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BEFORE THE

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

HEARING IN THE MATTER OF CALIFORNIA DEPARTMENT OF WATER RESOURCES AND UNITED STATES BUREAU OF RECLAMATION REQUEST FOR A CHANGE IN POINT OF DIVERSION FOR CALIFORNIA WATER FIX	**TESTIMONY OF GARY IVEY, Ph.D. - REVISED** **FRIENDS OF STONE LAKES NATIONAL WILDLIFE REFUGE**

I. INTRODUCTION

I have worked as a Research Associate with the International Crane Foundation since 2007, focusing on the conservation needs of Sandhill Cranes (*Grus canadensis*; recently considered *Antigone canadensis;* family *Gruidae)* in the western U.S. I received my doctorate and master's degrees in Wildlife Science, both from Oregon State University in 2007 and 2015. For my Master's Thesis I studied Greater Sandhill Crane (*G. canadensis tabida*) nesting ecology, and for my doctoral dissertation, I studied wintering ecology of Greater and Lesser Sandhill Cranes (*G. c. canadensis*) in the Sacramento-San Joaquin Delta. I received two bachelor's degrees (Wildlife Management and Biology) from Humboldt State University (1977, 1978). I began studying Greater Sandhill Cranes in 1979 while I worked as a technician on a nesting study at Malheur National Wildlife Refuge ("NWR") in SE Oregon and furthered studying them while I worked as a Refuge Biologist at Sacramento NWR Complex (1 year), Kern NWR (2 years), and Malheur NWR (15 years). I served as a consultant on California's Draft Recovery Plan for Greater Sandhill Cranes (1998-2001) and also as a subconsultant to assist with development of Greater Sandhill Crane conservation and mitigation measures for the Bay Delta Conservation Plan ("BDCP"). I also carried out several field research projects for The Nature Conservancy ("TNC") relating to management of Staten Island for Sandhill Crane benefits.

II. BACKGROUND

Greater Sandhill Cranes were exploited by unregulated hunting by American settlers and for the meat markets in the late 19th and early 20th centuries. They also suffered severe historic habitat losses due to drainage and conversion of wetland habitats on both breeding and wintering areas throughout the western U.S. While once a common breeding species throughout the mountains in California, Walkinshaw (1949) (FSL-38) estimated only three to five nesting pairs remained in 1944.

With the passage of section 3511 of the Fish and Game Code in 1970, the Greater Sandhill Crane was designated a fully-protected species meaning no take can be authorized for this project. (FSL-28) Subsequently in 1983, the California Fish and Game Commission

voted unanimously to add the Greater Sandhill Crane to the List of Rare Animals (Cal. Code Regs., tit. 14, § 670.5). The California Endangered Species Act (1984) classifies the Greater Sandhill Crane as a State Threatened species. (See SWRCB-102, FEIR/S, pp. 12-~~1243~~ 3543 [take prohibited], Appendix 12A-24 [listing status].) Additionally, the Lesser Sandhill Crane (*G. c. canadensis*) is classified as a "Bird Species of Conservation Concern" (Shuford and Gardali 2008). (FSL-34)

As a whole, the family Gruidae is one of the world's most endangered bird families, with cranes often serving as "keystone" species for conserving grasslands, wetlands and associated agricultural landscapes around the world. Cranes are long-lived birds (one species lived to 83 years in a zoo) and they exhibit very low productivity and recruitment which makes it difficult for them to rapidly recover from population-level effects of habitat losses or unnatural causes of mortality such as from transmission line collisions. Their adaptation to forage in agricultural grain fields has helped to allow the species to come-back from near historic extinction; however, they have not fully recovered their historic breeding range and aren't likely to ever recover to their pre-settlement population levels.

Sandhill Cranes are a very popular species that catch the public's interest more than most other wildlife because their elegance and charisma is appealing to people; plus, they are an important economic asset. An economic study of the spring Sandhill Crane staging area along the Platte River in Nebraska estimated that over 90,000 visitors who travel there each spring add about $30 million to the local economy (FSL-31, Case and Sanders 2009). It is likely that cranes wintering in the Central Valley generate much higher financial benefits to local economies there, as they are present for over 6 months during winter and thousands of visitors enjoy them at several NWRs, State Wildlife areas and Nature Preserves in the Sacramento Valley, the Delta, and the San Joaquin Valley. Several Central Valley birding festivals include tours to see Sandhill Cranes in their activities, including the Lodi Sandhill Crane Festival, the Galt Winter Bird Festival, the Marysville Swan Festival and the Chico Snow Goose Festival.

