACE jurisdiction over nontidal waters of the U.S. extends laterally to the OHWM or beyond the OHWM to the limit of any adjacent wetlands, if present (33 CFR 328.4). The OHWM is defined as "that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding area" (33 CFR 328.3). Jurisdiction typically extends upstream to the point where the OHWM is no longer perceptible.

As discussed above, USACE regulatory jurisdiction under Section 404 of the CWA is founded on a connection between the water body in question and interstate commerce. In the past, an indirect nexus could potentially be established if isolated waters provided habitat for migratory birds, even in the absence of a surface connection to a navigable water of the U.S. The 1984 rule that enabled the USACE to expand jurisdiction over isolated waters of this type became known as the Migratory Bird Rule. However, on January 9, 2001, the U.S. Supreme Court narrowly limited USACE jurisdiction of "nonnavigable, isolated, intrastate" waters based solely on the use of such waters by migratory birds and, particularly, the use of indirect indicators of interstate commerce (e.g., use by migratory birds that cross state lines) as a basis for jurisdiction. The Court's ruling derives from the case *Solid Waste Agency of Northern Cook County v. United States Army Corps of Engineers*, No. 99-1178 (SWANCC). The Supreme Court determined that the USACE had exceeded its statutory authority by asserting CWA jurisdiction over an abandoned sand and gravel pit in northern Illinois, which provides habitat for migratory birds.

In 2006, the U.S. Supreme Court further considered USACE jurisdiction of "waters of the United States" in the consolidated cases *Rapanos v. United States* and *Carabell v. United States* (126 S. Ct. 2208), collectively referred to as *Rapanos*. The Supreme Court concluded that wetlands are "waters of the United States" if they significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as navigable. On June 5, 2007, the USACE issued guidance regarding the *Rapanos* decision. After consideration of public comments and agencies' experience, revised guidance was issued on December 2, 2008. This guidance states that the USACE will continue to assert jurisdiction over TNWs, wetlands adjacent to TNWs, relatively permanent non-navigable tributaries that have a continuous flow at least seasonally (typically three months), and wetlands that directly abut relatively permanent tributaries. The USACE will determine jurisdiction over waters that are non-navigable tributaries that are not relatively permanent and wetlands adjacent to non-navigable tributaries that are not relatively permanent only after making a significant nexus finding. According to the guidance, the USACE generally will not assert jurisdiction over the following features: swales or erosional features (e.g., gullies, small washes characterized by low volume, infrequent, or short duration flow); and ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water.

Furthermore, the preamble to USACE regulations (Preamble Section 328.3, Definitions) states that the USACE does not generally consider the following waters to be waters of the U.S. The USACE does, however, reserve the right to regulate these waters on a case-by-case basis.

- Nontidal drainage and irrigation ditches excavated on dry land;
- Artificially irrigated areas that would revert to upland if irrigation ceased;
- Artificial lakes or ponds created by excavating and/or diking dry land to collect and retain water and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing;
- Artificial reflecting or swimming pools or other small ornamental bodies of water created by excavating and/or diking dry land to retain water for primarily aesthetic reasons; and
- Water-filled depressions created in dry land incidental to construction activity and pits excavated in dry land for purposes of obtaining fill, sand, or gravel unless and until the construction or excavation operation is abandoned and the resulting body of water meets the definition of waters of the U.S.

Waters found to be isolated and not subject to CWA regulation may still be regulated by the RWQCB under the State Porter-Cologne Water Quality Control Act (Porter-Cologne Act).

Wetlands

Wetland delineations for Section 404 purposes must be conducted according to the *Regional Supplement to the Corps Wetland Delineation Manual: Arid West Region* (*Regional Supplement*) (USACE 2008) and the USACE *1987 Wetland Delineation Manual* (*1987 Manual*) (Environmental Laboratory 1987). Where there are differences between the two documents, the *Regional Supplement* takes precedence over the *1987 Manual*.

The USACE and United States Environmental Protection Agency (EPA) define wetlands as follows:

> "Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions."

In order to be considered a jurisdictional wetland under Section 404, an area must possess three wetland characteristics: hydrophytic vegetation, hydric soils, and wetland hydrology. Each characteristic has a specific set of mandatory wetland criteria that must be satisfied in order for that particular wetland characteristic to be met. Several indicators may be analyzed to determine whether the criteria are satisfied.

