FINAL MONITORING REPORT FOR THE CALIFORNIA LEAST TERN 2019 SEASON

PIER 400 NESTING SITE LOS ANGELES HARBOR
CITY OF LOS ANGELES, LOS ANGELES COUNTY, CALIFORNIA

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EXECUTIVE SUMMARY

Langdon Biological Consulting, LLC (LBC), under contract Agreement No. 18-3615 with Los Angeles Harbor Department (LAHD) Environmental Management Division (EMD), monitored the State and Federally Endangered California Least Tern (*Sternula antillarum browni*; [CLTE]); Federal Permit TE-839078-6, California Scientific Collector's Permit, SCP-1532) nesting site at Pier 400 in the Los Angeles Harbor during the 2019 breeding season.

Pre-season site-preparation activities began with early-February evaluation of the 15-acre nesting site to: determine the condition of the sand substrate, to estimate the extent of necessary repairs to the chick fencing and "No Fly Zone" signage, and other miscellaneous preparations. LBC attended the February 11 meeting with LAHD, EMD staff, LAHD Construction and Maintenance (C&M), CDFW; and USFWS via conference call. At this meeting the timeline and protocol for site preparation completion prior to the April 1 deadline was established.

Site preparation took place from March 6 – 27, 2019. LAHD C&M performed chick fence repairs, vegetation removal, site grading, and weed management on the Central Nesting Site (CNS) and Tern Management Area - West (TMA-W). The CNS was herbicide-treated in March 28.

Between April 13 and April 19, LBC monitors established a rectangular sampling grid on the CNS using cement roof-tiles at each node, and hazing devices ("scare-terns") were randomly placed on the CNS (in favored areas from previous years) to discourage roosting and nesting by Elegant Terns (ELTE).

Following the arrival of CLTE at the nesting site on April 24, LBC monitored the site three to six times per week. After CLTE nesting began on or about May 8, nest counts were performed twice per week (Wednesday and Saturday) until the culmination of the nesting season on August 3.

During the 2019 nesting season, 304 eggs were laid in 200 nests and 219 eggs were hatched by an estimated 161 nesting CLTE pairs. Individual CLTE were observed flying over the site or foraging adjacent to the site every day of the nesting season. Eighty-five total eggs were lost; 53 CLTE eggs were lost for multiple, non-predation causes; abandonment (37), burial by wind (five), damaged by unknown mechanisms (two), or were infertile (nine), while 32 CLTE eggs were predated (five by unknown predators, 14 by ELTE (trampling), four by Black Skimmer (BLSK, trampling), and nine were broken-open and eaten by corvids (American Crow (AMCR) or Common Raven (CORA)).

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INTRODUCTION

Langdon Biological Consulting, LLC (LBC), under contract Agreement No. 18-3615 (Agreement) with Los Angeles Harbor Department (LAHD) Environmental Management Division (EMD), monitored the State and Federally Endangered California Least Tern (*Sternula antillarum browni*; [CLTE]); Federal Permit TE-839078-6) nesting site at Pier 400 in the Los Angeles Harbor during the 2019 breeding season.

This report is organized topically and, where appropriate, chronologically, beginning with the pre-season activities and the nest monitoring discussion. The methods, data, site analyses, and comparison of trends at other sites for each topic are discussed comprehensively within each corresponding section.

1.1 SITE LOCATION AND DESCRIPTION

Construction commenced on the designated LAHD 15.7-acre CLTE nesting site (located on Pier 400 within Terminal Island) (Appendix A, Figure 1) in 1996 and is separated from a paved perimeter road south of the APM shipping-container terminal by a 10-foot high chain link fence topped with cantilevered barbed wire. The nesting site is nearly square in shape and 18 to 24 feet in elevation above sea level. The site is relatively flat, gently sloping to the east and south and is surrounded by a black plastic, ¼-inch mesh chick fencing approximately three feet in height. The nesting site substrate consists of fine to medium-coarse dry sand with shell particles dredged from the Los Angeles Harbor in 1997 and from later dredging of the Main Shipping Channel. The 10- acre area west of the nesting site is referred to as Tern Management Area - West (TMA-W).

1.2 BACKGROUND AND PURPOSE FOR THIS STUDY

The California Least Tern is listed as endangered by both the Federal and California Endangered Species Acts and has historically nested in the vicinity of the Port of Los Angeles. CLTE nesting within the Port of Los Angeles has been documented every year since 1973 (KBC, 2013; eGIS, 2015). In 1984 the LAHD first entered into a Memorandum of Agreement (MOA) with United States Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW) and United States Army Corps of Engineers (USACOE), which is renewed every three to five years. The MOA ensures that the LAHD provides 15 acres of suitable, protected nesting habitat for the CLTE and allows for the relocation of the nesting site under specified conditions (2011). CLTE have historically nested in various areas of the harbor, however since 1997, CLTE have nested only within the designated 15.7-acre site on Pier 400, which is part of a larger 582-acre peninsula, known as Terminal Island, in the Port of Los Angeles (Appendix A, Figure 1).

The objective for LBC CLTE management is to ensure that the nesting site produces the most fledglings possible. Site preparation, monitoring and management, and predator control can increase CLTE nesting success at the Pier 400 nesting site by gathering information on nests and breeding behavior and by implementing effective predator management with as little disturbance to CLTE as possible. Timely collection of nesting site information allows site managers to adapt site management methods in response to issues that face the colony in a given season.

1.3 SCOPE OF WORK

This report presents the results of the following general scope of work for managing and monitoring the nesting site, as described in Agreement 18-3615 between LBC, LLC and LAHD:

- Monitoring services for the CLTE colony within the LAHD's jurisdiction during the 2019-2021 breeding seasons;
- An annual breeding report documenting the findings of the Pier 400 monitoring program, and a comparison with other CLTE nest sites in Los Angeles and Orange Counties; LBC also provided weekly and monthly reports to EMD regarding the status of the nesting site;
- Predator management to increase the potential for CLTE success;
- Worker education programs for Pier 400 construction workers with close proximity to CLTE, as needed;
- Observations regarding nesting by other tern species;
- The scope and findings of studies performed by others at the nesting site; and
- Recommendations for site preparation for the 2019 breeding season.

2 PRE-SEASON SITE ACTIVITIES

The following section describes site preparations at the nesting site prior to CLTE arrival.

To provide the best nesting conditions and to promote nest initiation and colony productivity, the Pier 400 nesting site is evaluated semi-annually (February and September) to manage the vegetation, and annually to determine condition of the sand substrate, repair chick fencing, and establish a delineation grid for the upcoming season's nest-mapping and monitoring.

Preparation of the nesting site for the 2019 nesting season began with occasional site visits by LBC in January and February to; assess the type and density of vegetation on the site, determine the extent of repairs needed for the chick fence, ascertain the state of the "No Fly Zone" signage, check the condition of the silt-fence along the eastern access roadway (placed between the chick fence of the central nesting site and the riprap to prevent CLTE chicks from accessing the riprap), evaluate the need for litter removal, assess the site condition of the TMA-W, check for signs (scat or footprints) of predators in the area, and identify other necessary preparations.

On February 11, LBC met with LAHD EMD staff, Construction and Maintenance (C&M), CDFW, and USFW to establish a timeline and methods for preparation of the CNS and TMA-W. It was agreed upon that the 2018 site preparation methods had been effective and would be repeated for the 2019 site preparation. Site preparations began on March 6 and continued until March 27; details of site preparation are in the sections below.

Notification letters to 31 nearby airports, military bases, helicopter and flight schools, describing the nature of the restricted flight area over the breeding site were mailed in early April 2019. The 'No Fly Zone' signs – that were completely redesigned in 2018 and installed near their previous locations on the site, one near the southeast corner on the access road and the other facing west on the west-facing slope of the CNS – were still in-place.

The site preparations for CNS and TMA-W were completed by March 28.

2.1 EVALUATION AND PREPARATION OF NESTING SITE SURFACE

Nesting sites that are considered to be the most conducive to CLTE generally are those that are comprised of sand or sandy soil with low levels of native plant cover. Evaluation in February revealed that winds that can commonly reach 40 miles-per-hour caused displacement downwind of the sand over much of the site. By the end of the nesting season there were sand dunes advancing with the wind across the east access road and into the rip-rap and further into the east bay[1]. Monitors commented multiple times during the late season that while approaching the nesting site from Navy Way the CNS sand was being visibly blown into the east bay.

[1] *Monitors commented that while approaching the nesting site from Navy Way sand from the CNS was being blown into the east bay on windy days.*

After C&M had completed site preparations, which included dragging/raking much of the displaced sand back onto the CNS, the sand-depth was judged suitable for successful nesting in 2019.

Plant cover on the nesting site has often included several species of non-native, plants including sea rocket (*Cakile maritima*), Bermuda grass (*Cynodon dactylon*), horseweed (*Conyza canadensis*.), telegraph weed (*Heterotheca grandiflora*), sweet clover (*Melilotus indica*) and invasive exotic species such as Russian thistle (*Salsola ssp.*), and coastal sandbur (*Cenchrus incertus*). In order to help prevent regrowth during the critical hatching and fledgling periods and based on expert recommendation from CDFW and approval received from USFWS and CDFW, starting in 2012, LAHD has (beginning in 2012 and continuing each nesting season since) applied to the site an Imazapyr-based herbicide that contained both pre- and post-emergent components.

During the three weeks spanning March 6 – 27, and under LBC oversight, the LAHD team removed the vegetation from both the CNS and the TMA-W. The vegetation on the TMA-W was removed by a combination of hand-removal, mowing, and disking after which the TMA-W was treated with a glyphosate-based herbicide (*Roundup*). On the CNS, the Russian thistle was removed by front- loader and loaded into trucks, and then the entire site was dragged by a tractor with a rake. The raking redistributed the sand and collected the remaining low-lying vegetation. Unfortunately, the dragging and raking resulted in a very large number of chick-fence fragments and other debris of various sizes being distributed across the entire CNS.

On March 28, an Imazapyr-based herbicide (Arsenal with Rodeo) was applied to the CNS by a licensed herbicide applicator, Quality Sprayers, Inc. (QSI). By applying the herbicide within days of the vegetation removal, it was hoped that the herbicide would "seal" the top of the sand allowing the maximum time for absorption of the chemical into the seed bank and any remaining plant material. This method of applying the herbicide after removing the vegetation has produced the best results to date.