Approximately 20% of the Central Valley Population of Greater Sandhill Cranes, and approximately 33% of the Pacific Coast Population of Lesser Sandhill Cranes winter in the Delta Region (Ivey, unpublished data). Sandhill Cranes are found in some numbers throughout the Delta; primarily in Sacramento and San Joaquin counties, but also in east Yolo, Solano and Contra Costa counties. The wintering area includes both the Central Delta and Cosumnes and Stone Lakes areas, and is approximately 1,500 km^2, bounded on the west by the Sacramento River and the Deep Water Ship Channel, on the north by Elk Grove and South Sacramento, on the south by Highway 4 to Stockton and on the east by Lodi, Galt and rural communities of Herald and Wilton. This area includes the Cosumnes River floodplain (below Wilton), the Mokelumne River floodplain (below Galt), the Sacramento River floodplain (below Freeport), and the Delta tracts and islands which lie east of the Deep Water Ship Channel, east of the Sacramento River channel between Rio Vista and Antioch, north of Highway 4, and west of Interstate Highway 5 (FSL-36 Figure 2A.19-2).

Because of the importance of the Delta region for wintering Sandhill Cranes, agencies and conservation groups have acquired, enhanced, and managed lands for use by wintering Sandhill Cranes. Most of this activity has centered on 5 major roost complexes in the Delta region; the Isenberg Sandhill Crane Reserve owned by California Department of Fish and Wildlife, Stone Lakes NWR owned by U.S. Fish and Wildlife Service, Cosumnes River Preserve, established by TNC in partnership with the Bureau of Land Management and with multiple ownerships, and the more recent acquisition of Staten Island by TNC. All these properties include a portion of habitat managed to provide winter roost sites for Sandhill Cranes; however, most of Sandhill Crane foraging occurs on private lands in close proximity to these managed roost sites. The highest densities of Greater Sandhill Cranes occur in the east-central Delta on Staten Island and adjacent tracts and islands (including Brack Tract and Isenberg Sandhill Crane Reserve), followed by Stone Lakes NWR and Cosumnes River Preserve. Other Delta roost sites (on private lands) support much lower numbers of Sandhill Cranes. Loss of foraging habitat on these private lands appears to be the biggest threat to the future welfare of the Central Valley Population of Greater Sandhill Cranes. Habitat losses are

primarily due to conversion to incompatible crop types (e.g., vineyards and orchards) as well as expanding urbanization and other developments. Habitat losses that occur within the daily flight radius of a Sandhill Crane may change crane abundance at a roost, regardless of management actions at the roost site itself (Ivey et al. 2015, SOSC-16). Capacities of existing wintering sites to support Sandhill Cranes are threatened by habitat loss, which is occurring throughout the Central Valley. The Delta is certainly under the greatest threat due to pressures from expanding urban areas and is losing habitat (grain fields) to incompatible permanent crops faster than other regions (estimated at 18.3% by 2040; Central Valley Joint Venture 2006:79, FSL-32), which could contribute to a reduction of the population. In summary, the Delta Greater Sandhill Cranes are already stressed by such habitat losses and so the effects of the Delta Tunnels construction and operations will add additional stress and risk to the population's future viability. This issue of cumulative impacts was not discussed or evaluated in Chapter 12 of the FEIR/S.

III. TESTIMONY

1. Transmission Line Take of Greater Sandhill Cranes is Likely

Any new transmission lines within the Delta Sandhill Crane use area will pose a mortality risk to Greater Sandhill Cranes and result in take of this fully-protected and threatened subspecies under state law. As a subconsultant working on the BDCP in the 2010 to 2015 timeframe, I developed a model to estimate take of Greater Sandhill Cranes from proposed project transmission lines and used the same model to identify potential mitigation options to compensate for the take by reducing collision risk from existing powerlines. In the context of the BDCP, take of Greater Sandhill Crane could be permitted under certain conditions since the BDCP was a Habitat Conservation Plan/Natural Communities Conservation Plan. (See Fish & Game Code, § 3511, citing Fish & Game Code, § 2835, FSL-28.) It is my understanding that the currently petitioned project, Alternative 4A in the FEIR/S, is no longer a NCCP.