Hydrophytic vegetation and hydric soils indicators provide evidence that episodes of inundation have lasted more than a few days or have occurred repeatedly over a period of years, but do not confirm that an episode has occurred recently. Conversely, wetland hydrology indicators provide evidence that an episode of inundation or soil saturation occurred recently, but do not provide evidence that episodes have lasted more than a few days or have occurred repeatedly over a period of years. Because of this, if an area lacks one of the three characteristics under normal circumstances, the area is considered non-wetland under most circumstances.

Determination of wetland limits may be obfuscated by a variety of natural environmental factors or human activities, collectively called "difficult wetland situations," including cyclic periods of drought and flooding or highly ephemeral stream systems. During periods of drought, for example, bank return flows are reduced and water tables are lowered. This results in a corresponding lowering of ordinary high water and invasion of upland plant species into wetland areas. Conversely, extreme flooding may create physical evidence of high water well above what might be considered ordinary and may allow the temporary invasion of hydrophytic species into non-wetland areas. In the highly ephemeral systems typical of Southern California, these problems are encountered frequently. In these situations, professional judgment based on years of practical experience and extensive knowledge of local ecological conditions comes into play in delineating wetlands. The *Regional Supplement* provides additional guidance for difficult wetland situations.

Hydrophytic Vegetation

Hydrophytic vegetation is plant life that grows and is typically adapted for life in permanently or periodically saturated soils. The hydrophytic vegetation criterion is met if more than 50 percent of the dominant plant species from all strata (tree, shrub, herb, and woody vine layers) are considered hydrophytic. Hydrophytic species are those included on the National Wetland Plant List (Lichvar et al. 2016).

Each species on the list is rated according to a wetland indicator category, as shown in Table A. To be considered hydrophytic, the species must have wetland indicator status (i.e., be rated as OBL, FACW, or FAC).

Table A: Hydrophytic Vegetation

Category		Probability
Obligate Wetland	OBL	Almost always occur in wetlands (estimated probability > 99 percent)
Facultative Wetland	FACW	Usually occur in wetlands (estimated probability 67–99 percent)
Facultative	FAC	Equally likely to occur in wetlands and non-wetlands (estimated probability 34–66 percent)
Facultative Upland	FACU	Usually occur in non-wetlands (estimated probability 67–99 percent)
Obligate Upland	UPL	Almost always occur in non-wetlands (estimated probability > 99 percent)

The delineation of hydrophytic vegetation is typically based on the most dominant species from each vegetative stratum (strata are considered separately); when more than 50 percent of these dominant species are hydrophytic (i.e., FAC, FACW, or OBL), the vegetation is considered hydrophytic. In particular, the USACE recommends the use of the "50/20" rule (also known as the dominance test) from the *Regional Supplement* for determining dominant species. Under this method, dominant species are the most abundant species that immediately exceed 50 percent of the total dominance measure for the stratum, plus any additional species composing 20 percent or more of the total dominance measure for the stratum. In cases where indicators of hydric soil and wetland hydrology are present but the vegetation initially fails the dominance test, the prevalence index must be used. The prevalence index is a weighted average of all plant species within a sampling plot. The prevalence index is particularly useful when communities only have one or two dominants, where species are present at roughly equal coverage, or when strata differ greatly in total plant cover. In addition, USACE guidance provides that morphological adaptations may be considered when determining hydrophytic vegetation when indicators of hydric soil and wetland hydrology are present (USACE 2006). If the plant community passes either the dominance test or prevalence index after reconsideration of the indicator status of any plant species that exhibit morphological adaptations for life in wetlands, then the vegetation is considered hydrophytic.

Hydric Soils

Hydric soils[1] are defined as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.[2] Soils are considered likely to meet the definition of a hydric soil when one or more of the following criteria are met:

1. All Histels except Folistels and Histosols except Folists;

[1] The hydric soil definition and criteria included in the 1987 Manual are obsolete. Users of the Manual are directed to the United States Department of Agriculture (USDA) Natural Resources Conservation Service website for the most current information on hydric soils.

[2] Current definition as of 1994 (FR July 13, 1994).

2. Soils that are frequently ponded for a long duration or very long duration[3] during the growing season; or
3. Soils that are frequently flooded for a long duration or very long duration during the growing season.