Even though a few Russian thistle plants grew on the CNS during the nesting season, the distribution was much less extensive than in previous years. During nest counts on Wednesdays and Saturdays LBC personnel hand-removed every Russian thistle seedling that was encountered. By the end of the nesting season no living Russian thistle plants were observed on the CNS.

LBC will visit the site in late October 2019 to evaluate the post-season condition of the CNS, the TMA-W, and the access roads in preparation for the 2020 nesting season.

2.1.1 What Was Learned Was Used: Substrate and Herbicide Application

As discussed in Section 2.1 of the Monitoring Report for the California Least Tern 2018 Season, the sand substrates at the POLA have presented a problem for herbicidal control of weeds (especially Russian thistle) since herbicides can migrate or percolate more quickly through the larger pore-spaces between sand grains than the pore-spaces between soil particles, likely resulting in dispersed/diluted herbicide at substrate depths too low to be effective against germinating weeds. Since 2011, the reduced depth of the sand substrate on the CNS after erosion from winter rains may lowered dilution rates (i.e., increased effectiveness) of herbicide.

In addition to the limiting factor of substrate, Russian thistle has several distinct ecological advantages over most other plants. One advantage is its ability to germinate well, even under moisture-limited conditions. Only a few hours of moisture at the right time promotes germination and rapid tap-root growth to locate deeper, subsurface moisture. Post-emergent herbicide effectiveness on Russian thistle is restricted to late-February to mid-March because of the narrow window during which the young seedling is susceptible to the herbicide, before its epidermis becomes hardened and resistant to the activity of surfactants.

Going forward, LBC will focus on preparing the CNS with time enough to be treated with a pre- and post-emergent herbicide cocktail after all of the vegetation has been removed from the TMA-W and CNS but before the germinating seedlings in the soil bank have reached their "hard" stage. In addition, LBC might find that avoidance of single-herbicide use or repeated use of herbicides that have the same mode of action might help to prevent the evolution of herbicide-resistant populations. LBC and the Harbor Department will continue to engage the agencies for new information and advice.

2.2 CHICK FENCE REPAIR

Between March 5-29, LAHD staff, under LBC guidance, repaired the chick fence that surrounds the CNS. Repair of the fence is required annually because the structure is damaged by high winds, sun, and mammals that attempt to gain entry to the site during the non-breeding season. In additional to natural deterioration, the site is often utilized by flight schools to conduct engine failure exercises. The high winds from the propellers may contribute to the sand redistribution and fence deterioration. LAHD replaced much of the east-side fence that had deteriorated and had been buried by sand build up. At several locations, the LAHD team used zip-tie fasteners to mend broken areas or openings. In other areas, new sections or patches of fencing were added to cover holes or span openings. The LAHD team also replaced broken wooden stakes or reinforced stakes in areas that were either undercut by the wind or collapsed from sand accumulation.

After the completion of the above-noted site activities, LBC determined that the nesting site was sufficiently prepared for nesting.

In late June or early July (dates to be determined), LAHD personnel returned to the CNS and made repairs to the chick fence that included patching new holes and reburying the bottom of the fence.

2.3 GRID ESTABLISHMENT

On January 27, LBC removed the grid markers from the CNS in preparation for the nesting season. Following fence repair and vegetation removal by LAHD, and herbicide application on March 28, between April 13 and 19 LBC repainted, re-stenciled and replaced grid markers throughout the nesting site to assist in nest mapping. These grid markers, (half-round roofing tiles that can also serve as chick shelters), were placed at the nodes of a rectangular grid approximately 100 feet on each side. The arrangement and approximate locations of these tiles can be seen on Figures 2, Appendix A.

2.4 WORKER EDUCATION PROGRAM (WEP)

During site preparation activities, LBC conducted a WEP training for LAHD workers who accessed the site. The training provided background regarding the nature and importance of the nesting site, the Endangered Species Act, the Migratory Bird Treaty Act (MBTA), specific nesting site work conditions and nesting site protections, and workers were given the opportunity to ask questions.

While not under LBC oversight, EMD staff conducted WEP for contractors performing site improvements for the APM Terminal automation upgrade project.

3 NESTING SITE MONITORING

Timely collection of nesting site information allows site managers to adapt management methods in response to predators or other issues that face the colony. The following sections describe the methods used to monitor the nest site and the results of the season's monitoring effort.

3.1 SITE MONITORING METHODS

Nesting site monitoring requires qualified biologists to regularly enter the colony to assess the condition of nests while keeping disturbance of nesting birds to a minimum. Biologists Spencer Langdon, Nick Liberato, and Bob Schallmann, were regular site monitors and were permitted to conduct the work under a 10 (a)(1)(A) Endangered Species Act USFWS permit (TE-839078-6). 2018 interns Eve Knezevich, Michelle Gonzalez, Matt Billinghurst, Amanda Martinez, and Kadi Erickson also participated in monitoring CLTE. Before on-site monitoring began, LBC held an off-site meeting with all participants to discuss monitoring methods, reporting and documentation requirements, schedules for each monitor, communication and notification procedures, use of on-site equipment, and site security. To minimize impacts to the nesting activities, the monitoring team entered the nesting site as infrequently as possible while still obtaining the necessary amount of data to achieve an understanding of the conditions within the colony that warranted attention.

LBC visited the nesting site in 2019 approximately five times in January and February, and more frequently in March while monitoring work by C&M. Following the arrival of CLTE at the nesting site in mid-April, LBC increased the monitoring frequency to three to six times per week. After CLTE nesting began in mid-May, LBC monitored the nesting site daily but did not yet walk through the nesting site. Instead, nest locations were first noted by observing CLTE incubating posture. When it was apparent that several nests were present, nest counts (discussed below) were initiated and continued twice per week (Wednesday and Saturday). LBC continued to monitor the nesting site for nests throughout the season while CLTE were present, ending the nesting season on August 16 after 6 days of monitoring with no observations of CLTE.

Prior to conducting nest counts, LBC monitors met on-site to review the known or suspected locations of nests, observe the behavior of the CLTE and other species at the site, and develop a survey strategy that would minimize disturbance to the CLTE colony. To perform nest counts, two or three monitors walked parallel transects through the nesting site to identify and count nests. When monitors observed a new, previously unmarked nest, the contents were noted and two tongue

depressors were placed perpendicular to one another and approximately one meter west of each CLTE nest (so that the nest number could be read from all directions). The monitors recorded the GPS location of each nest so they could be mapped and more easily relocated on subsequent visits.

While monitoring the site, biologists observed and recorded site data on project-specific field forms. (Samples of those field forms are provided in Appendices C & D.) The monitors recorded the contents of all marked nests, noting evidence of nest initiation, egg production, hatching, egg depredation, chick rearing, fledging, chick mortality, and/or abandonment. Raw data from the 2019 season are presented in Appendix E. Monitors also reported other bird species present at the nesting site (Appendix F), with a focus on potential predators. LBC also recorded information on incidences of human disturbances to the nesting site, other than those by LBC monitors and other researchers under LBC guidance.

Following field visits LBC biologists entered nest data from the nest log datasheets into a comprehensive spreadsheet. After compiling the data, mean clutch size, total nest numbers, hatch rates, and nest outcomes were tallied and summarized for weekly and monthly updates to the LAHD-EMD.

3.1.1 CLTE BANDING

No CLTE were banded in 2019.

3.2 MONITORING RESULTS AND ANALYSES

The findings and analyses of the monitoring results of the various stages of productivity are discussed in the following sections.

3.2.1 Arrival

Monitors first observed CLTE in the vicinity of the nesting site when three individuals were seen over the CNS on April 24.

3.2.2 Nest Initiation

The first CLTE nests of 2019 were detected on May 8. The last nests were discovered on July 17, resulting in a total of 200 nests being initiated by 161 breeding pairs containing a season total of 304 eggs. During the 2019 nesting season, which was ended on August 16 after six days of no CLTE sightings at the site, 219 chicks and approximately 97 fledglings were produced. Known nests were present on the site for 84 days (May 8 – July 31) and CLTE were present for 106 days.

3.2.3 Clutch Size

The average CLTE clutch size at the nesting site in 2019 was 1.5 eggs (304 eggs recorded for 200 nests). This clutch size is similar to the Pier 400 10-year average of 1.6 (Appendix B, Table 1). Statewide, clutch size has remained constant at an average 1.5 eggs per nest for the last 20 years (Lewison and Deutschmann 2014).

3.2.4 Egg Predation/Trampling

Of 304 eggs produced by CLTE's at this nest site for the 2019 season, nine eggs (3.0%), were predated by corvids, five (1.6%) were predated by unidentified (but likely non-CORA) predators. Trampling by ELTE and BLSK accounted for 18 egg failures (5.9% of total eggs; 14 by ELTE and four by BLSK) which means that ELTE were once again the single largest source of CLTE mortality this season after egg abandonment (See Section 4 below).

3.2.5 Egg Abandonment

Of the 304 eggs produced in 2019, abandonment accounted for only 37 egg failures (12.2% of total eggs).

3.2.6 Hatching & Chick Mortality

During the 2019 season, 219 of the 304 eggs hatched for a success rate of 72.0%. Of these 219 hatches, five chicks/fledglings (1.6%) are known to have been predated by Peregrine Falcon (PEFA) and 28 chicks/fledges (9.2%) were found dead of non-predatory causes. Known post-hatching mortality is then 33 (10.9% of total eggs), resulting in 186 potential fledglings.

3.2.7 Departure

The last egg hatched and the nest markers were pulled for the last abandoned nest (containing a total of two eggs) on July 31 (see Appendix A, Figures 3-6). One more nest survey was conducted on August 3 to make certain that no nests had gone undetected after which the LBC biologists removed the nest markers from the remaining nine nests and concluded (after five nests counts without detecting new nests) that nesting had ended for the 2019 season. The last nest to be detected was on July 17 and the last CLTE were observed at the site on August 8.

LBC monitors continued to visit the site for a few more days to confirm the departure of CLTEs, and the 2019 nesting season was closed on August 16, 2019.

