

Kaheawa Wind Power Habitat Conservation Plan FY 2024 Annual Report



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Incidental Take License ITL-08/ Incidental Take Permit TE118901-1

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Executive Summary

This report summarizes work performed by Kaheawa Wind Power, LLC (KWP I), owner of the Kaheawa Wind Power I Project (Project), during the State of Hawai'i fiscal year (FY) 2024 (July 1, 2023 – June 30, 2024) under the terms of the approved Habitat Conservation Plan (HCP). The HCP was approved in January 2006 and describes KWP I's compliance obligations under Project's state Incidental Take License (ITL-08) and federal Incidental Take Permit (TE118901-1). Species covered under the HCP include four federally and state-listed threatened and endangered species (Covered Species). The 20-turbine Project was constructed in 2005 and 2006 and has been operating since June 22, 2006.

Wildlife fatality monitoring in FY 2024 continued within search plots limited to cleared areas within 70-meters of each Wind Turbine Generator (WTG). Canine-handler teams searched each of the fatality monitoring search plots once per week year-round. Bias correction trials were conducted quarterly at the Project to measure the probability that a carcass would persist until the next search (carcass persistence) and the probability that an available carcass would be found (searcher efficiency) by a canine search team. In FY 2024, mean probabilities of a carcass persisting until the next search were 0.85 (bat surrogates), 1.00 (nēnē surrogates), and 1.00 (seabird surrogates); searcher efficiency was 1.00 for surrogates of all three species groups.

Three fatalities of Covered Species were detected in FY 2024, all nēnē. All nēnē were found incidentally during scheduled searches but outside the search plot. Since the commencement of operations, the Project's total observed direct take of Covered Species has been 13 'ōpe'ape'a , 37 nēnē, and 8 'ua'u. The fatality estimates using the Evidence of Absence estimator at the upper 80 percent credibility level are estimated at less than or equal to 28 'ōpe'ape'a , 53 nēnē, and 18 'ua'u. Rounded up indirect take estimates for the Covered Species are four 'ōpe'ape'a , two nēnē, and five 'ua'u. Combining these values, there is an approximately 80 percent chance that cumulative take of Covered Species at the Project since the beginning of operations through FY 2024 was less than or equal to 32 'ōpe'ape'a , 55 nēnē, and 23 'ua'u.

The bat acoustic monitoring program captured bat activity across the Project at five detector locations throughout FY 2024. Between July 2022 and June 2023, the 'ōpe'ape'a were detected on 92 out of 1,715 detector-nights sampled (5.4 percent). In FY 2024, notably, peak activity occurred during the pregnancy period rather than during post-lactation, though it should be noted that the post-lactation period may have been impacted by the aftermath of the August 2023 wildfires in the vicinity of the KWP I. Acoustic monitoring trends continue to demonstrate a statistically significantly increasing trend in annual detection rates.

Mitigation obligations have been met for three of the four Covered Species. The 'ōpe'ape'a baseline (Tier 1) and Higher level of take (Tier 2) mitigation funding obligations were met prior to this fiscal year; current estimated take remains within Higher levels of take (Tier 2). KWP I's nēnē current estimate of take remains within Tier 1. Tier 1 mitigation is ongoing as propagation efforts at the Haleakalā Ranch nēnē release pen, with additional mitigation efforts currently under discussion

with DOFAW and USFWS. USFWS provided concurrence that the Tier 2 mitigation obligation had been met for the 'ua'u based on outcomes of the 2022 breeding season on Lāna'i; KWP I awaits similar documentation from DOFAW. The Tier 1 mitigation obligation for the 'a'o was met prior to FY 2024 based on outcomes of the 2022 breeding season at Makamaka'ole. To date, KWP I has not had observed take of the 'a'o.

KWP I communicated actively with USFWS and DOFAW throughout FY 2024. The communication was conducted through conference calls, site visits, submittal of quarterly reports, in-person meetings, and email communications related to the Project's HCP. The purpose of these communications included required semi-annual and annual HCP implementation meetings and focused discussions of all components of mitigation. KWP I submitted to agencies a letter of intent to amend the existing HCP in May 2024, additional nēnē mitigation proposals in April, May, and June of 2024, conducted an in-person site visit in February 2024 (rescheduled from September 2023 due to wildfires), and an in-person semi-annual meeting in June 2024 which included discussions related to the HCP amendment.

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1.0 Introduction

The Hawaii Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW) and U.S. Fish and Wildlife Service (USFWS) approved the Kaheawa Wind Project I (Project) Habitat Conservation Plan (HCP) in 2006. Kaheawa Wind Power, LLC (KWP I) was issued a federal Incidental Take Permit (ITP; ITP- TE118901-1) from the USFWS and a state Incidental Take License (ITL; ITL-08) from the DLNR in January of 2006. The ITP and ITL cover the incidental take of four federally and state-listed threatened and endangered species (referred to as the Covered Species) over a 20-year permit term.

The Covered Species include the:

- ‘Ōpe‘ape‘a (Hawaiian hoary bat; *Lasiurus cinereus semotus*);
- Nēnē (Hawaiian goose; *Branta sandvicensis*);
- ‘Ua‘u (Hawaiian petrel, *Pterodroma sandwichensis*); and
- ‘A‘o (Newell’s shearwater, *Puffinus newelli*).