Hydric soils develop under conditions of saturation and inundation combined with microbial activity in the soil that causes a depletion of oxygen. While saturation may occur at any time of year, microbial activity is limited to the growing season, when soil temperature is above biologic zero (the soil temperature at a depth of 50 centimeters, below which the growth and function of locally adapted plants are negligible). Biogeochemical processes that occur under anaerobic conditions during the growing season result in the distinctive morphologic characteristics of hydric soils. Based on these criteria, a National List of Hydric Soils was created from the National Soil Information System (NASIS) database and is updated annually.

The *Regional Supplement* has a number of field indicators that may be used to identify hydric soils. The NRCS (2003) has also developed a number of field indicators that may demonstrate the presence of hydric soils. These indicators include hydrogen sulfide generation, the accumulation of organic matter, and the reduction, translocation, and/or accumulation of iron and other reducible elements. These processes result in soil characteristics that persist during both wet and dry periods. Separate indicators have been developed for sandy soils and for loamy and clayey soils.

Wetland Hydrology

Under natural conditions, development of hydrophytic vegetation and hydric soils is dependent on a third characteristic: wetland hydrology. Areas with wetland hydrology are those where the presence of water has an overriding influence on vegetation and soil characteristics due to anaerobic and reducing conditions, respectively (Environmental Laboratory 1987). The wetland hydrology parameter is satisfied if the area is seasonally inundated or saturated to the surface for a minimum of 14 consecutive days during the growing season in most years (USACE 2006).

Hydrology is often the most difficult criterion to measure in the field due to seasonal and annual variations in water availability. Some of the indicators that are commonly used to identify wetland hydrology include visual observation of inundation or saturation, watermarks, recent sediment deposits, surface scour, and oxidized root channels (rhizospheres) resulting from prolonged anaerobic conditions.

Deepwater Aquatic Habitat

Deepwater aquatic habitats are areas that are permanently inundated at mean annual water depths greater than 6.6 feet or permanently inundated areas greater than 6.6 feet in depth that do not support rooted-emergent or woody plant species.[4] Deepwater aquatic waters do not qualify as wetland waters due to the lack of hydrophytic terrestrial vegetation. Deepwater aquatic waters are

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3 A long duration is defined as a single event ranging from 7 to 30 days; a very long duration is defined as a single event that lasts longer than 30 days.

4 Areas < 6.6 feet mean annual depth that support only submergent aquatic plants are vegetated shallows, not wetlands.

recognized as having a high habitat value due to their use as a fish and wildlife resource and limited distribution in the arid west.

California Department of Fish and Wildlife

The CDFW, through provisions of the California Fish and Game Code (Sec. 1600 et seq.), is empowered to issue agreements for any alteration of a river, stream, or lake where fish or wildlife resources may be adversely affected. Streams (and rivers) are defined by the presence of a channel bed and banks and at least an intermittent flow of water. The CDFW regulates wetland areas only to the extent that those wetlands are part of a river, stream, or lake as defined by the CDFW.

The CDFW has various definitions and descriptions of the terms "channel bed" and "banks." The following definitions are taken from Appendix C: Legal Opinions of the CDFW's *A Field Guide to Lake and Streambed Alteration Agreements Sections 1600–1607 California Fish and Game Cod*e to characterize the bed and bank:

> The extent of a stream bed and banks can be measured by several means: (1) flood plain, depending on the return frequency considered and if the riparian vegetation is present in the flood plain; (2) the outer edge of riparian vegetation used as a line of demarcation; (3) the bank, channel, or levee that confines flows; and (4) the extent of riparian vegetation outside of a levee.

The following concepts are also described in *A Field Guide to Lake and Streambed Alteration Agreements* prepared by the CDFW Environmental Services Division in January 2004:

> Streams can include intermittent ephemeral streams, dry washes, canals, aqueducts, irrigation ditches if they support aquatic life, riparian vegetation, or seasonally stream-dependent terrestrial wildlife, such as amphibians.
>
> Natural attributes or biological components of a stream include aquatic and riparian vegetation, and all aquatic animals, including fish, amphibians, reptiles, invertebrates, and terrestrial species, which derive benefits from the stream system.

The CDFW regulates wetland areas only to the extent that those wetlands are a part of a river, stream, or lake as defined by the CDFW. CDFW jurisdiction typically extends beyond the stream bed/banks to the limits of the riparian vegetation (if present) associated with streams, rivers, or lakes. The CDFW defines riparian as:

> On, or pertaining to, the banks of a stream. As riparian vegetation or riparian woodland. Vegetation which occurs in and/or adjacent to a watercourse. For the purpose of administering Code Section 1600, et seq., this should be expanded to vegetation adjacent to lakes as well.[5]

[5] *A Field Guide to Lake and Streambed Alteration Agreements Sections 1600–1607 California Fish and Game Code*, January 1994.