3.2.8 Fledgling Productivity

The estimated number of fledglings to depart the site at the end of the breeding season measures the productivity of a CLTE colony.

LBC estimated that 123 fledglings were produced in the 2019 nesting season based on fledgling counts conducted between June 26 and July 31. We know that total fledglings cannot exceed 186 (due to known predation of 33 chicks/fledglings of the 219 eggs that hatched) and that there were at

least 123 fledglings (based on modified CDFW recommendation 3WD, Table 1 footnotes c, d, and e). The observed estimate of 123 fledglings is based on the average between the minimum observed number over the 2-week counting period (60) and the 219 hatches minus known mortality (33).

The Pier 400 nesting site had 200 of the total nests for the Los Angeles-Orange County region for 2019 (Appendix B, Table 2). The total number of fledglings reported from the seven nesting sites in the Los Angeles and Orange County region increased from 187 in 2015 to 202 in 2017 and to 206 in 2019 (LBC 2019; Appendix B, Table 2). Based on these numbers, 2019 must be considered a productive year for the CLTE colony at the Los Angeles Harbor CLTE nesting site, especially when compared to productivity for this site in recent years.

4 PREDATOR MANAGEMENT

Predation is a natural hazard for a species that is not at the top of the food chain. For consistency with previously CLTE annual reports for this nesting site, predation includes the direct and intentional act of a predator consuming an egg or chick and, (b) the indirect or unintentional impacts to CLTE such as the trampling of an egg by another bird species. Although a certain amount of predation is natural, the overall increase in CORA populations over time warrants active predator management to facilitate the recovery of CLTE. Under the LAHD's USFWS depredation permit, field biologist Spencer Langdon conducted as-needed predator management at the nesting site, prior to and during the CLTE nesting season.

The following summarizes the management of specific predators at the Pier 400 nest site in the 2019 season:

Common Raven (***Corvus corax***) –Nine (3.0%) of the 304 eggs produced this season were predated by CORA based on the presence of footprints surrounding the predated nests. CORA were occasionally observed in the vicinity of (and even adjacent to) the nest site during the nesting season, but the fact that this was the second time that LBC instituted uninterrupted, diurnal monitoring of the site for the 98 days between April 24 and July 31 was certainly a factor in denying these birds any predatory success. Another significant CORA-inhibiting factor might have been the removal in 2018 of the stacked containers that had been stored just north of the nest site for multiple years. It is thought that these containers provided excellent potential cover for CORA (and other predators), affording them the opportunity to approach very closely, monitor the site, and strategically plan their predatory raids. See any previous annual report for this site to determine the significance of these birds as CLTE egg and chick predators.

Peregrine falcon (*Falco peregrinus*) - PEFA were occasionally observed above or adjacent to the nest site. Visits ranged from perched surveillance, to fly-overs of the site, to active attempts at predation directed at chicks, fledglings, and adult CLTE. These birds were observed to be responsible for the predation of five chicks/fledglings (1.6% of the 2019 egg total) as well as four adults. In addition, it is highly likely that there was at least some undetected predation by these birds. Curiously, PEFA seemed to spend relatively little time targeting Caspian and Elegant terns nesting adjacent to the CNS this season. Several unsuccessful attempts to haze PEFA during daylight hours were made but dependable hazing

devices (pyrotechnic shells) were ineffective due to the considerable distance between predator control personnel and the PEFA.

American kestrel (*Falco sparverius*) – AMKE were not a predator of chicks, fledglings, or adult CLTE during the 2019 season. No predation was directly attributable to this species for 2019.

Feral Cats (*Felis catus*) - Tracks of feral cats were found on the nest site on numerous occasions during the 2019 season and live traps were deployed in each instance. One feral cat was trapped this season and transported to a no-kill shelter but predation was attributable to cats.

Black-crowned night heron (*Nycticorax nycticorax, BCNH*) - BCNH were documented as a significant predator of CLTE in previous years at Pier 400 (LBC 2014), however, none were observed during the 2019 season and there was no recorded CLTE predation.

Western Gull (*Larus occidentalis, WEGU)* - Western gulls were not as numerous on the CNS as they have been in previous seasons but we regularly observed five or more WEGU on the TMA-W predating on ELTE eggs that were laid but immediately abandoned. No CLTE egg predation was directly attributable to this species for 2019.

Heermann Gull (*Larus heermanni, HEEG)* - Heerman gulls were not common on the CNS this seasons but we regularly observed five or more HEEG on the TMA-W predating on ELTE eggs that were laid but immediately abandoned. No CLTE egg predation was directly attributable to this species for 2019.

Elegant terns (*Thalasseus elegans)* - The presence of ELTE at the nesting site is discussed further in Sections 4.1 and 5. ELTE were responsible for the trampling of 14 (3.0%) of the 304 eggs produced at the site for the 2019 season. Elegant terns were the single largest source of CLTE mortality for the 2019 season (other than the 28 chicks/fledglings that were found dead for unknown reasons). ELTE presence on the CNS was certainly also the cause of at least some of the CLTE nest abandonment, though it would be difficult to estimate the extent of this phenomenon.

The concerted efforts of the entire LBC team were required to discourage these birds from actually laying nests on the nest site as they had done in previous years. Since it is expected that ELTE will continue to return to the vicinity of Pier 400, LBC is prepared to continue in upcoming seasons with some of the successful hazing techniques (including nocturnal harassment of the significant numbers of night-congregating, non-nesting ELTE) used in 2016-2018.

Black Skimmer (*Ryncops niger)* – This is the first season where we observed instances of BLSK trampling CLTE eggs on the CNS; BLSK trampled and damaged four (1.3%) CLTE eggs in 2019.

Raccoon (*Procyon lotor)* – One adult raccoon was observed taking Caspian Tern (*Hydroprogne caspia,* CATE) eggs on the TMA-W. No CLTE egg predation was directly attributable to this species for 2019.

4.1 PREDATOR MANAGEMENT TECHNIQUES

Predator management activities were initiated prior to the arrival of the first CLTE, which occurred on April 24, 2019. Prior to the arrival of the CLTE, Caspian Terns (*Hydroprogne caspia,* CATE), ELTE, and a few Royal Terns (*Thalasseus maximus*, ROYT), collectively referred to as large terns, began roosting on the pavement outside of the CNS and a small number attempted to roost inside the CNS. Over the next few weeks the number of large terns continued to increase. In an attempt to prevent large terns from roosting or nesting in the CNS, and thus increasing the risk of trampling CLTE nests as in the preceding years, the monitors began to haze the roosting groups by walking "menacingly" toward the groups, sometimes requiring an hour or more to temporarily drive the ELTE from the CNS. Although hazing in this way was temporarily effective, it was very time consuming and would have required personnel to be present on the site during all hours of the day and even during the occasional night shift to haze night-roosting birds.

The effort to exclude the large terns from the CNS included using hand-held pen lasers combined with the physical presence of monitors near the flock. Fortunately, overnight ELTE hazing was not required for the 2019 season. Eventually the large terns abandoned their efforts to nest on the CNS, although nocturnal roosting by ELTE continued to be a problem for much of the later season. CATE, ROYT, and BLSK) nesting in the center of the TMA-W eventually extended their nesting activities up the slope to the extreme southwest corner of the CNS, but this caused no problems for the CLTE.

Going forward, LBC intends to continue the use of the techniques described above (with advice and consent of USFWS) in an effort to prevent roosting or nesting on the CNS by large terns.

4.2 PREDATOR MANAGEMENT OUTCOME AND DISCUSSION

Once nesting by CLTE began, field biologists recorded predator observations during monitoring events. If observers determined the predator to be a threat to the CLTE, predator managers hazed or trapped potential predators.

During 2019, 14 eggs (3.0% of the egg total) were lost to ELTE trampling (Appendix B, Table 1). This was the third-most significant source of all the CLTE mortality this season after abandonment and mortality by "unknown causes". Predation by CORA was the fourth-most significant source of CLTE mortality (after ELTE trampling and nest abandonment), accounting for 10 chicks/fledglings (3.3% of the egg total). Predation by PEFA accounted for four adults and five chicks/fledglings (1.6% of the egg total). Although cats were observed directly and tracks were occasionally found, only one cat was trapped and transported to a no-kill shelter this season.

ELTE continue to be our biggest problem, with PEFA also being troublesome. We must continue to exert our best efforts to minimize the impact of these birds' impact. Further, though they were nominally successful again this year at predating eggs, and although we think that full daylight presence of monitors is an expensive but useful tool in our "battle" with the CORA, we expect to

have to expend a great deal of time, energy, and personnel-power on CORA resistance in the upcoming seasons.

5 NESTING BY OTHER SPECIES

In 2019, at least 100 CATE, 20 ROYT, and 20 BLSK established nests adjacent to the nesting site. The continued presence of ELTE at the Pier 400 site might be related to the persistent failure of their traditional nesting site on Rasa Island in the Gulf of California where 200,000 to 300,000 ELTE typically nest. None nested on Rasa Island in 2014, 2015, or 2016; apparently preferring the Pier 400 site as well as other locations in Southern California (personal communications Dr. Michael Horn and Dr. Charles Collins). The lack of nesting ELTE in 2019 at the CNS represents a decrease from 2018 (which was also a large decline from the 2015 and 2016 nesting seasons). Though ELTE did not nest on either the CNS or the on the TMA-W, nocturnal roosting (but non-nesting) caused some trampling of the CNS even though no ELTE nests were lain down on the CNS. This is likely due in part to the exclusion methods and tactics used by LBC personnel throughout the nesting season (section 4.1).

6 COMPARISON OF 2019 RESULTS WITH PREVIOUS YEARS

The number of nest initiations observed in 2019 (200) is a 50% increase compared to the nest count for 2018 (133) and 2017 (five) and is more or less on a par with 2012 and 2013 (at 211 and 254, respectively). The nest counts from 2019 and the 13 most recent seasons are presented in Appendix B, Table 1. The maximum number of CLTE observed at any time during 2019 was well over 100 (on May 23). An average of about 40-50 CLTE were observed over the CNS on any given day for most of the season and approximately 161 nesting pairs were present during the 2019 nesting season.