The HCP frames take levels and mitigation as “Baseline Take” and “Higher Take.” Hereafter, this document refers to Baseline Take as Tier 1 and Higher Take as Tier 2.

The Project was constructed in 2005 and 2006 and was commissioned to begin operating on June 22, 2006. The Project continues to be operated by KWP I.

KWP I and Tetra Tech, Inc. (Tetra Tech) have collaborated to prepare this progress report to describe the work performed for the Project during the State of Hawai‘i 2024 fiscal year (FY 2024; July 1, 2023 – June 30, 2024) pursuant to the terms and obligations of the approved HCP, ITL, and ITP. KWP I has previously submitted annual HCP progress reports for FY 2007 through FY 2023 to the USFWS and DOFAW (KWP I 2007, KWP I 2008, KWP I 2009, KWP I 2010, KWP I 2011, KWP I 2012, KWP I 2013, KWP I 2014, KWP I 2015, KWP I 2016, KWP I 2017, KWP I 2018, Tetra Tech 2019, Tetra Tech 2020, Tetra Tech 2022a, Tetra Tech 2022b, Tetra Tech 2023).

2.0 Fatality Monitoring

The Project has implemented a year-round intensive fatality monitoring program to document downed (i.e., injured or dead) wildlife incidents involving Covered Species and other species at the Project since operations began in June 2006. In consultation with USFWS, DOFAW, and the Endangered Species Recovery Committee (ESRC), fatality search areas have evolved over time from the start of operations through the initiation of the current approach, established in April 2015. The last modifications were in response to the March 31, 2015, ESRC meeting, wherein members agreed to “encourage the applicant to work with the statistical experts and researchers to develop an alternative more efficient and focused monitoring strategy which still meets the committee’s

expressed preference for continuation of annual monitoring.” The evolution of the searched areas in which fatality monitoring occurred (search plots) included:

- In June 2006, search plots were 180-meter by 200-meter rectangles centered on each of the Project’s 20 wind turbine generators (WTG).
- On October 1, 2010, search plots were reduced to 73-meter radius circular plots centered on each WTG, except where steep slopes prohibited visual searching.
- Since April 2015, search plots were reduced to the graded WTG pads and access roads that fall within a 70-meter radius circle centered on each of the Project’s 20 WTGs (Figure 1). This search area continues to be used for monitoring in FY 2024.

In FY 2024, all 20 WTGs were searched for fatalities once per week. The FY 2024 mean search interval for all WTGs was 7.0 days ($SD = 0.28$). The search plots were searched by a canine search team which included a trained detector dog accompanied by a handler. Should search conditions prevent the use of dogs (e.g., weather, injury, availability of canine search team, etc.), search plots would be visually surveyed by Project staff. In FY 2024, all searches were conducted by canine teams and no visual searches occurred.

Three fatalities of Covered Species were detected in FY 2024, all nēnē. All three fatalities were found incidentally during scheduled searches as they were outside of the defined search area, including one in January, one in February, and one in April (Section 7.2.1). In each case, potential causes of death may have been something other than a turbine strike, namely predation. No other Covered Species were found. Fatalities of other species including those protected under the Migratory Bird Treaty Act (MBTA) are reported in Section 7.4.

Additionally, KWP I tracks observations of live nēnē on site when they overlap with the timing of fatality searches. A total of 23 observations of 62 (non-distinct) individual nēnē were made over 18 days between September 2023 and April 2023 with observations made in every month of this timeframe.

Precautions have been taken to prevent potential canine interactions with wildlife, particularly the nēnē. If nēnē were present in the search area, the canine handler immediately retrieved and restrained the dog, avoided disturbing the birds, postponed searching in the vicinity of the birds, worked on leash away from wildlife and/or temporarily skipped canine searches in the proximity of the nēnē. No canine searcher-wildlife interactions occurred in FY 2024.