An artificial waterway is considered natural if the landowners and the community regard the ditch as a natural drainage course and normal circumstances, as having existed over 7 years ("Departmental Jurisdiction Over Waterways," CDFW memo dated October 17, 1988, and "Jurisdictional Issues in the Application of Fish and Game Code Sections 1601 and 1603," CDFW memo dated July 2, 1990). Other Legal Advisor recommendations to amend the CDFW Operating Manual include the following treatment of resources:

> Artificial waterways are jurisdictional if that constructed drainage now has attributes similar to a natural stream bed and that artificial channels or ditches without natural attributes are not subject to Fish and Game Code provisions.

In obtaining CDFW agreements, the limits of wetlands are not typically determined. The reason for this is that the CDFW generally includes, within the jurisdictional limits of streams and lakes, any riparian habitat present. Riparian habitat includes willows, mule fat, and other vegetation typically associated with the banks of a stream or lake shorelines and may not be consistent with USACE definitions. In most situations, wetlands associated with a stream or lake would fall within the limits of riparian habitat. Thus, defining the limits of CDFW jurisdiction based on riparian habitat will automatically include any wetland areas and may include additional areas that do not meet USACE criteria for soils and/or hydrology (e.g., where riparian woodland canopy extends beyond the banks of a stream, away from frequently saturated soils).

Regional Water Quality Control Board

The RWQCBs are responsible for the administration of Section 401 of the CWA. Typically, the areas subject to RWQCB jurisdiction coincide with those of the USACE (i.e., waters of the U.S., including any wetlands). The RWQCB may also assert authority over waters of the State under waste discharge requirements pursuant to the Porter-Cologne Act.

METHODOLOGY

Prior to conducting the fieldwork, current and past aerial photographs were reviewed in Google Earth (Google Earth 2017), as well as previous environmental documents containing jurisdictional delineation analysis conducted within the vicinity of the Project area. These include:

- *Environmental Assessment and Initial Study/Mitigated Negative Declaration: Super Creek Quarry Expansion Revised BLM Plan of Operations and Amended Reclamation Plan No. 137; Riverside County, California.* Prepared and submitted to U.S. Department of the Interior, BLM-Palm Springs South Coast Field Office. California Department of Conservation, State Mining and Geology Board, June 2014.
- *Colorado River Basin Regional Water Quality Control Board: Order for Technically-Conditioned Clean Water Act Section 401 Water Quality Certification for Discharge of Dredged and/or Fill Materials.* Letter regarding Section 401 Water Quality Certification for the Painted Hills Mining Company Super Creek Quarry Expansion and Reclamation Plan 137, WDID No. 7A3331440001. Dated December 9, 2014.

LSA biologists Claudia Bauer and Jodi Ross-Borrego conducted the fieldwork for this assessment on July 11, August 31, 2017, and Ms. Borrego conducted additional fieldwork on March 1, 2018. A portion of the he Project area ("Survey Area") was surveyed systematically on foot to identify and map potential jurisdictional areas and evaluate them according to USACE and CDFW criteria. The potential jurisdictional features were evaluated as follows:

Areas supporting species of plant life potentially indicative of wetlands, exhibiting a bed and bank, and/or an Ordinary High Water Mark (OHWM), were evaluated according to routine wetland delineation procedures described in the USACE *Wetlands Delineation Manual* (Environmental Laboratory, 1987), and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region, Version 2.0* (Environmental Laboratory, 2008) (Manual) and the USACE *A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States* (Environmental Laboratory, August 2008) (2008 Field Guide). The USACE has directed the use of the Field Guide to assess non-wetland, low gradient, alluvial ephemeral/intermittent channel forms, similar to those drainages found on site.

Other documents reviewed for this evaluation include *Vegetation and Channel Morphology Responses to the Ordinary High Water Discharge Events in the Arid West Stream Channels* (Robert Lichvar et al. 2009) and *Review and Synopsis of Natural and Human Controls on Fluvial Channel Processes in the Arid West* (John J. Field et al. 2007).