Nest monitoring from 1973 to 1996 prior to the development of the Pier 400 nesting site revealed that CLTE in the Port of Los Angeles did not exceed 134 nest initiations per season, averaging approximately 48 nests (Appendix B, Table 4). After the construction of the Pier 400 nesting site in 1996, nest initiations from 1997 to 2016 averaged 452 per season (Appendix B, Table 4). Previous biologists/observers attributed the increase to local conditions, such as improved environmental conditions and the recruitment of CLTE from other regional sites. This increase could also be attributed to improved state-wide population conditions, which also showed an overall increase in the population of CLTE (Keane 2013), even during the largest channel deepening dredge project to take place at the Harbor.

Statewide, the population of CLTE has increased since 1997, which is thought to be primarily due to improved predator control, improved prey base, as well as the addition of nesting sites over time. Although there has been an overall net increase in the CLTE nest initiations at the Pier 400 site since 1997, there was a decline at the rate of 200 nests per season at the site for six years consecutively between 2005 and 2011, when there were only 10 nests, with a modest recovery from 2012 to 2016 (average of 168 nests; Appendix B, Table 4). The overall statewide population peaked in 2011 at approximately 7100 breeding pairs and has declined in the following three years to approximately 5350 pairs in 2014. In the years since 2011, nest initiations at the Pier 400 site have rebounded

modestly – 2017 notwithstanding, while statewide- recorded nest initiations have declined. A long-term analysis of state-wide CLTE data indicated the number of breeding pairs and nests declined significantly across the state since 2007 (Lewison and Deutschmann 2014), a period when Pier 400 has also shown an overall decline in the number of nests.

7 OTHER STUDIES

The Pier 400 CLTE nesting colony has been of interest to academics as well as local scientists, because these researchers seek to better understand the biology and ecology of both CLTE and other nesting species.

On May 13 and again on August 13, (after all nesting had completed), Dr. Mike Horn from the Biology Department at California State University, Fullerton, inquired via email (as he had inquired over last several years) to determine the number and distribution of the ELTE that had been nesting at the CNS. Dr. Horn was advised that no ELTE had nested in 2019 on the CNS or on the TMA-W.

8 RECOMMENDATIONS FOR 2020

The following recommendations for the 2020 nesting season are provided in the interest of ensuring the best conditions for CLTE productivity:

- **Predator Management –** LBC was successful at continuing nocturnal monitoring in 2019 to discourage night-roosting of thousands of ELTE and to keep tabs on nocturnal predators. Continuous daytime personnel presence was also initiated this season in an effort to deter diurnal predators (especially CORA). This strategy seemed to be 100 percent successful for CORA, though not so effective for AMKE and PEFA. Thus, predator management should place primary emphasis on deterring daytime predators while continuing to monitor for nocturnal predators. Cats and night herons are potentially significant predators that are difficult to detect. Making careful observations at night as well as scanning areas adjacent to the site for predator tracks can make sure impacts to CLTE are limited.
    - LBC will continue development of its CORA management plan and implement further enhancements to this plan prior to the 2019 nesting season. An enhanced CORA management plan will likely include installation of cameras to monitor CORA activity even while monitors are not on site, installation of blinds within the CNS to allow personnel to be present and undetectable when CORA visit the site, decoys and bait-stations, artificial call lures, and any other method that can be tried to prevent CORA from predating CLTE. We are also considering the implementation of a drone deterrent protocol for use with both CORA and ELTE.
- **Elegant Tern Management –** Continue to implement stringent exclusion methods and tactics by LBC personnel prior to and in the early part of the CLTE nesting season by placing scare-terns, coyote and great-horned owl decoys, scare-tape stakes, and physical harassment, and nocturnal laser-hazing.

- If the above methods fail to exclude the ELTE, POLA personnel should install silt fencing between elegant/Caspian tern nesting areas and CLTE nesting areas to protect CLTEs from disturbance and trampling by large terns and their crèches of chicks. The precise location of the ELTE can vary greatly so it is important that the biologists work closely with LAHD personnel to assess how much fencing is required, when and where it should be installed.

- **Site Preparation –** LBC recommends incorporating the following site preparation activities into the 2019 site management tasks: The site will require re-grading and chick fence repair, as well as a signage upgrade on the outer fences.

  - **Site grading –** Re-grade the nesting site as necessary to redistribute sand buildup along the perimeter fence. LBC collected sand depths at more than 100 locations within the CNS and estimates an average sand depth of 7.6 inches. Alternatively, the site might need a layer of new sand, as was required in 2011 (the first time since the site was constructed in 1996), when approximately 20,000 cubic yards of new sand was imported to the nesting site resulting in a 10- to 12-inch depth for the entire nesting surface.

  - **Chick fence repair –** Examine and repair as necessary the chain-link fence and chick fence separating the nesting site from the container terminal. The chick fence should be a minimum of 18 inches above ground and six inches below ground.

  - **Signage –** Replace the USFWS "Least Tern Nesting Area" signs as needed along the above-described chain-link fence by March 31. Signs should be laminated to maximize weather-resistance. Signs in Spanish should also be posted. Signs should be placed from the eastern to the western end of the fence, each separated by a maximum of 50 feet. The severely deteriorated "NO HELICOPTER" signs were finally replaced in 2018 with new ones that read "NO FLY ZONE". These, however, are still relatively small and may not be legible to aircraft flying over the site. As there are numerous instances of low-flying aircraft over the site during every season, we suggest either producing new signs with 6-foot lettering or the painting of the pavement north of the CNS and TMA-W with the following notice:

    ← ← NO FLY ZONE APRIL – JULY FROM HERE SOUTH TO WATER → →

  - **Grid markers** – Continue to provide roof tiles for use as grid markers and chick shelters. Broken tile markers will be replaced in 2020.

  - **Herbicide application** – An Imazapyr-based herbicide with both pre- and post-emergent components was used in 2019 and allowed to remain on the site for the longest possible pre-emergent action. Removing vegetation from the site prior to the application of the herbicide seems to have reduced the percent cover of vegetation in the 2016 and 2019 nesting seasons compared to previous years. Similar treatment is recommended for 2019. However, due to the possibility of producing a resistant strain of Russian thistle, it is possible that cycling the type of herbicide at some interval may be beneficial.

- **TMA-W weed management** – Hand-removal and mechanically dragging the site to remove invasive vegetation was successful for 2019, as it was in previous years, and is recommended again for 2020. Application of post-emergent herbicide on vegetation in the TMA-W following mowing should also be performed again to minimize the spread of weed

seeds from prevailing westerly winds into the nesting site. The dead vegetation should be left on the site to maximize the effectiveness of the herbicide, reduce sand transport from exposed areas of soil, reduce the potential of dispersing seed, and discourage nesting in the TMA-W.

- **Hazing of other tern species** – Implement hazing techniques prior to CLTE arrival to better reserve the nesting site for CLTE. See Section 4.1 – Predator Management Techniques, for more detail. Going forward, LBC intends to continue the use of these or similar devices to prevent roosting or nesting by large terns.
- **WEP Programs –** Re-implement education programs for new Pier 400 construction workers and all persons with access to the portion of Pier 400 south of the terminal.
- **Refuse management –** Continue to encourage container terminal operators to initiate and continue a trash pickup program for Pier 400, particularly for areas within 500 feet of the nesting site, to minimize the occurrence of potential predators such as gulls, American crows (*Corvus brachyrhynchos, AMCR*) and CORA near the nesting site. Perhaps we can also initiate periodic passes of a street sweeper along the north road to minimize tire puncture risks to vehicles traveling there. Multiple flat tires have been experienced by LBC biologists in recent seasons.
- **Prey base assessment –** Going forward LBC staff will commit to regularly contact local bait companies as a way of incorporating regional prey-base information into our knowledge base. LBC was not successful with this item in 2019. LBC was not able to establish regular, reliable contact with a known bait boat operator in 2019, largely because the bait-boat company that most frequently harvests in the bay east of the CNS was sold by the long-term owner/Captain and we do not yet have a relationship with the new owner/Captain. Of course, annual foraging surveys would be the best way of ascertaining the prey base for any given year.
- **Human disturbance –** Future monitoring efforts will document instances of aircraft and watercraft presence in the vicinity of the CNS. LBC was successful with implementation of this protocol in 2019 and documented a few occurrences of human disturbance, mostly by jet-skis in the afternoons and early evening in mid-summer. LBC thinks that some of the behavior by jet-ski operators, those making high speed passes very near the kelp beds in the east foraging areas, presents a threat to foraging CLTE. Personal fishing boats and sightseeing boats were also regularly present but presented no threat to foraging CLTE. Perhaps a series of buoys can be deployed delineating the edge of the kelp beds as off limits to all watercraft for nesting seasons going forward.