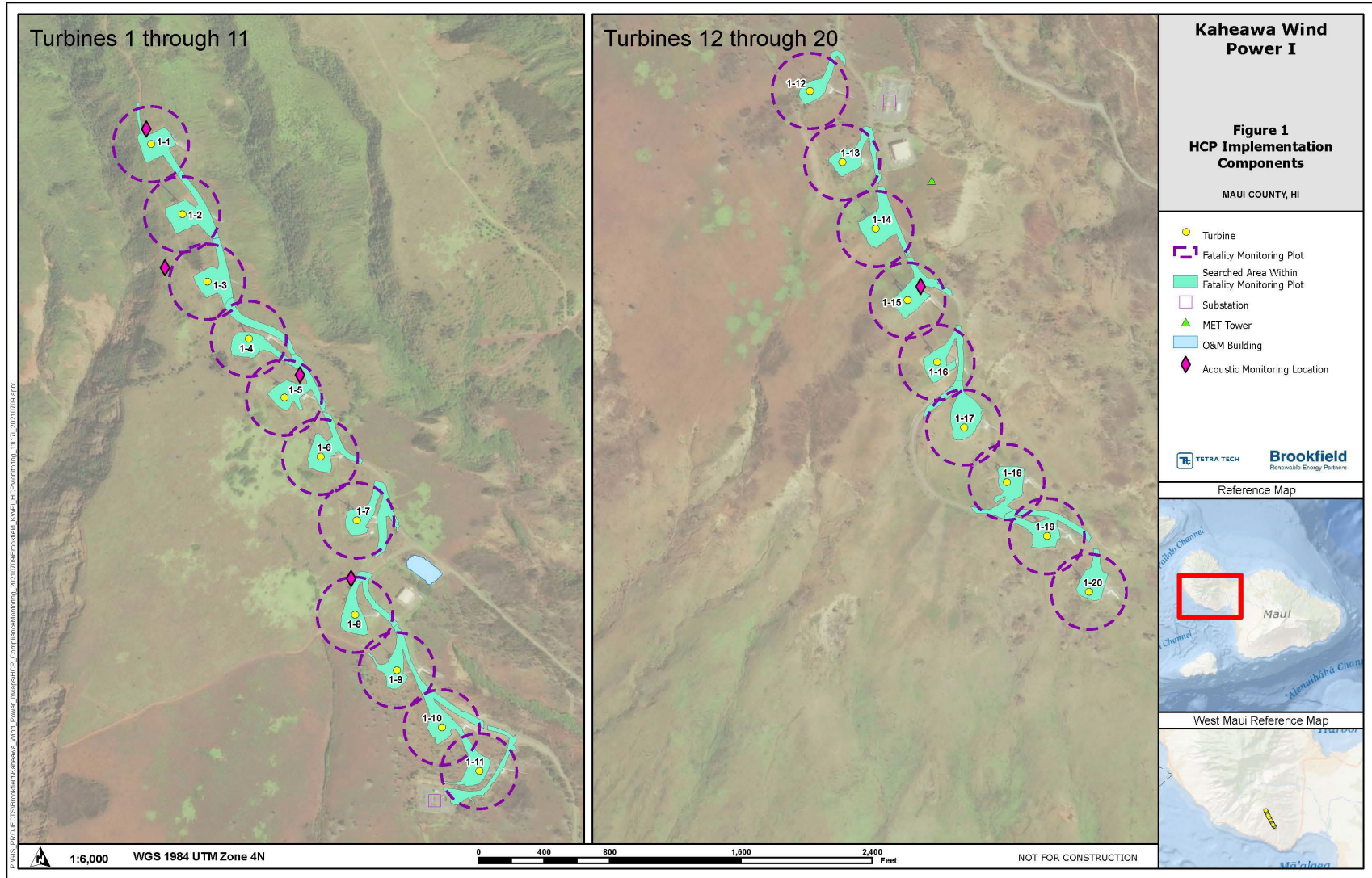


Figure 1. HCP Implementation Components

3.0 Carcass Persistence Trials

One 28-day carcass persistence trial was conducted in each quarter of FY 2024, for a total of four trials in FY 2024. Trials used black rats (*Rattus rattus*) for 'ōpe'ape'a surrogates (i.e., small carcass), large chickens (*Gallus gallus*) for nēnē surrogates (i.e., large birds), and wedge-tailed shearwater (*Ardenna pacifica*) carcasses as surrogates for the 'ua'u and the 'a'o (i.e., medium birds; Covered Seabird Species) and included a total of 43 carcasses (24 small, 10 medium, and 9 large).

For FY 2024, the probability that a carcass persisted until the next search was 0.85 for all bat surrogate carcasses (95 percent Confidence Interval [CI] = 0.74, 0.93; N=24), 1.00 for nēnē surrogates (95 percent CI = 0.97, 1.00; N=9), and 1.00 for seabird surrogates (95 percent CI = 0.97, 1.00; N=10).

4.0 Searcher Efficiency Trials

Searcher efficiency trials occurred throughout the year with a total of 64 searcher efficiency trial carcasses were placed over 20 trial days during FY 2024. Similar to the carcass persistence trials, black rats were used as surrogates for bats and chickens were used as surrogates for the nēnē. Trial proctors used wedge-tailed shearwaters and other medium-sized birds collected under the Project's Special Purpose Utility Permit (MBPER0055564-0, valid through 03-31-2025) and Protected Wildlife Permits (WL21-18 and 231228115819-WILD) as surrogates for Covered Seabird Species. All trials were conducted on canine search teams in FY 2024, as no visual searches occurred. Of the 64 trial carcasses placed, seven bat surrogates were lost to scavenging prior to the search; all other carcasses were available for detection. For FY 2024, the probability that a canine search team would find a carcass was 1.00 for bat surrogates (95 percent CI = 0.94, 1.00; N=37), 1.00 for nēnē surrogates (95 percent CI = 0.76, 1.00; N=9), and for 'ua'u surrogates (95 percent CI = 0.80, 1.00; N=10).

5.0 Vegetation Management

In order to maximize fatality monitoring efficiency and minimize impacts to native plants without compromising soil stability, KWP I performs vegetation management at the Project. Vegetation management activities have evolved over time, and account for management activity restrictions during the nēnē nesting season. The evolution of activity includes:

- Initial vegetation management activities within the search plots were limited to between April 1 and October 31 to minimize risk during the nēnē nesting season.
- In November 2016, Stephanie Franklin of DOFAW-Maui verbally approved using hand management tools (spray packs and weed whackers) during the nēnē nesting season if the activity was within the current search area and did not disturb wildlife.

- In March 2017, Stephanie Franklin of DOFAW-Maui verbally approved the removal of Christmas berry (*Schinus terebinthifolius*) within 70 meters of the WTGs to reduce potential nēnē nesting habitat in the vicinity.
- In September 2021, Stephanie Franklin of DOFAW-Maui verbally approved the continuation of the quarterly management program and woody vegetation removal using hand and power tools, and manual application of herbicide on cut stumps as necessary, in proximity to select turbines. Additional woody vegetation removal was approved to occur within a one-meter buffer of select turbine access roads with all work completed between April 1 and October 31 and in conjunction with a biological monitor.