Those areas identified as potential jurisdictional waters of the U.S./streambeds of the CDFW were examined in the field for evidence of jurisdiction (wetland parameters, OHWM, streambed and bank, and/or riparian habitat). Each drainage feature, the USACE OHWM widths and CDFW streambed widths were measured in the field and mapped on an aerial photograph (scale 1 inch = 300 feet) and were subsequently transferred to LSA's Geographic Information System (GIS). Due to the lack of hydric vegetation, no soil pits were dug as part of this delineation.

RESULTS

Potential Jurisdictional Areas

A total of nine drainage features were identified within the Survey Area. During storm events, Drainages 1 through 3 flow within the Survey Area near the existing access roads, Drainage 9 flows west to east along the northern boundary of the survey area, Drainages 4 through 7 flow within or adjacent to the main existing access road, and Drainage 8 flows perpendicular to the main access road near the western edge of the project. No evidence of ponding (desiccated polygons) was found within the Survey Area. No wetland and/or riparian habitat was found to be present within the Survey Area. Table B shows the potential jurisdictional water of the U.S./CDFW streambeds occurring within the Survey Area. The locations of the potential jurisdictional areas are shown in Figure 2 (Sheets 1 through 5). Representative site photographs are provided in Figure 3.

Table B: Potential Jurisdictional Drainage Features within the Survey Area

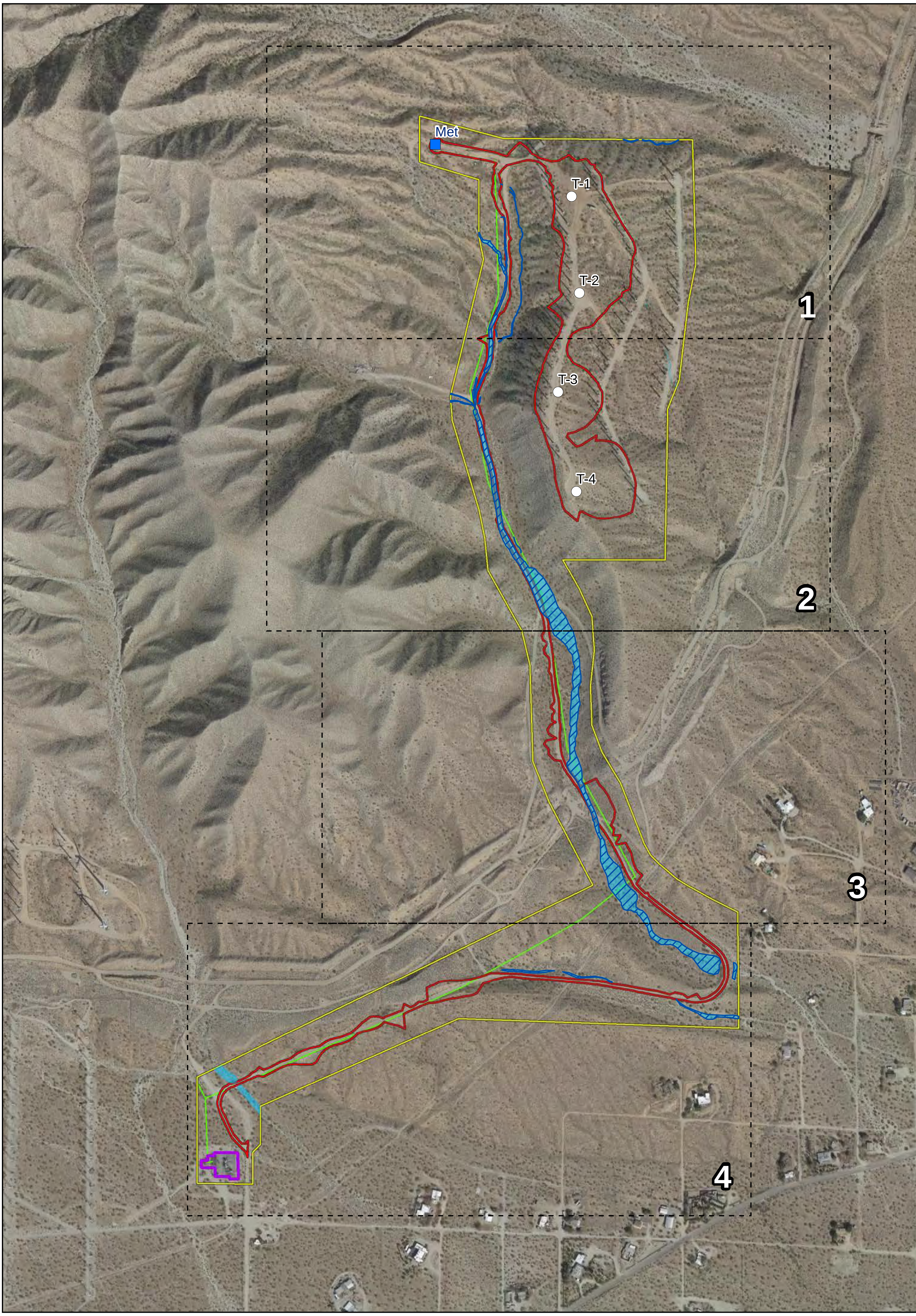
Drainage	Length (linear feet)	Potential Waters of the United States (acres)		Potential CDFW Jurisdictional Streambed (acres)
		Non-Wetland	Wetland	
1	38	0.00	0.0	0.004
2	350	0.00	0.00	0.03
3	21	0.00	0.00	0.00
4	970	0.06	0.00	0.06
5	5,662	4.13	0.00	4.16
6	73	0.00	0.00	0.01
7	896	0.19	0.00	0.28
8	280	0.00	0.00	0.29
9	290	0.03	0.00	0.03
Total	**8,581**	**4.41**	**0.00**	**4.86**