In order to estimate annual take in the 2013 BDCP, I estimated how many individual Greater Sandhill Crane flights cross the proposed project lines during a wintering season. One

study of Greater Sandhill Crane transmission line collisions provides estimates of mortality rates per crossing (Brown and Drewien 1995, SOSC-35) and I used their estimated mortality rates to estimate take of the subspecies. To estimate the number of crossings, my model used data collected during surveys of Greater Sandhill Cranes conducted during the winters of 2006–2007, 2007–2008, and 2008–2009 by automobile, aircraft, and on foot (Ivey et al. 2014, SOSC-13), and birds outfitted with transmitters were tracked to identify roosting and foraging areas. These efforts quantify the approximate number of night-roosting Greater Sandhill Cranes, with estimates in a roost site complex ranging from 10 to 1,500 birds (Staten Island, FSL-35). Data from 33 Greater Sandhill Cranes outfitted with radio transmitters were used to determine the distances they flew from roost sites to foraging areas as well as the proportion of birds that foraged within different distance intervals from their roost. In other words, my study determined the proportion of the roosting population that can be expected to forage within 1, 2, and 3.7 miles (2, 4, and 6 kilometers) of the roost. Results indicated that all Greater Sandhill Cranes (100%) forage within 1.2 miles (2 kilometers) of the roost site, 18% between 1.2 and 2.5 miles (2 and 4 kilometers) of the roost, 9% between 4 and 5 kilometers, and 5% between 3 and 3.7 miles (5 and 6 kilometers) (Ivey et al. 2015, SOSC-16). In order to weight collision risk relative to the size of a given roosting site, the number of birds at each roost was divided by 1,500 (the maximum number of greater sandhill crane at a roost-site complex). Using this method, the largest roost site would be standardized to a value of 1 and the smallest roost site (10 birds) would be assigned a value of 0.0067 (10/1500) (see FSL-37 [Collision Risk Index Map for Greater Sandhill Crane]). This value was then multiplied by the percentages derived above to determine the relative risk in a given area based on roost size and distance from the roost. This final number is the collision risk index value. Results were made spatially explicit in ArcGIS, where each cluster of roost sites was buffered by a radius of 1, 2, 3, and 3.7 miles (2, 4, 5, and 6 kilometers), and collision risk index values were mapped within those distance categories. In cases where the roost-site buffers overlapped, the values were added together (i.e., risk in that polygon increased).

Using this approach, an average population size was determined for each line segment crossing each polygon, which was then multiplied by 130 days (the mean number of days that greater sandhill crane spend in the Delta wintering area) and by four flights per day (birds going between foraging areas and roost sites twice a day, crossing the lines twice in the morning and twice in the evening). Based on the assumption that the probability of flying out of the roost in a given cardinal direction is 25%, this number was then divided by four, resulting in a crossing estimate for each segment and for the total line. The number of crossings was then multiplied by collision mortality rates that were calculated for greater sandhill crane in the Rocky Mountains of Colorado (Brown and Drewien 1995, SOSC-35) to estimate annual take of Greater Sandhill Cranes using their highest estimate (30.4×10^{-5} collisions per crossing) to be conservative in favor of the subspecies in the estimate. Using this analysis of the previously proposed BDCP project's original transmission line configuration, I estimated that the project would result in 48 Greater Sandhill Crane deaths per year. (BDCP Appendix 5J, FSL-30)

According to adopted AMM20: "*Prior to powerline construction, the wildlife agency-approved, qualified crane biologist familiar with crane biology will coordinate with DWR to develop a plan for achieving the performance standard (no take of greater sandhill crane associated with the new facilities) using one or a combination of the measures described above. The plan will include an analysis, using the method described in BDCP Appendix 5.J, Attachment 5.J.C, Analysis of Potential Bird Collisions at Proposed BDCP Powerlines, of the 2013 Public Draft BDCP to demonstrate that this standard has been met for the final transmission line alignment. The best available science will be used to estimate bird strike reduction associated with powerline diverters installed on existing lines in highest risk zones for the species and to design and implement roost site surveys as described in Section 3B.4.20.6 of the 2013 Public Draft BDCP, Surveys to Inform Avoidance and Minimization.*" (SWRCB-111, p. 4-33 [Mitigation, Monitoring and Reporting Program])

The effects analysis referenced as *BDCP Appendix 5.J, Attachment 5.J.C* (FSL-30) also considered an estimated growth rate of the Central Valley Population (estimated at 1.4%) and the estimated annual take from implementing the BDCP project, which also included the same

tunnels project component as analyzed in the currently proposed project known as California WaterFix or Alternative 4A as a percentage of the population. In the BDCP analysis, if the percentage of take was lower than the growth rate, the population was assumed to continue to increase or to be stable. However, the analysis did not consider the effects of transmission line losses on the much smaller local Delta Greater Sandhill Crane population, that might reach a level to result in a reduction of these local birds. I would be concerned that take of the local subspecies would slow their recovery. Therefore, it is critical that the final project include transmission line choices that prevent take of this species.