The vegetation management program currently being implemented at the Project consists of twice annual herbicide treatments and an as-needed weed-whacking program. Herbicides are applied to the cleared areas within each search plot outside of the nēnē breeding season, as wind and weather conditions allow. Remaining vegetation is trimmed by weed whacking to maintain annual consistency of the cleared area extent within 70 meters of each turbine. In FY 2024, vegetation management occurred in October 2023 (Q2), and April-May, 2024 (Q4).

6.0 Scavenger Trapping

KWP I implements regular scavenger trapping at the Project to contribute to a high probability of a carcass persisting between fatality searches and to reduce the depredation risk to nēnē. The program includes a quarterly intensive trapping effort followed by ongoing biweekly (every other week) trapping effort. In FY 2024, trapping included the use of 24 DOC250 body grip traps and 18 live traps placed throughout the Project. Trap distribution has remained consistent through the implementation of the program, and represents the increased level of effort initiated in FY 2022. In FY 2024, there were an average of 30 trap nights per quarter for cage traps, and 91 trap nights per quarter for the DOC250s. With this effort, the scavenger trapping program removed a total of 32 mongooses (*Herpestes auropunctatus*), and five feral cats (*Felis cattus*) in FY 2024. No non-target animals were trapped.

7.0 Documented Fatalities and Take Estimates

Three fatalities of Covered Species were detected in FY 2024, all nēnē (Section 7.2.1). All observed downed wildlife were handled and reported in accordance with the Downed Wildlife Protocol provided by USFWS and DOFAW (USFWS and DOFAW 2020). No injured (live) downed wildlife was observed at the Project in FY 2024.

To calculate take estimates, the number of observed fatalities is scaled to account for fatalities that are not detected (unobserved). Unobserved fatalities are the result of three primary factors:

- Carcasses may be scavenged before searchers can find them;

- Carcasses may be present, but not detected by searchers; and
- Carcasses may fall outside of the search area.

Carcass persistence and searcher efficiency (bias correction; see Sections 3.0 and 4.0) measure the effect of the first two factors. The third factor, the number of carcasses that fall outside of the search plot area, is dependent upon the proportion of the carcass distribution that is searched. The search area for fatalities at the Project has evolved over time (Section 2.0); therefore, the proportion of the carcass distribution searched has varied historically. As no changes to search plot dimensions have been made since FY 2016, the estimate of the density weighted proportion (DWP) of the carcass distribution searched (Appendix 1) has remained the same as described in the FY 2017 annual report (KWP I 2017).

Cumulative take at an upper credible limit (UCL) of 80 percent was calculated for each Covered Species for which documented fatalities have occurred, per request of USFWS and DOFAW. The UCL is estimated from three components:

1. Observed direct take (ODT) during protocol (standardized) fatality monitoring;
2. Estimated Unobserved direct take (UDT); and
3. Estimated Indirect take.

The Evidence of Absence software program (EoA; Dalthorp et al. 2017), the agency-approved analysis tool for estimating direct take, uses results from bias correction trials and ODT to generate a UCL of direct take (i.e., ODT + UDT). Direct take values from this analysis can be interpreted as: there is an 80 percent probability that actual direct take at the Project over the analysis period was less than or equal to the 80 percent UCL. Indirect take calculations are based on the HCP (KWP I 2006) and agency guidance. Indirect take is estimated based on factors such as the breeding season in which fatalities are observed, sex and age characteristics of Covered Species fatalities found at the Project, their associated life history characteristics as described in the Project's approved HCP, and current agency guidance for the 'ōpe'ape'a (e.g., USFWS 2016).

Additionally, EoA includes a module that allows users to project future estimates of mortality based on results of past fatality monitoring. Due to the inherent uncertainty of these projections (including the potential future contribution of indirect take) and the amplification of this uncertainty resulting from the use of the 80 percent UCL as the estimate of take for regulatory compliance, long term projections may have limited utility. Nevertheless, they do help gauge the likelihood of permit take exceedance, and may help operators in their mitigation planning, assuming future management and monitoring conditions can be reasonably estimated.

7.1 'Ōpe'ape'a

7.1.1 *Estimated Take*

A total of 13 'ōpe'ape'a fatalities have been observed at the Project since monitoring began in June 2006. Of the 13 observed, 10 were found inside of fatality search plots and are used to estimate

direct take. Three bat fatalities were classified as incidental observations. All bat carcasses have previously been transferred to the U.S. Geological Survey or the Bishop Museum for genetic sexing. Genetic sexing is used to refine estimates of indirect take.

The observed ‘ōpe‘ape‘a fatalities by fiscal year are listed in Table 1.