9 REFERENCES

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APPENDIX A

Figures

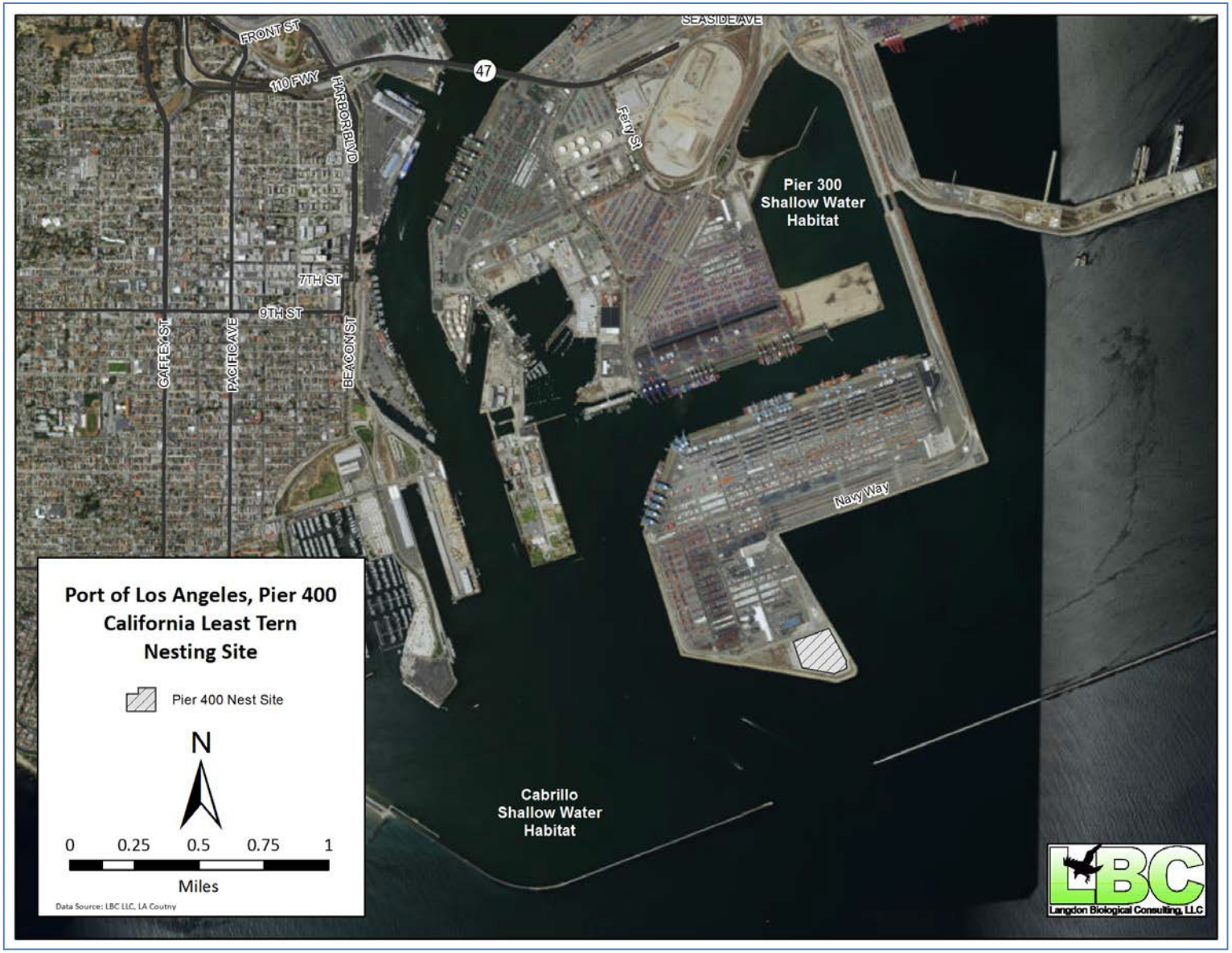

Figure 1: Port of Los Angeles, Pier 400 California Least Tern Nesting Site Location, 2019

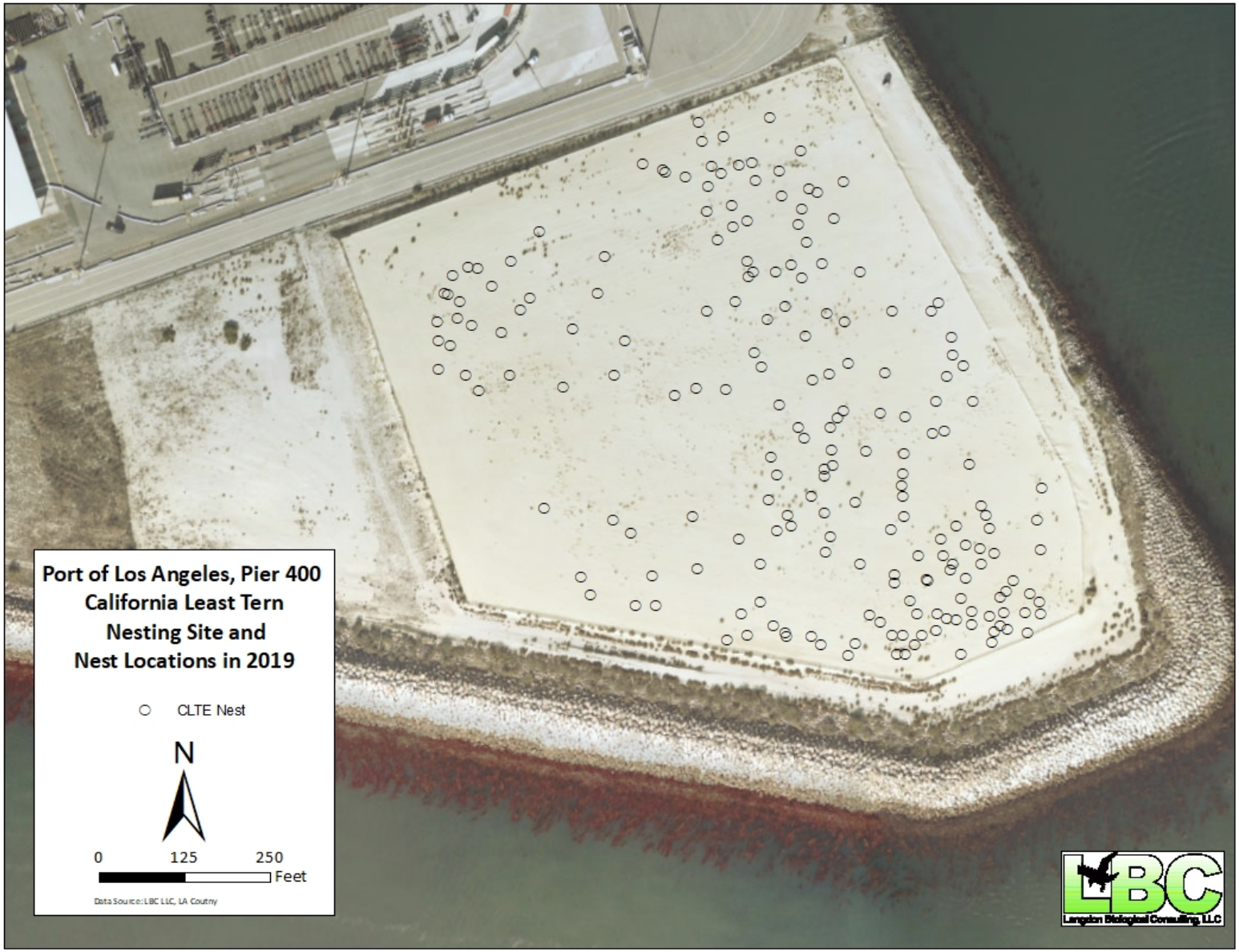

Figure 2: Port of Los Angeles, Pier 400 California Least Tern Nest Locations, 2019