Soils

A mosaic of soils occurs within the Survey Area and is mapped by the NRCS as the following types:

- CdC: Carsitas Gravelly Sand, 0 to 9 percent slopes;
- CkB: Carsitas Fine Sand, 0 to 5 percent slopes;
- CnE: Chuckwalla Cobbly Fine Sandy Loam, 9 to 30 percent slopes; and
- LR: Lithic Torripsamments-Rock Outcrop Complex.

Carsitas gravelly sand (CdC) soil is on the NRCS 2015 National Hydric Soils List (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/).



LSA

FIGURE 2

LEGEND

Desert Hot Springs Survey Area

Potential Jurisdictional Features

USACE Non-Wetland Waters of the U.S.

CDFW Streambed

Preliminary Site Plan

Desert Hot Springs Disturbance Limits

New Turbine Locations

New Met Tower Location

Existing Substation

Existing Overhead Distribution Line

0 250 500

FEET

Source: Google Earth, 2017

Desert Hot Springs Wind Energy Repowering Project

Overview Map

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LSA

LEGEND

Desert Hot Springs Survey Area
Photo Points
Culvert

Preliminary Site Plan

Desert Hot Springs Disturbance Limits
New Turbine Locations
New Met Tower Location
Existing Substation
Existing Overhead Distribution Line

Potential Jurisdictional Features

USACE Non-Wetland Waters of the U.S.
CDFW Streambed

N

0 100 200
FEET

Source: Google Earth, 2017

Index Map

FIGURE 2
Sheet 1 of 4

Desert Hot Springs Wind Energy Repowering Project

Potential Jurisdictional Waters and Photograph Locations

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LSA

LEGEND

Desert Hot Springs Survey Area

Photo Points

Culvert

Preliminary Site Plan

Desert Hot Springs Disturbance Limits

New Turbine Locations

New Met Tower Location

Existing Substation

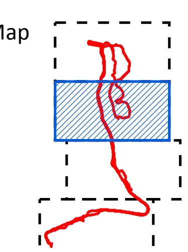
Existing Overhead Distribution Line

Potential Jurisdictional Features

USACE Non-Wetland Waters of the U.S.

CDFW Streambed

Index Map



0 100 200
FEET

Source: Google Earth, 2017

FIGURE 2

Sheet 2 of 4

Desert Hot Springs Wind Energy Repowering Project

Potential Jurisdictional Waters and Photograph Locations

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LSA

LEGEND

Desert Hot Springs Survey Area
Photo Points
Culvert

Preliminary Site Plan

Desert Hot Springs Disturbance Limits
New Turbine Locations
New Met Tower Location
Existing Substation
Existing Overhead Distribution Line