Table 1. Observed ‘Ōpe‘ape‘a Fatalities at KWP I Through FY 2024

Fiscal Year	‘Ōpe‘ape‘a Observed Direct Take	‘Ōpe‘ape‘a Incidental Fatality Observations	Total
2007	0	0	0
2008	0	0	0
2009	0	1	1
2010	0	0	0
2011	0	1	1
2012	0	0	0
2013	2	0	2
2014	4	0	4
2015	0	0	0
2016	0	0	0
2017	1	1	2
2018	1	0	1
2019	1	0	1
2020	0	0	0
2021	0	0	0
2022	0	0	0
2023	1	0	1
2024	0	0	0
Total	10	3	13

The estimated direct take (ODT + UDT) for the 13 ‘ōpe‘ape‘a fatalities found between the start of fatality monitoring in June 2006 and end of FY 2024 (June 30, 2024) is less than or equal to 28 bats (80 percent UCL; Appendix 1a).

Indirect take is estimated to account for the potential loss of individuals (offspring) that may occur indirectly as the result of the loss of an adult (breeding) female through direct take during the period that females may be pregnant or supporting dependent young. The seasonal timing and sex of all observed fatalities (those observed in fatality monitoring as well as incidental to fatality monitoring) is used in the estimate of indirect take. Cumulative indirect take is calculated as 3.17 adults (Appendix 2a).

The UCL for cumulative Project take of the 'ōpe'ape'a at the 80 percent credibility level is 32 adult bats (28 [estimated direct take] + 4 [estimated indirect take, rounded up from 3.17]). That is, there is an approximately 80 percent probability that cumulative take at the Project at the end of FY 2024 is less than or equal to 32 bats (Appendix 1a).

7.1.2 Projected Take

KWP I projected 'ōpe'ape'a take through the end of the permit term using the fatality monitoring data collected through FY 2024. The objective of this analysis was to evaluate the potential for the Project to exceed the permitted take limit at the 80 percent UCL prior to the end of the permit term (Appendix 3). For this analysis, the detection probability for future years is assumed to be unchanged from the FY 2024 detection probability (0.479; 95 percent CI 0.422, 0.537), and the fatality rate is unaltered for all future years ($\rho=1$). Future indirect take is unknown and will potentially vary based on the timing of ODT. Based on historical Project data, KWP I assumed total indirect take for the Project over the permit term would be a maximum of six adult equivalents (approximately 20 juveniles based on assumed 'ōpe'ape'a survival rates; USFWS 2016), or 12 percent of the permitted take. Currently, the proportion of total take that is attributable to indirect take is roughly 10.2 percent (3.17 [adult bat equivalents estimated from indirect take] / 31.17 [bats estimated combining the direct and indirect take]), making the assumption of indirect take of six adult bats conservative. Assuming six adult bat equivalents are attributed to the Project as indirect take, the permitted direct take under the Project's ITP and ITL would be 44 bats (50 bats [permitted by ITL and ITP] minus 6 bats [estimated as attributed to indirect take] = 44 bats estimated direct take maximum).

Based on the analysis, there is over a 99.9 percent probability that the 80 percent UCL of cumulative take at the Project *will not* exceed permitted Tier 2 take during the permit term (Appendix 3). EoA projected a median estimate of 20 years of Project operation without a direct take estimate exceeding 44 bats. Therefore, based on these projections the Project is likely to remain below the permitted take limit of 50 'ōpe'ape'a for the permit term.

7.2 Nēnē

7.2.1 Estimated Take

A total of 37 nēnē fatalities attributable to the Project have been observed at the Project since monitoring began in June 2006. Twenty-seven of the 37 geese were found inside of fatality search plots and are used to estimate direct take, while ten were detected outside of the standardized search parameters and thus considered incidental detections. The observed nēnē fatalities by fiscal year are listed in Table 2.

Table 2. Observed Nēnē Fatalities at KWP I Through FY 2024

Fiscal Year	Nēnē Observed Direct Take	Nēnē Incidental Fatality Observations	Total
2007	0	0	0
2008	2	1	3
2009	1	0	1
2010	1	0	1
2011	5	0	5
2012	1	0	1
2013	4	0	4
2014	3	0	3
2015	4	0	4
2016	1	0	1
2017	0	1	1
2018	1	1	2
2019	2	0	2
2020	0	0	0
2021	0	2 ¹	2
2022	1	0	1
2023	1	2	3
2024	0	3	3
Total	27	10	37

1. Includes one juvenile fatality found outside of search area. Based on estimated age and carcass condition at discovery, it is unknown if carcass was attributed to Project operations or other circumstances.

On January 9, 2024, one adult nēnē carcass was incidentally observed during a scheduled search 25 meters from Turbine 12 but outside of the cleared search area. On February 27, 2024, one adult nēnē carcass was incidentally observed during a scheduled search 50 meters from Turbine 17, again outside of the cleared search area. On April 2, 2024, one adult nēnē carcass was incidentally observed during a scheduled search 27 meters from Turbine 15 outside of the cleared search area. In each case, potential causes of death may have been something other than a turbine strike, namely predation.

The estimated direct take (ODT + UDT) for the 27 nēnē fatalities (within the search area) found between the start of operation (June 5, 2006) and end of FY 2024 (June 30, 2024) is less than or equal to 53 geese (80 percent UCL; Appendix 1b).

Indirect take is estimated to account for the potential loss of individuals that may occur as the result of the loss of their parents. Both parents care for young post-fledging (Banko et al. 2020). The point during the breeding season when an adult is taken determines to what extent offspring may

be affected. Cumulative indirect take was 3.55 juveniles (1.82 adults, assuming a 0.8 annual survival rate and 3 years from fledging to adult; Appendix 2b).¹

The UCL for cumulative Project take of the nēnē at the 80 percent credibility level is 55 geese (53 [estimated direct take] + 2 [estimated indirect take, rounded up from 1.82]). That is, there is an approximately 80 percent probability that cumulative take at the Project at the end of FY 2024 is less than or equal to 55 adult geese.