The FEIR/S discusses options for altering existing transmission lines to reduce take of Greater Sandhill Cranes (SWRCB-10~~5~~2, FEIR/S, pp.12-3549-12-3550); however, DWR does not own those existing lines and thus implementation of those measures would rely on cooperation with the utility companies, adding uncertainty that the measure can be implemented. To be effective, the final strategy for such mitigation would need to be developed with approval of cooperating utility companies before project construction begins. In any case, actions to reduce take at existing lines would not do anything to prevent unpermittable take (FSL-28) of Greater Sandhill Cranes the new transmission lines included in the project. (See SWRCB-10~~5~~2, FEIR/S Figure 3-25; see also FSL-33, LAND-3 and LAND-120 [figures showing proposed transmission lines].)

The analysis to estimate Greater Sandhill Crane take which I developed, described in BDCP *Appendix 5.J., Attachment 5.J.C* (FSL-30), is less than perfect and relied primarily on Sandhill Crane studies conducted in other regions and during other seasons with differences in night-time hours, weather conditions and landscapes. These factors could bias Delta Greater Sandhill Crane mortality estimates. Ideally, a more thorough study of transmission line impacts to Sandhill Cranes should be conducted in the Delta prior to project approval or construction to better inform the model and provide more accurate estimates of take.

A study by Murphy et al. (2016a) (SOSC-44) in Nebraska that combined searches for carcasses along lines with the use of electronic detectors of collisions and monitoring with night-vision spotting scopes showed that previous studies likely underestimated crane collision

rates. Total mortality, including crippling and nocturnal (lack of observations at night) biases, was 2.8 to 3.7 times higher than indicated by a traditional corrected-count mortality estimator, because neither crippling bias nor nocturnal bias were adequately considered in those studies. This suggests that the population effects of the losses of Greater Sandhill Cranes were underestimated by the model.

A recent study suggested that glow-in-the-dark markers and smaller gaps between markers reduced collision risk by Sandhill Cranes (Murphy et al. 2016b, SOSC-45). Therefore, I suggest that marking standards for the project include glow-in-the-dark markers and smaller gaps between markers to be incorporated into the transmission line design. I suggest DWR consult with the above authors on spacing recommendations. Likely even more effective would be solar-charged lights affixed to markers to make them even more visible in poor light. Such technology should be relatively easy to attach to some existing marker styles. Also, it is very important that the project maintain markers on lines designated to be marked for the life of the lines, as indicated in AMM 20.

Chapter 12, page 12-3550; line 46; page 12-3551; lines 1-3 states: "*Considering that the temporary lines would be removed within the first 10–14 years of Alternative 4A implementation, and with the implementation* ***of one*** *or a combination of the measures described under AMM20 Greater Sandhill Crane, there would be no take of greater sandhill crane from the project pursuant to California Fish and Game Code Section 86."* Some measures listed in AMM20 Greater Sandhill Crane would not result in fully mitigating take if implemented alone. For example, only marking project lines, siting new transmission lines in lower bird strike risk zones, or shifting locations of flooded areas that provide crane roosts to lower risk areas if implemented as stand-alone measures, would not lead to no net take of Greater Sandhill Cranes.

2. Project disturbance contributions to take of Greater Sandhill Cranes was not adequately addressed

The project would substantially increase traffic and other activities related to construction and ongoing monitoring and maintenance, which will lead to increased take of Greater Sandhill Cranes which has not been accounted for in the model described above. Murphy et al. (2016a) (SOSC-44) showed that cranes are at particular risk when flushed at night; however, any time they are flushed and cross transmission lines in flight, there is a risk of collision, particularly given the foggy conditions that often occur in this region. (See SWRCB-5, BDCP Appendix 5JC.) Alternative 4A fails to account for the effects of construction disturbance that would cause Greater Sandhill Cranes to flush over both new project lines and existing transmission lines, increasing the number of transmission line crossings, leading to some level of increased take of the subspecies. One way to reduce this additional take would be to complete construction in crane use areas outside the Greater Sandhill Crane wintering period; however, there would still be disturbance from project operations activities for the future of the project which could result in take.

3. Mitigation of Greater Sandhill Crane Habitat Losses is Insufficient

FEIR/S Chapter 12, page 12-3549; lines 6-8 states: *"However, the project proponents have committed to habitat protection, restoration, management, and enhancement associated with Environmental Commitment 3 and Environmental Commitment 10 that are greater than the mitigation ratios described above."* (See also SWRCB-111, MMRP, pp. 4-32, 5-6 to 5-7, 5-13 to 5-14.) Although the commitments in EC 3 and EC 10 include more acres of habitat than the Greater Sandhill Crane habitat that is directly impacted by the project, unless the habitat conservation of EC 3 and EC 10 is implemented within the crane use landscapes, they won't contribute to crane objectives. (See FSL-35 [crane use map].)