Potential Jurisdictional Features

USACE Non-Wetland Waters of the U.S.
CDFW Streambed

N

0 100 200
FEET

Source: Google Earth, 2017

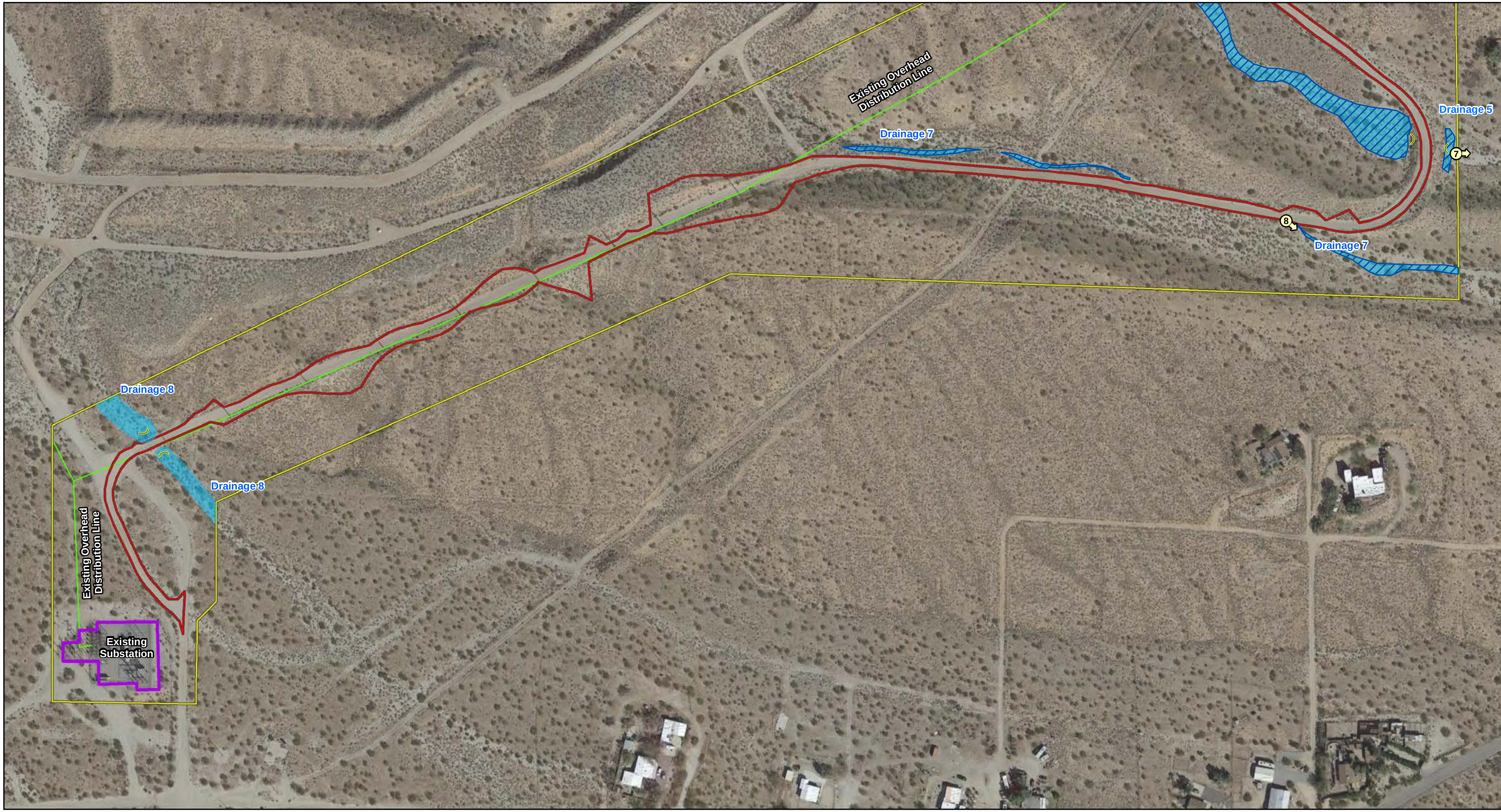
I:\DUD1801\GIS\MXD\DesertHotSprings\JD\JD_DesertHotSprings.mxd (8/24/2018)

Index Map

FIGURE 2
Sheet 3 of 4

Desert Hot Springs Wind Energy Repowering Project

Potential Jurisdictional Waters and Photograph Locations



LSA

LEGEND

- Desert Hot Springs Survey Area
- Photo Points
- Culvert

Preliminary Site Plan

- Desert Hot Springs Disturbance Limits
- New Turbine Locations
- New Met Tower Location
- Existing Substation
- Existing Overhead Distribution Line