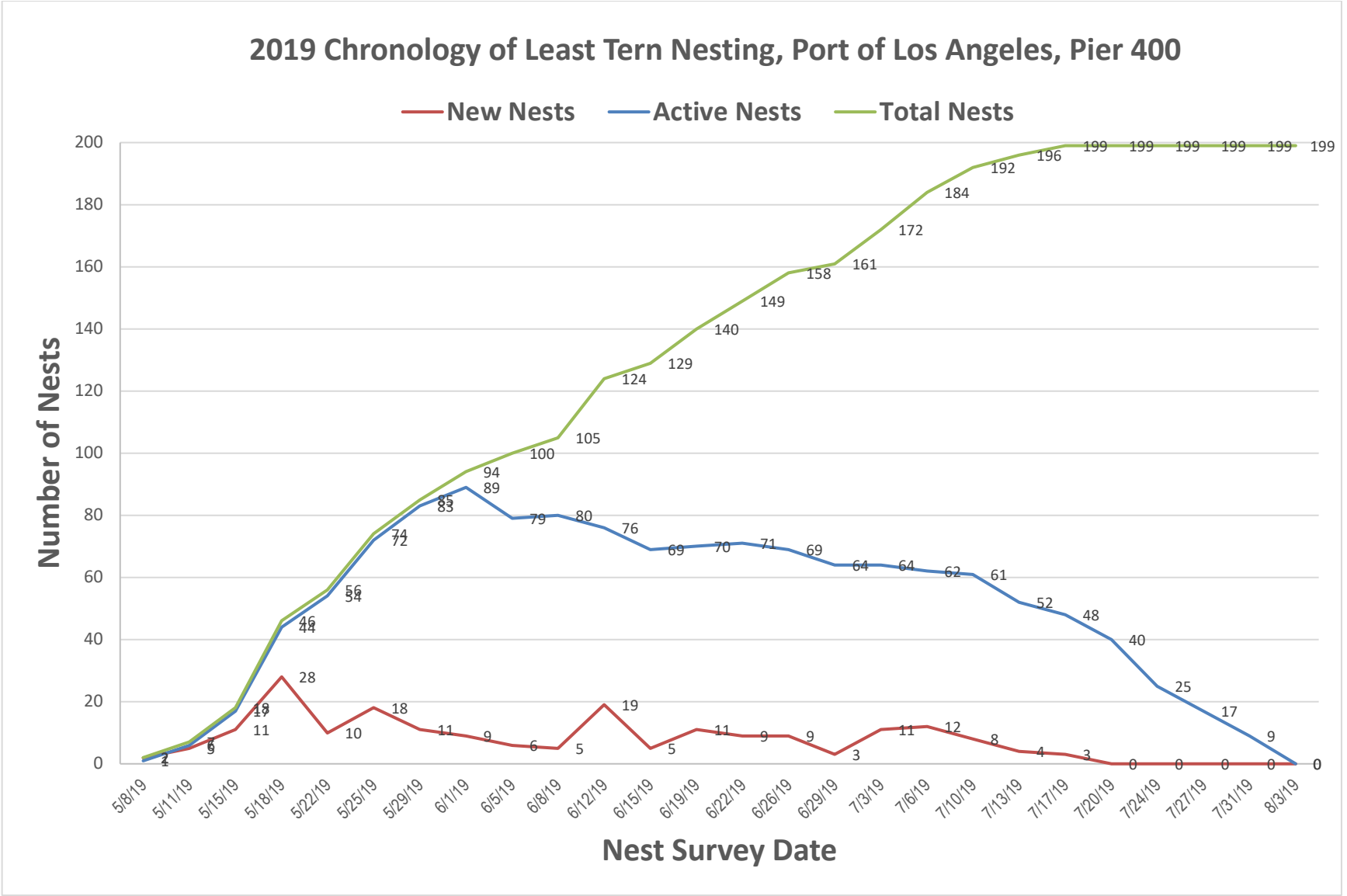

Figure 3: 2019 Chronology of Least Tern Nesting, Port of Los Angeles, Pier 400

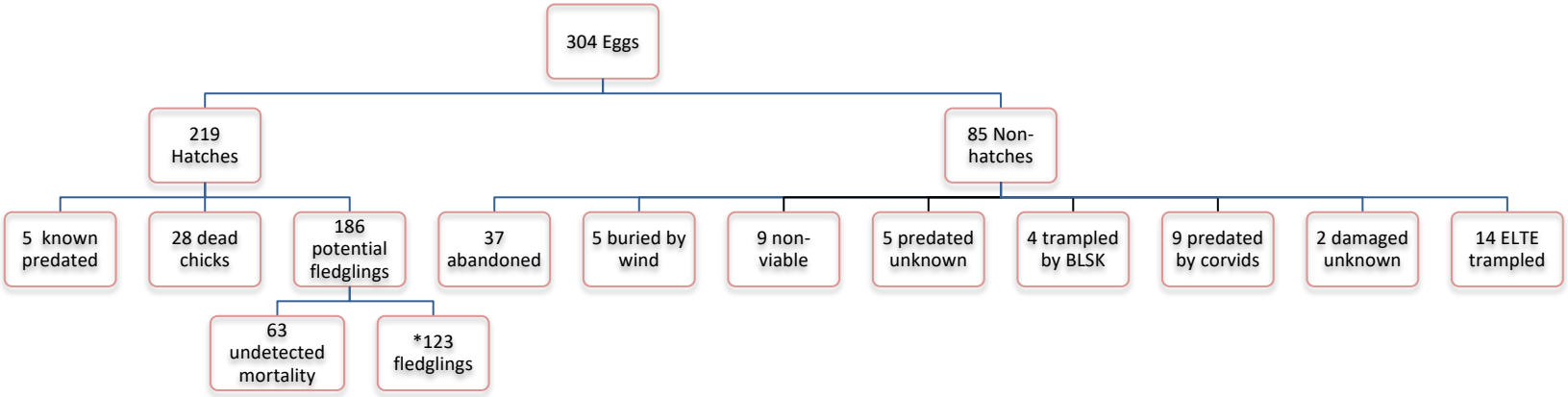

Figure 4: Flowchart of 2019 Nesting Season Results. Note: Fledgling estimate is USFWS method modified 3WD and subject to adjustment

APPENDIX B

TABLES

Table 1: Least Tern 2019 Breeding Statistics for Pier 400, with Comparisons to 2005 – 2018

Statistic	Average 2005-2019	% Change from 2018	2019	2018	2017	2016	2015[a]	2014[a]	2013[a]	2012[a]	2011[a]	2010[a]	2009[a]	2008[a]	2007a	2006[a]	2005[a]
Total Nests	354.5	49.6	200	133	5	141	110	126	254	211	10	216	435	529	710	907	1332
Re-nesting Terns[b]	32.0	5.6	38	36	0	15	0	14	17	8	2	52	64	43	41	72	78
Total Nesting Pairs[b]	323.2	66.0	161	97	0	126	110	93	245	203	8	190	371	486	669	835	1254
Total Eggs	590.8	32.2	304	230	9	209	178	205	392	358	16	345	685	891	1135	1494	2411
Mean Clutch Size (average eggs per nest)	1.63	-11.76	1.5	1.70	1.80	1.50	1.62	1.63	1.50	1.70	1.60	1.60	1.57	1.64	1.60	1.65	1.81
Number of Eggs Hatched	404.1	47.0	219	149	0	103	13	143	274	268	5	49	302	582	742	1031	2182
Hatching Success (eggs hatched of total eggs)	0.53	11.17	0.7	0.65	0.00	0.49	0.07	0.70	0.70	0.75	0.31	0.14	0.44	0.65	0.65	0.69	0.91
Eggs Lost to Predators/Trampling	37.3	44.44	39	27	9	18	143	20	22	13	0	138	55	33	8	29	6
Percent of Total Eggs Lost to Predators/Trampling	0.19	9.65	0.1	0.12	1.00	0.09	0.80	0.10	0.06	0.04	0.00	0.40	0.08	0.04	0.01	0.02	0.00
Eggs Abandoned and/or Infertile	148.5	-14.81	46	54	0	88	20	42	96	77	11	158	328	276	385	434	213
Percent of Total Eggs Abandoned/Infertile	0.28	-35.61	0.2	0.24	0.00	0.42	0.11	0.21	0.25	0.22	0.69	0.46	0.48	0.31	0.34	0.29	0.09
Known Mortality (dead & depredated chicks)	143.5	0.00	33	33	0	14	13	31	127	86	5	6	126	172	349	260	898
Percent Mortality (% of total chicks hatched)	0.37	-31.82	0.2	0.22	0.00	0.14	1.00	0.22	0.46	0.32	1.00	0.12	0.42	0.30	0.47	0.25	0.41
Minimum Fledglings[c]	145.6	172.73	60	22	0	46	0	16	31	35	0	4	75	201	186	641	867
Maximum Fledglings	91.5	60.34	186	116	0	89	0	112	147	82							
Final Fledglings[e]	58.8	78.26	123	69	0	66	0	64	89	59							
Fledglings per Nest	0.26	286.31	0.62	0.16	0.00	0.47	0.00	0.13	0.12	0.17	0.00	0.02	0.17	0.38	0.26	0.71	0.65
Fledglings per Hatched Egg (chick survival[d])	0.24	274.43	0.56	0.15	0.00	0.64	0.00	0.11	0.11	0.13	0.00	0.08	0.25	0.34	0.25	0.62	0.40
Fledglings per Pair (minimum)	0.28	232.16	0.76	0.23	0.00	0.36	0.00	0.17	0.13	0.17	0.00	0.02	0.20	0.41	0.28	0.77	0.69

a. Historical data from LBC, 2016, 2017, 2018; eGIS 2015, and KBC 2013

b. The estimated number of pairs is the total number of nests, minus the estimated number of nests initiated by re-nesting pairs (from the same or other sites).

c. The minimum fledgling estimate is based upon one of the four methods recommended by CDFW: Method 3WD; Beginning two weeks after the first fledgling observation, the number of fledglings at the end of each 2-week period. However, this method likely results in an underestimate, since fledglings may be away from the nesting site learning to forage with parents. In addition, persistent predator presence, whether observed or not, can result in early departure from the nesting site by adults and fledglings. Thus, an alternative method was also used to estimate fledglings; see note "d" and "e", below.

d. LBC calculated the maximum number of chicks that could have survived to fledging (total eggs hatched, minus the number of dead and depredated chicks/fledglings), as the Maximum Fledglings Estimated. The Minimum Fledglings Estimated was simply the sum of the maximum number of fledges observed during a 2-week observation period as in note "c", above.

e. The average value between the minimum and maximum estimates was used as a final estimate of productivity.

Table 2: Summary of Least Tern Nesting and Productivity, L.A. and Orange Counties, 2019

Nesting Site	Total Nests	% Total Nests[a]	Mean (est.) Fledglings[b]	% Total Fledglings[a]	Mean (est.) Fledglings per Nest[b]
Pier 400	200	4.5%	59	7.0%	0.62
Venice Beach	6	0.1%	0	0.0%	0.00
Seal Beach Wildlife Refuge	54	1.2%	0	0.0%	0.00
Bolsa Chica	134	3.0%	45	5.3%	0.43
Huntington Beach	531	11.9%	96	11.3%	0.20
Anaheim Lake	0	0.0%	0	0.0%	0.00
Burris Sand Pit	17	0.4%	2	0.2%	0.13
Upper Newport Bay	20	0.4%	4	0.5%	0.20
Regional Totals	962	21.5%	206	24.3%	0.20
Totals for State	4479		846		0.23

[a] Percent of the total for all Los Angeles and Orange County CLTE nesting sites
[b] Mean for all Los Angeles and Orange County CLTE nesting sites

Table 3: Summary of Least Tern Nesting and Productivity at Los Angeles Harbor Nesting Sites, 1973 to 2019

Year	Pairs[a]	% Statewide Pairs[b]	Nests	Fledglings	Fledglings per Pair	Fledglings per Nest	% Statewide Fledglings[b]
1973-1980 (avg)	31	4.6%	31	27.5	0.4	0.4	unknown
1981	46	4.7%	43	7	0.2	0.2	0.8%
1982	70	6.8%	70	14	0.2	0.2	2.7%
1983	91	8.9%	91	70	0.8	0.8	7.8%
1984	133	13.8%	134	105	0.8	0.8	20.3%
1985	99	9.7%	99	65	0.7	0.7	9.9%
1986	104	10.8%	104	78	0.8	0.8	8.8%
1987	40	4.3%	50	5	0.1	0.1	0.9%
1988	5	0.4%	2	0	0.0	0.0	0.0%
1989	19	1.5%	20	6	0.3	0.3	0.8%
1990	32	1.9%	41	12	0.4	0.3	0.7%
1991	2	0.1%	2	0	0.0	0.0	0.0%
1992	0	0.0%	0	0	0.0	0.0	0.0%
1993	10	0.4%	10	8	0.8	0.8	0.4%
1994	31	1.1%	37	3	0.1	0.1	0.1%
1995	15	0.6%	16	9	0.6	0.6	1.0%
1996	56	1.8%	68	48	0.9	0.7	2.8%
1997	80	2.0%	105	105	1.3	1.0	4.2%
1998	172	4.2%	218	148	0.9	0.7	6.4%
1999	235	6.5%	367	165	0.7	0.5	23.8%
2000	437	9.5%	565	551	1.3	1.0	14.4%
2001	404	8.4%	459	228	0.6	0.5	10.0%
2002	287	8.0%	320	34	0.1	0.1	6.1%
2003	894	13.0%	963	659	0.7	0.7	25.0%
2004	951	14.8%	1071	556	0.6	0.5	37.4%
2005	1254	17.4%	1332	867	0.7	0.7	45.0%
2006	835	11.9%	907	641	0.8	0.7	20.1%
2007	669	9.8%	710	186	0.3	0.3	8.0%
2008	486	6.7%	529	210	0.4	0.4	8.8%
2009	371	5.2%	435	75	0.2	0.2	3.9%
2010	190	3.0%	216	4	0.0	0.0	0.2%
2011	8	0.15%	10	0	0.0	0.0	0.0%
2012	203	3.8%	211	35	0.2	0.2	9.0%
2013	245	4.4%	254	31	0.1	0.1	2.2%
2014	93	1.7%	126	16	0.6	0.1	3.9%
2015	110	2.4%	110	0	0.0	0.0	0.0%
2016	126	2.9%	141	66	0.5	0.5	3.6%
2017	5	0.3%	5	0	0	0	0.0%
2018	97	2.4%	133	69	0.7	0.2	7.6%
2019	161	4.1%	200	123	0.8	0.6	14.5%

[a] Values are approximate numbers of CLTE pairs nesting at one or more nest sites in the Los Angeles Harbor. This number does not include pairs likely re-nesting (nesting for a second or third time in the same year after nest failure at the same or another nesting site). The number of nesting pairs is less accurate than the number of nests but is used to estimate the statewide population, since many nests are probable re-nests during years of high losses to predators or other nest failures.