Mitigation credits for KWP I are lagging the Project's take given a (previously reported) challenging mitigation environment. In FY 2024, KWP worked closely with DOFAW and USFWS to provide and allocate funding for, and reach an updated consensus on, mitigation credits achieved through FY 2023. While final credit letters are still forthcoming, total mitigation credits through FY 2024 (including preliminary results from the FY 2024 breeding season) are distributed annually as indicated in rows K and L of Appendix 2b.

Per the HCP, the Project may cause a net loss in productivity in the event that take outpaces the number of individuals produced from mitigation efforts. The lag between production of geese through mitigation efforts and the take of geese at the Project drive the estimates of lost productivity. Accrued lost productivity at a given point in time is calculated as the cumulative take less the number of individuals generated from mitigation efforts to date, and then adjusted by a factor of 0.1 to account for the probability that those unmitigated birds would have produced young (KWP 2006). USFWS and DOFAW have agreed that the Project will not accrue lost productivity for nēnē take that occurred prior to calendar year 2011, the year the release pen was constructed. Six nēnē fatalities were documented at the Project prior to January 1, 2011. Accrued lost productivity is currently estimated at 9.84 juvenile, or 5.04 adult equivalents (Appendix 2b).

KWP I had consulted with agencies throughout FY 2024 regarding adjustments to the mitigation program needed to meet obligations, including the required process authorizing take at the Tier 2 level. In FY 2024, KWP I submitted a letter of intent to USFWS and DOFAW to seek a permit amendment for the Project, and continues to actively work with DOFAW and USFWS to develop additional and alternative nēnē mitigation proposals.

The baseline take rate, assessed at the 80 percent UCL (less than or equal to 3.05 nēnē fatalities/year when calculated as less than or equal to 55 nēnē over 18 years of operations), has triggered adaptive management threshold as set forth in the HCP (3 nēnē fatalities/year; Section 10.0).

7.2.2 Projected Take

KWP I projected nēnē take through the end of the permit term using the fatality monitoring data collected through FY 2024. The objective of this analysis was to evaluate the potential for the Project to exceed the Tier 1 take limit (described as Baseline Take in the Project's HCP) at the 80 percent UCL prior to the end of the permit term (Appendix 3). For this analysis, the detection

¹ No indirect take was attributed to the observed juvenile fatality observed in FY 2021, as a juvenile could not have dependent young.

probability for future years is assumed to match the estimated overall detection probability of FY 2024 (0.344; 95 percent CI 0.326, 0.361), and the fatality rate is unaltered for all future years ($\rho=1$). Future indirect take is unknown and will potentially vary based on the timing of ODT. Based on historical Project data, KWP I assumed total indirect take for the Project over the permit term would be a maximum of two adult equivalents (approximately four juveniles based on an assumed nēnē survival rate from juvenile to adult of 0.512; KWP I 2006), or 3.3 percent of the Tier 1 take. Currently, the proportion of total take that is attributable to indirect take is 3.4 percent (1.84 [adult goose equivalents estimated from indirect take]/ 54.84 [adult geese estimated, combining the direct and indirect take]), making the assumption of two indirect take on par with the 18 year dataset. Assuming two adult nēnē are attributed to the Project as indirect take, the permitted direct take under Tier 1 of the Project’s ITP and ITL would be 58 nēnē (60 geese [permitted by ITL and ITP for Tier 1] minus 2 geese [estimated attributed to indirect take] = 58 geese estimated direct take maximum).

Based on the analysis described above, there is a 45.1 percent chance that the 80 percent UCL of cumulative take *will not* exceed the Tier 1 take limit during the permit term (Appendix 3). EoA projected a median estimate of 20 years of Project operation without a direct take estimate exceeding 58 geese. KWP I has taken actions to minimize the threats to the nēnē at the Project and anticipates continuing to work with USFWS, DOFAW, and technical experts to further reduce risks of take (Sections 5.0, 10.0).

7.3 ‘Ua‘u

7.3.1 Estimated Take

A total of eight ‘ua‘u fatalities have been observed at the Project since monitoring began in June 2006. Seven of the eight petrels were found inside of fatality search plots and were used to estimate direct take. The FY 2013 fatality was found outside of the designated search areas and is treated as an incidental observation. The observed ‘ua‘u fatalities by fiscal year are listed in Table 3.

Table 3. Observed ‘Ua‘u Fatalities at KWP I Through FY 2024

Fiscal Year	‘Ua‘u Observed Direct Take	‘Ua‘u Incidental Fatality Observations	Total
2007	0	0	0
2008	1	0	1
2009	0	0	0
2010	0	0	0
2011	0	0	0
2012	2	0	2
2013	0	1	1
2014	1	0	1
2015	2	0	2

Fiscal Year	'Ua'u Observed Direct Take	'Ua'u Incidental Fatality Observations	Total
2016	0	0	0
2017	0	0	0
2018	0	0	0
2019	1	0	1
2020	0	0	0
2021	0	0	0
2022	0	0	0
2023	0	0	0
2024	0	0	0
Total	7	1	8

The estimated direct take (ODT + UDT) for the seven 'ua'u fatalities found between the start of operation (June 5, 2006) and end of FY 2024 (June 30, 2024) is less than or equal to 18 petrels (80 percent UCL; Appendix 1c).