4. Further Restricting Timing of Construction Activities Could Help Avoid Crane Disturbance

According to AMM20 page 4-32; lines 15-18: "*To the extent feasible, construction that cannot be completed prior to commencement of the wintering season will be started before*

September 15 or after March 15, such that no new sources of noise or other major disturbance that could affect cranes will be introduced after the cranes arrive at their wintering grounds." (SWRCB-111, MMRP, p. 4-32.) This measure may allow most cranes to avoid disturbance by selecting habitats away from construction sites. However, I would recommend that if a new above ground project must be started after September 15 and before March 15, that the project disturbance begin towards the mid-day period, between 11AM and 3PM so that foraging birds or night roosting birds don't get exposed to sudden changes in disturbance while they are using important habitats.

5. Lesser Sandhill Crane was not Adequately Addressed as a Covered Species

This subspecies is common in the Delta and is a California Bird Species of Special Concern (Shuford and Gardali 2008, FSL-34). I believe that the BDCP was remiss in not including this subspecies as a "*Covered Species*" and addressing its conservation needs in *Appendix 2A, Covered Species Accounts*. Other Bird Species of Special Concern (Suisun Song Sparrow, Tricolored Blackbird, Western Burrowing Owl, and Yellow-breasted Chat), and additionally, the White-tailed Kite were addressed in Appendix 2A. Additionally, this subspecies is also highly vulnerable to take from transmission line collisions and such take should be avoided. I suggest a model similar to the model described in BDCP *Appendix 5.J., Attachment 5.J.C* (FSL-30) should be derived for this subspecies to mitigate the impacts of take. Such a model would use similar parameters; however, the flight distances to foraging sites are about 2.5 miles longer, which means that such a model would extend to a much larger impact landscape.

6. Salinity effects on future Greater Sandhill Crane foraging habitat should have been considered

According to testimony presented in Part 1 of this proceeding, project diversions will cause reduced flows into the Delta, leading to increased salinity in irrigation water. Specifically, "by taking the flow from the north, less flow is available for salinity control from the point of diversion to the south, and less freshwater from the Sacramento River is drawn into the Delta in general. This allows the brackish water to radiate inward into the Delta, but also provides

less flushing within the Delta to remove accumulated salts from irrigation, wetlands and wildlife management. That accumulation works in concert with reduced outflow salinity control by the Sacramento River to increase salinity throughout the Delta." (Exhibit II-24; see also II-13 and LAND-78 [testimony detailing the effects of increased soil salinity on plant growth].) Increases in salinity would likely lead to reduced yield and extent of grain crops important to Greater Sandhill Crane foraging habitat in the Delta, further degrading their foraging landscape which is already stressed by continual reductions in grain crops in their Delta wintering region. These impacts to Greater Sandhill Crane foraging habitat were not assessed in the Bay Delta Conservation Plan, Chapter 12, or the Avoidance and Minimization Measures for the Greater Sandhill Crane, and are unmitigated impacts in the Petition.

CONCLUSION

In summary, in regards to the State Fully-Protected and Threatened Greater Sandhill Crane, I find that take of this subspecies from project implementation will occur, and since the petitioned project, Alternative 4A in the FEIR/S, is no longer a HCP/NCCP, such take would be illegal, unless the final project should only consider transmission line options that prevent take of the subspecies. Actions to reduce take at existing lines would not do anything to prevent unpermittable take of Greater Sandhill Cranes on the new lines required.

I also find the FEIR/S lacking in respect to Greater Sandhill Cranes as it failed to consider project disturbance effects which would result in additional take of the subspecies. It also failed to address the cumulative impacts contributing to habitat loss for this subspecies in the Delta, which will be compounded by the project, and to adequately address the project effects on salinity increases in Delta irrigation supplies which will indirectly contribute to foraging habitat loss as increased salinity will reduce the availability of crane forage crops such as corn and rice. Additionally, although the FEIR/S included other Species of Conservation Concern, it failed to address the Lesser Sandhill Crane which will be significantly impacted by take and habitat losses from the project.

In its current form, the petitioned project would result in unreasonable effect on both Greater and Lesser Sandhill Cranes and is contrary to the public's interest.

Executed on the 28th day of November, 2017, at Bend, Oregon.

Gary L. Ivey

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