[b] Percentages are derived from averages of ranges presented in annual reports prepared for the California Department of Fish and Wildlife. Pier 400 is among the approximately 48 sites statewide.

APPENDIX C

BLANK CALIFORNIA LEAST TERN NEST COUNT DATA FORM

POLA Police Operator #/Name _____

PORT OF LOS ANGELES PIER 400
NEST MONITORING DATA FORM

Date _____ **Time Begin** _____

Observers _____ **Time End** _____

Location (circle): Nesting Site TMAW Other _____

Observations of Potential Predators _____

_____

_____

_____

_____

Human Disturbances:

_____

Notes on Other Terns:

_____

Nest Num	Grid	Num. E & C	Notes	Nest Num	Grid	Num. E & C	Notes	Nest Num	Grid	Num. E & C	Notes	Nest Num	Grid	Num. E & C	Notes
1				26				51				76			
2				27				52				77			
3				28				53				78			
4				29				54				79			
5				30				55				80			
6				31				56				81			
7				32				57				82			
8				33				58				83			
9				34				59				84			
10				35				60				85			
11				36				61				86			
12				37				62				87			
13				38				63				88			
14				39				64				89			
15				40				65				90			
16				41				66				91			
17				42				67				92			
18				43				68				93			
19				44				69				94			
20				45				70				95			
21				46				71				96			
22				47				72				97			
23				48				73				98			
24				49				74				99			
25				50				75				100			

E=egg C=chick (enter number for each) PH=probable hatch UNK=unknown P=lost to predator (record likely predator in notes; D=damaged; F=flooded; A=abandoned; pull=nest marker pulled

APPENDIX D

BLANK CALIFORNIA LEAST TERN FIELD DATA FORM

POLA PD Operator _____ Total CLTE Observed Adults _____ Fledges _____

Langdon Biological Consulting, LLC
Port of Los Angeles Least Tern Monitoring Study
Field Notes

Date _____ Observer(s) _____ Time Begin _____ Time End_____

Total Hours Worked _____

Locations monitored: Pier 400 Nesting Site, TMAW, Asphalt, North Road

Weather: Temp_____ Wind speed _____ Wind direction_____ Other_____

Potential predators (write predator name in CAPS at beginning of line then describe observation):

_____
_____
_____
_____
_____
_____
_____

Other Observations: # Big Terns _____ Where? _____

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Bird Species Observed (use AOU codes)

POLA-field-data-sheet-2018.docx

APPENDIX E

CALIFORNIA LEAST TERN NEST DATA
LOS ANGELES HARBOR 2019

CALIFORNIA LEAST TERN NEST DATA, LOS ANGELES HARBOR, 2019

(A = abandoned; C=chick; D=damaged; DC=dead chick; PH = probable hatch; P=lost to predator or trampled; NV=non-viable)

Nest #	Egg 1 Found	Egg 1 Fate	Egg 1 Fate Date	Egg 2 Found	Egg 2 Fate	Egg 2 Fate Date
1	5/8/19	C	6/1/19	5/11/19	C	6/1/19
2	5/8/19	P	5/8/19			
3	5/11/19	C	6/1/19	5/11/19	C	6/1/19
4	5/11/19	C	6/5/19	5/15/19	C	6/5/19
5	5/11/19	PH	6/5/19	5/15/19	PH	6/5/19
6	5/11/19	PH	6/5/19	5/15/19	PH	6/5/19
7	5/11/19	C	6/5/19			
8	5/15/19	C	6/5/19	5/15/19	C	6/5/19
9	5/15/19	C	6/8/19	5/18/19	A	6/22/19
10	5/15/19	C	6/8/19	5/18/19	PH	6/8/19
11	5/15/19	P	6/8/19	5/15/19	P	6/8/19
12	5/15/19	C	6/5/19			
13	5/15/19	PH	6/5/19	5/18/19	PH	6/5/19
14	5/15/19	P	5/18/19			
15	5/15/19	C	6/8/19	5/18/19	C	6/8/19
16	5/15/19	A	6/19/19	5/15/19	A	6/19/19
17	5/15/19	C	6/8/19	5/18/19	C	6/8/19
18	5/15/19	PH	6/5/19	5/15/19	C	6/5/19
19	5/18/19	C	6/8/19	5/18/19	C	6/8/19
20	5/18/19	C	6/8/19	5/18/19	C	6/8/19
21	5/18/19	C	6/5/19	5/18/19	C	6/5/19
22	5/18/19	C	6/5/19	5/18/19	C	6/5/19
23	5/18/19	C	6/8/19	5/18/19	C	6/8/19
24	5/18/19	PH	6/5/19	5/18/19	PH	6/5/19
25	5/18/19	C	6/8/19	5/18/19	C	6/8/19
26	5/18/19	PH	6/8/19	5/18/19	C	6/8/19
27	5/18/19	C	6/8/19	5/18/19	C	6/8/19
28	5/18/19	C	6/8/19	5/18/19	C	6/8/19
29	5/18/19	C	6/8/19	5/18/19	C	6/8/19
30	5/18/19	PH	6/12/19			
31	5/18/19	C	6/8/19	5/22/19	PH	6/12/19
32	5/18/19	C	6/12/19	5/22/19	C	6/12/19
33	5/18/19	B	5/18/19			
34	5/18/19	C	6/12/19	5/22/19	C	6/12/19
35	5/18/19	PH	6/12/19	5/18/19	PH	6/12/19
36	5/18/19	A	6/29/19			
37	5/18/19	C	6/8/19	5/18/19	PH	6/12/19
38	5/18/19	C	6/12/19			

Nest #	Egg 1 Found	Egg 1 Fate	Egg 1 Fate Date	Egg 2 Found	Egg 2 Fate	Egg 2 Fate Date
39	5/18/19	DC	6/12/19	5/22/19	C	6/12/19
40	5/18/19	C	6/12/19	5/18/19	C	6/12/19
41	5/18/19	NV	6/29/19			
42	5/18/19	NV	6/29/19	5/18/19	NV	6/29/19
43	5/18/19	C	6/5/19			
44	5/18/19	B	5/18/19			
45	5/18/19	PH	6/12/19			
46	5/18/19	PH	6/5/19	5/18/19	PH	6/12/19
47	5/22/19	PH	6/12/19			
48	5/22/19	A	6/8/19			
49	5/22/19	C	6/8/19	5/22/19	C	6/8/19
50	5/22/19	PH	6/5/19	5/22/19	PH	6/5/19
51	5/22/19	P	6/1/19	5/22/19	P	6/1/19
52	5/22/19	PH	6/12/19	5/22/19	PH	6/12/19
53	5/22/19	C	6/15/19	5/22/19	C	6/15/19
54	5/22/19	P	6/5/19	5/22/19	D	6/22/19
55	5/22/19	PH	6/5/19	5/22/19	PH	6/5/19
56	5/22/19	P	6/19/19			
57	5/25/19	PH	6/12/19	5/25/19	PH	6/12/19
58	5/25/19	C	6/12/19	5/25/19	C	6/12/19
59	5/25/19	C	6/8/19	5/25/19	C	6/12/19
60	5/25/19	NV	7/6/19			
61	5/25/19	C	6/15/19			
62	5/25/19	C	6/12/19			
63	5/25/19	PH	6/12/19	5/25/19	C	6/12/19
64	5/25/19	PH	6/12/19			
65	5/25/19	NV	7/6/19	5/25/19	NV	7/6/19
66	5/25/19	P	6/1/19	5/25/19	A	7/10/19
67	5/25/19	P	6/19/19	5/25/19	P	6/19/19
68	5/25/19	A	7/6/19			
69	5/25/19	P	6/5/19	5/25/19	NV	7/10/19
70	5/25/19	PH	6/19/19			
71	5/25/19	C	6/12/19	5/25/19	C	6/12/19
72	5/25/19	C	6/12/19	5/25/19	C	6/12/19
73	5/25/19	PH	6/19/19			
74	5/25/19	C	6/19/19	5/29/19	C	6/19/19
75	5/29/19	C	6/12/19	5/29/19	C	6/12/19
76	5/29/19	C	6/19/19			
77	5/29/19	C	6/22/19	6/1/19	C	6/22/19
78	5/29/19	C	6/15/19			
79	5/29/19	A	6/22/19	5/29/19	A	6/22/19
80	5/29/19	C	6/22/19	6/1/19	C	6/22/19
81	5/29/19	C	6/19/19	5/29/19	NV	7/6/19
82	5/29/19	C	6/19/19			