Indirect take is estimated to account for the potential loss of individuals that may occur as the result of the loss their parents. Both parents for the 'ua'u care for their young until fledging. The point during the breeding season when an adult is taken determines to what extent offspring may be affected. Cumulative indirect take was calculated at 13.59 juveniles (4.08 adults assuming a 0.3 survival rate from fledging to adult; Appendix 2c).

The Project may cause a net loss in productivity if take outpaces the number of individuals produced from mitigation efforts. The life history lag between production of the 'ua'u through mitigation efforts and the take of petrels at the Project drives the estimates of lost productivity. Accrued lost productivity at a given point in time is calculated as the cumulative take less the number of individuals generated from mitigation efforts to date, and then adjusted by a factor of 0.15 to account for the probability that those unmitigated petrels would have produced young (KWP I 2006). Each year's lost productivity is accumulated until mitigation occurs for the estimated adult take. Lost productivity information is provided in Appendix 2c.

The UCL for cumulative Project take of the 'ua'u at the 80 percent credibility level is 23 petrels (18 [estimated direct take] + 5 [estimated indirect take, rounded up from 4.08]). That is, there is an approximately 80 percent probability that cumulative take at the Project at the end of FY 2024 is less than or equal to 23 petrels.

7.3.2 Projected Take

KWP I projected 'ua'u take through the end of the permit term using the fatality monitoring data collected through FY 2024. The objective of this analysis was to evaluate the potential for the Project to exceed the permitted take limit at the 80 percent UCL prior to the end of the permit term

(Appendix 3). For this analysis, the detection probability for future years is assumed to match the estimated overall detection probability of FY 2024, and the fatality rate is unaltered for all future years ($\rho=1$). Future indirect take is unknown and will potentially vary based on the timing of ODT. Based on historical Project data, KWP I assumed total indirect take for the Project over the permit term would be a maximum of eight adult equivalents (approximately 27 juveniles based on an assumed 'ua'u survival rate of 0.3 from fledging to adult; KWP I 2006), or 21.1 percent of the permitted take. Currently, the proportion of total take that is attributable to indirect take is 18.5 percent (4.08 [adult petrel equivalents estimated from indirect take]/ 22.08 [adult petrel estimated combining the direct and indirect take]), making the assumption of eight indirect take upwardly conservative.

Assuming eight adult 'ua'u equivalents are attributed to the Project as indirect take, the permitted direct take under the Project's ITP and ITL would be 30 petrels (38 petrels [permitted by ITL and ITP] minus 8 petrels [estimated to be attributed to indirect take] = 30 'ua'u estimated direct take maximum).

Based on the analysis described above and presented in Appendix 3, there is a 99.94 percent chance that the 80 percent UCL of cumulative take *will not* be exceeded during the permit term. Specifically, the estimated direct take threshold of 30 exceeds more than 99 percent of the projected mortality estimates (Appendix 3). EoA projected a median estimate of 20 years of Project operation without a direct take estimate exceeding 30 petrels. Therefore, the Project anticipates remaining below the permitted take limit of 38 'ua'u for the permit term.

7.4 Non-listed Species

In addition to the three nēnē fatalities, 10 fatalities representing five non-listed species were documented at WTGs at the Project in FY 2024. One of the five species observed in FY 2024 is protected by the Migratory Bird Treaty Act (MBTA): the koa'e kea (white-tailed tropicbird; *Phaethon lepturus*; one individual). The other nine fatalities were of four non-native (introduced) species without MBTA protection: the black francolin (*Francolinus francolinus*; two individuals), gray francolin (*Francolinus pondicerianus*; two individuals), ring-necked pheasant (*Phasianus colchicus*; four individuals), and warbling white-eye (*Zosterops japonicus*; one individual). A list of fatalities for FY 2024 is provided in Appendix 4.

8.0 Wildlife Education and Observation Program

The wildlife education and observation program (WEOP) helps to ensure the safety and well-being of native wildlife in work areas and along site access roadways. The training provides useful information to assist staff, contractors, and visitors to be able to conduct their business in a manner consistent with the requirements of the HCP, the Conditional Use Permit, land use agreements and applicable laws. Personnel are trained to identify Covered Species and other species of wildlife that may be found on-site and what protocol to follow, as determined in the HCP and through relevant agency guidance (e.g., USFWS and DOFAW 2020), when downed wildlife is found. The trainees are

also made aware of driving conditions and receive instruction on how to drive and act around wildlife. Records of wildlife observations by WEOP-trained staff are also used by the HCP program to identify the patterns of wildlife use of the site. In FY 2024, downed wildlife observations found during standardized searches were supplemented by two incidental downed wildlife observations reported by Project personnel trained by the WEOPs program.

Over the course of FY 2024, 101 people received WEOP training. WEOP trainings will continue to be conducted on an as-needed basis to provide on-site personnel with the information to respond appropriately in the event they observe a Covered Species or encounter downed wildlife while on-site.

9.0 Mitigation

The Project's mitigation requirements are described in Section 5.0 of the approved HCP (KWP I 2006).

9.1 'Ōpe'ape'a

9.1.1 Mitigation

Mitigation for Tier 1 take of 20 bats was funded in 2006 and completed. An HCP minor amendment approved by USFWS in October 2015 and DOFAW in January 2016 authorized take of up to an additional 30 'ōpe'ape'a under Tier 2 which had been identified in the HCP but not included on the ITP and ITL.