Potential Jurisdictional Features

- USACE Non-Wetland Waters of the U.S.
- CDFW Streambed

0 100 200
FEET

Source: Google Earth, 2017

Index Map

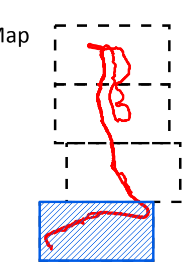


FIGURE 2
Sheet 4 of 4

Desert Hot Springs Wind Energy Repowering Project

Potential Jurisdictional Waters and Photograph Locations

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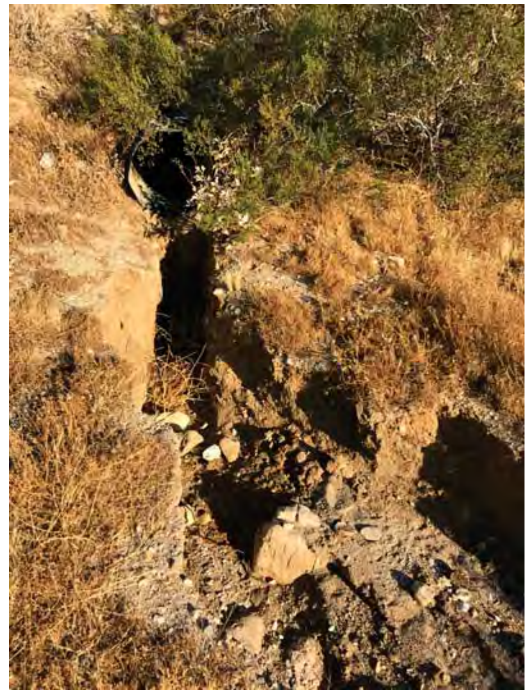
Photograph 1: View of Drainage 2


Photograph 2: View of Drainage 1


Photograph 3: View of Drainage 3


Photograph 4: View of Drainage 4

LSA

FIGURE 3
Sheet 1 of 2

Desert Hot Springs Wind Energy Repowering Project
Site Photographs

Photograph 5: View of Drainage 5

Photograph 6: View of Drainage 5

Photograph 7: View of Drainage 5

Photograph 8: View of Drainage 7

LSA

FIGURE 3
Sheet 2 of 2

Desert Hot Springs Wind Energy Repowering Project

Site Photographs

Discussion

Although no surface water was present onsite during the site surveys, evidence of surface flows from recent rainfall events was observed throughout the Survey Area. This is typical of alluvial fans, or bajadas, where ephemeral runoff is conveyed through these myriad of ephemeral drainage channels extending generally north to south across the entire Survey Area. These ephemeral drainages sustain surface runoff only during or immediately following rainfall events. The majority of the surface runoff percolates into the sandy soils and the rest evaporates.

Review of the aerial imagery (Google Earth 2017) showed Drainages 4, 5, 7, and 9 exhibit definitive OHWMs, evidenced by shelving and incised banks and ultimately connect southeast of the Survey Area with Garnet Wash. Garnet wash is tributary to the Whitewater River, which is a direct tributary to the Salton Sea. The USACE considers the Salton Sea to be a TNW of the U.S. These drainages are likely subject to both USACE and CDFW jurisdiction.

The remaining Drainages (1-3, and 6) found within the Survey Area are ephemeral and considered isolated as they have no nexus with a downstream TNW and likely not subject to the regulatory authority of the USACE, but would likely be subject to CDFW jurisdiction.

CONCLUSIONS

The Survey Area contains 4.41 acres of potential non-wetland waters of the United States subject to the regulatory authority of the USACE and RWQCB pursuant Sections 404 and 401, respectively, of the CWA. Additionally, the Survey Area contains 4.86 acres of potential streambed, subject to the regulatory authority of CDFW.

Since there is no public guidance on determining RWQCB jurisdictional areas, jurisdiction was determined based on the Federal definition of wetlands (three-parameter) and other waters of the U.S. (OHWM) as recommended by the September 2004 Workplan. Since there are areas within the Survey Area subject to USACE and CDFW jurisdiction, RWQCB jurisdiction in this case is coincident with USACE jurisdiction for purposes of Section 401 certification. The total area of potential RWQCB jurisdiction under Section 401 of the CWA within the Survey Area is 4.41 acres, which is synonymous with the total area of potential waters of the United States (i.e., USACE jurisdiction).

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