Nest #	Egg 1 Found	Egg 1 Fate	Egg 1 Fate Date	Egg 2 Found	Egg 2 Fate	Egg 2 Fate Date
83	5/29/19	C	6/12/19	5/29/19	A	7/10/19
84	5/29/19	C	6/8/19	5/29/19	C	6/8/19
85	5/29/19	PH	6/22/19	6/1/19	PH	6/22/19
86	6/1/19	PH	6/26/19	6/5/19	C	6/26/19
87	6/1/19	PH	6/26/19			
88	6/1/19	P	7/6/19	6/1/19	P	7/6/19
89	6/1/19	C	6/26/19	6/5/19	C	6/26/19
90	6/1/19	C	6/22/19	6/1/19	C	6/22/19
91	6/1/19	A	7/6/19			
92	6/1/19	C	6/15/19			
93	6/1/19	P	6/5/19			
94	6/1/19	A	7/6/19	6/1/19	A	7/6/19
95	6/5/19	C	6/26/19	6/5/19	C	6/26/19
96	6/5/19	PH	6/26/19	6/5/19	C	6/26/19
97	6/5/19	PH	6/26/19	6/5/19	C	6/26/19
98	6/5/19	C	6/26/19			
99	6/5/19	A	7/10/19			
100	6/5/19	D	7/3/19	6/5/19	A	7/6/19
101	6/8/19	PH	7/3/19	6/12/19	PH	7/3/19
102	6/8/19	C	6/26/19			
103	6/8/19	PH	6/29/19			
104	6/8/19	C	6/26/19			
105	6/8/19	C	7/3/19	6/12/19	A	7/24/19
106	6/12/19	A	7/10/19			
107	6/12/19	C	6/29/19			
108	6/12/19	A	7/13/19			
109	6/12/19	C	7/3/19	6/12/19	C	7/3/19
110	6/12/19	PH	7/3/19	6/12/19	PH	7/3/19
111	6/12/19	C	7/3/19			
112	6/12/19	C	7/3/19			
113	6/12/19	NV	7/24/19			
114	6/12/19	PH	7/6/19			
115	6/12/19	C	7/6/19			
116	6/12/19	C	6/26/19			
117	6/12/19	C	7/3/19	6/12/19	PH	7/3/19
118	6/12/19	PH	7/3/19	6/12/19	PH	7/3/19
119	6/12/19	C	7/6/19			
120	6/12/19	C	6/22/19			
121	6/12/19	C	7/6/19	6/15/19	C	7/6/19
122	6/12/19	PH	7/3/19			
123	6/12/19	PH	7/3/19	6/22/19	there was no egg 2	
124	6/12/19	C	7/3/19			
125	6/15/19	P	6/19/19	6/15/19	D	8/3/19
126	6/15/19	C	6/26/19	6/15/19	C	6/26/19

Nest #	Egg 1 Found	Egg 1 Fate	Egg 1 Fate Date	Egg 2 Found	Egg 2 Fate	Egg 2 Fate Date
127	6/15/19	PH	6/26/19			
128	6/15/19	PH	7/3/19	6/15/19	PH	7/3/19
129	6/15/19	PH	7/3/19	6/15/19	PH	7/3/19
130	6/19/19	A	7/13/19			
131	6/19/19	C	6/29/19			
132	6/19/19	PH	7/3/19	6/19/19	PH	7/3/19
133	6/19/19	C	7/6/19			
134	6/19/19	A	7/24/19			
135	6/19/19	C	7/10/19	6/19/19	C	7/10/19
136	6/19/19	A	7/13/19			
137	6/19/19	C	7/10/19	6/19/19	P	8/3/19
138	6/19/19	A	7/17/19			
139	6/19/19	A	7/17/19			
140	6/19/19	C	7/10/19			
141	6/22/19	B	7/10/19			
142	6/22/19	A	7/13/19			
143	6/22/19	A	7/24/19			
144	6/22/19	C	7/10/19			
145	6/22/19	C	7/13/19			
146	6/22/19	C	7/13/19	6/22/19	C	7/13/19
147	6/22/19	C	7/6/19	6/22/19	C	7/6/19
148	6/22/19	PH	7/13/19			
149	6/22/19	PH	7/13/19	6/22/19	C	7/13/19
150	6/26/19	PH	7/17/19	6/29/19	C	7/17/19
151	6/26/19	C	7/17/19			
152	6/26/19	C	7/6/19			
153	6/26/19	P	8/3/19			
154	6/26/19	PH	7/3/19	6/29/19	DC	7/17/19
155	6/26/19	C	7/17/19			
156	6/26/19	P	8/3/19			
157	6/26/19	C	7/17/19	6/29/19	C	7/20/19
158	6/26/19	PH	7/17/19	6/26/19	PH	7/17/19
159	6/29/19	A	7/20/19	6/29/19	A	7/20/19
160	6/29/19	P	7/17/19	7/3/19	P	7/17/19
161	6/29/19	C	7/20/19	6/29/19	PH	7/20/19
162	7/3/19	C	7/10/19			
163	7/3/19	P	7/10/19	7/3/19	P	7/10/19
164	7/3/19	PH	7/20/19	7/3/19	PH	7/20/19
165	7/3/19	C	7/13/19	7/3/19	C	7/13/19
166	7/3/19	A	7/27/19			
167	7/3/19	PH	7/24/19	7/3/19	PH	7/24/19
168	7/3/19	PH	7/24/19			
169	7/3/19	A	7/31/19			
170	7/3/19	PH	7/27/19	7/6/19	DC	7/27/19

Nest #	Egg 1 Found	Egg 1 Fate	Egg 1 Fate Date	Egg 2 Found	Egg 2 Fate	Egg 2 Fate Date
171	7/3/19	PH	7/24/19			
172	7/3/19	PH	7/24/19			
173	7/6/19	C	7/24/19			
174	7/6/19	PH	7/27/19			
175	7/6/19	PH	7/20/19	7/6/19	PH	7/20/19
176	7/6/19	C	7/20/19	7/6/19	C	7/20/19
177	7/6/19	PH	7/24/19			
178	7/6/19	B	7/27/19	7/10/19	B	7/27/19
179	7/6/19	C	7/24/19			
180	7/6/19	P	8/3/19			
181	7/6/19	PH	7/24/19			
182	7/6/19	C	7/27/19	7/10/19	PH	7/27/19
183	7/6/19	P	8/3/19			
184	7/6/19	C	7/24/19			
185	7/10/19	A	7/27/19			
186	7/10/19	C	7/27/19			
187	7/10/19	C	7/31/19			
188	7/10/19	P	8/3/19			
189	7/10/19	A	7/31/19			
190	7/10/19	A	7/27/19	7/10/19	A	7/27/19
191	7/10/19	P	7/31/19			
192	7/10/19	A	7/27/19	7/10/19	A	7/27/19
193	7/13/19	P	7/17/19			
194	7/13/19	A	7/27/19			
195	7/13/19	A	7/31/19			
196	7/13/19	D	8/3/19			
197	7/17/19	P	7/31/19			
198	7/17/19	PH	7/24/19			
199	7/17/19	P	8/3/19			
200	6/5/19	C	6/26/19			

APPENDIX F
LIST OF BIRDS OBSERVED AT PIER 400,
2019 NESTING SEASON

LIST OF BIRDS OBSERVED AT PIER 400 DURING 2019 NESTING SEASON

Anatidae	**ducks, geese, swans**
Melanitta perspicillata	surf scoter
Branta bernicla	Brant goose (black subspecies, *nigricans*)
Gaviidae	**loons**
Gavia immer	common loon
Gavia stellata	red-throated loon
Gavia pacifica	Pacific loon
Podicipedidae	**grebes**
Aechmophorus occidentalis	western grebe
Podiceps nigricollis	eared grebe
Phalacrocoracidae	**cormorants**
Phalacrocorax auritus	double-crested cormorant
Phalacrocorax penicillatus	Brandt's cormorant
Pelecanidae	**pelicans**
Pelecanus occidentalis	brown pelican
Ardeidae	**herons, egrets**
Ardea herodias	great blue heron
Ardea alba	great egret
Nycticorax nycticorax	black-crowned night heron
Accipitridae	**hawks, eagles, vultures, kites, osprey**
Pandion haliaetus	osprey
Buteo jamaicensis	red-tailed hawk
Charadriidae	**plovers**
Charadrius vociferus	killdeer
Pluvialis squatarola	black-bellied plover
Scolopacidae	**sandpipers**
Tringa incana	wandering tattler
Tringa semipalmata	willet
Numenius phaeopus	whimbrel
Numenius americanus	long-billed curlew
Haematopodidae	**oystercatchers**
Haematopus bachmani	black oystercatcher
Laridae	**gulls, terns, skimmers**
Larus occidentalis	western gull
Larus californicus	California gull
Larus delawarensis	ring-billed gull
Larus heermanni	Heermann's gull
Larus philadelphia	Bonaparte's gull
Hydroprogne caspia	Caspian tern
Thalasseus elegans	elegant tern
Thalasseus maximus	royal tern
Sternula antillarum	least tern (CA subspecies, *browni*)
Rynchops niger	black skimmer

Columbidae	**pigeons, doves**
Columba livia (non-native)	rock pigeon
Zenaida macroura	mourning dove
Apodidae	**swifts**
Aeronautes saxatalis	white-throated swift
Trochilidae	**hummingbirds**
Selasphorus sasin	Allen's hummingbird
Falconidae	**falcons**
Falco peregrinus	peregrine falcon
Falco sparverius	American kestrel
Psittacidae	**parrots**
Psittacula sp. (non-native)	unidentified parrot, possibly a ring-necked parrot
Tyrannidae	**"tyrant" flycatchers**
Myiarchus cinerascens	ash-throated flycatcher
Sayornis nigricans	black phoebe
Sayornis saya	Say's phoebe
Contopus sordidulus	western wood-pewee
Empidonax wrightii	grey flycatcher
Empidonax difficilis	Pacific-slope flycatcher
Corvidae	**crows, ravens, jays, magpies**
Corvus corax	common raven
Corvus brachyrhynchos	American crow
Alaudidae	**larks**
Eremophila alpestris	horned lark
Hirundinidae	**swallows**
Hirundo rustica	barn swallow
Sturnidae	**starlings, mynas**
Sturnus vulgaris (non-native)	European starling
Parulidae	**New World warblers**
Cardellina pusilla	Wilson's warbler
Oreothlypis ruficapilla	Nashville warbler
Emberizidae	**New World sparrows**
Melospiza melodia	song sparrow
Cardinalidae	**grosbeaks, cardinals, northern tanagers**
Piranga ludoviciana	western tanager
Fringillidae	**true finches**
Haemorhous mexicanus	house finch
Passeridae	**Old World sparrows**
Passer domesticus (non-native)	house sparrow