A mitigation project that mitigates for 15 of the additional 30 bats began May 2017 and was completed in FY 2020 (KWP I 2017, Tetra Tech 2020). This mitigation project consisted of 'ōpe'ape'a ecological research in East Maui, contracted to H.T. Harvey Ecological Consultants. The contract total cost was \$750,000.

Mitigation funding for the remaining 15 bats in Tier 2 was provided to the U.S. Geological Survey Hawaiian Hoary Bat Research Group starting in FY 2018 to conduct bat ecological research on Hawai'i Island to better inform future bat conservation. The funding obligation was completed in FY 2022, with research published in 2023 (available online at <https://peerj.com/articles/14365/>). The Project, in combination with KWP II, had a total funding obligation of \$1.7M to allocate to portions of each Project's mitigation requirement. KWP I, in combination with KWP II exceeded this funding obligation by \$131,500 over the original cost, for a total combined expenditure of \$1,831,500.

9.1.2 Acoustic Monitoring at the Project

As a voluntary measure (not required in the HCP), acoustic monitoring for bat activity at the Project has been conducted continuously since August 2008. In October 2013 (FY 2014) nine Song Meter SM2BAT+ ultrasonic recorders (SM2) were deployed, replacing the previously used Anabat SD2 bat

detectors (Titley Electronics, Brendale, QLD, Australia). Each SM2 was equipped with one SMX-U1 ultrasonic microphone (Wildlife Acoustics, Maynard, MA, USA) positioned horizontally, facing southwest (away from the prevailing northeast trade winds), 6.5 meters above ground level. In October 2019 (FY 2020), the Pali brush fires burned across most of the Project destroying four SM2 units. In order to continue with the objectives of the monitoring program and address gaps in the spatial coverage of SM2's introduced by the brush fire; the monitoring regime was redesigned in July 2020 with the deployment of five SM2 units (WTGs 1, 5, 13, 15, and 20; Figure 1). This type of unit has been continuously used since October 2013. Additionally, because of differences in the equipment used prior to FY 2014, data collected in FY 2024 is only comparable to data collected between FY 2014 and FY 2023.

The objective of bat acoustic monitoring is to better understand the annual and seasonal variation in bat activity at the Project. Analysis of variance (ANOVA) and a Tukey's Honest Significant Difference (HSD) were used to test for interannual differences in detection rates between sampling years. A linear model (LM) was constructed to test for a change in detection rates across all sampling years. FY 2014 was removed from the analysis because it did not represent a full sampling year and excluded months known to have high detection rates (July, August, and September). All data were normalized with an Ordered Quantile Normalization transformation using the 'bestNormalize' package in R (Peterson 2021). The distribution of residuals from the LM were examined to check for violations of model assumptions. All tests were two-tailed, employed an alpha value of 0.05, and were conducted in R version 4.3.1 (R Core Team 2023). The characterization of Hawaiian hoary bat seasons corresponds approximately to Gorresen et al. (2013).

In FY 2024, detection rates fluctuated seasonally and were similar to the seasonal trends observed in previous monitoring years. Over the course of the FY 2024 monitoring period (July 2023 to June 2024), Hawaiian hoary bats were detected on 92 nights out of 1,715 detector-nights sampled (5.4 percent). Detection rates increased between the months of August and October during the lactation and post-lactation reproductive periods, reaching an initial peak (0.14) in activity occurring during the month of October (Figure 2). Detection rates declined following the initial peak in October and remained low fluctuating monthly (between 0.01 and 0.03) throughout the post-lactation and pre-pregnancy reproductive periods (November to March). Detection rates slightly increased in April at the beginning of the pregnancy reproductive period and reached the highest annual peak in the month of May (0.22), followed by subsequent decline in the month of June (Figure 2). The temporal pattern in detection rates during FY 2024 generally follows the pattern observed in previous years (Figure 3). However, it is notable that this is the first sampling year in which the highest peak period of annual activity occurred during the pregnancy reproductive period rather than during the post-lactation reproductive period (Figure 3).

Only marginal fluctuations have occurred in the interannual detection rates throughout the FY 2015 – FY 2024 dataset of the Project's monitoring program (Table 4). Annual detection rates in FY 2024 declined from the previous FY 2023 sampling year (by 6.6 percent) and were the lowest since FY 2017 (Table 4). Despite this decline in FY 2024 there were no significant differences in annual

detection rates among any years between FY 2015 and FY 2024 (ANOVA: $F_{9,110} = 2.15, P < 0.031$; Tukey's HSD: $P > 0.148$). However, across all analyzed monitoring years (FY 2015 – FY 2024), there is a significant increasing trend in the annual detection rates (LM: $R^2 = 3.34$ percent; $F_{1,118} = 4.07, P < 0.046$; Figure 4).

The factors contributing to the abnormal shift in the timing of peak activity and the overall decline in the annual detection rate during the FY 2024 monitoring year are not known but may be a result of four wildfires that began on August 8, 2023 across the island of Maui.

In FY 2025, five Song Meter SM4BAT-FS and SMM-U2 microphones (the newest models available) will be deployed alongside the current models in order to understand how the more sensitive SMM-U2 microphones may affect the detection of bat activity at the Project.

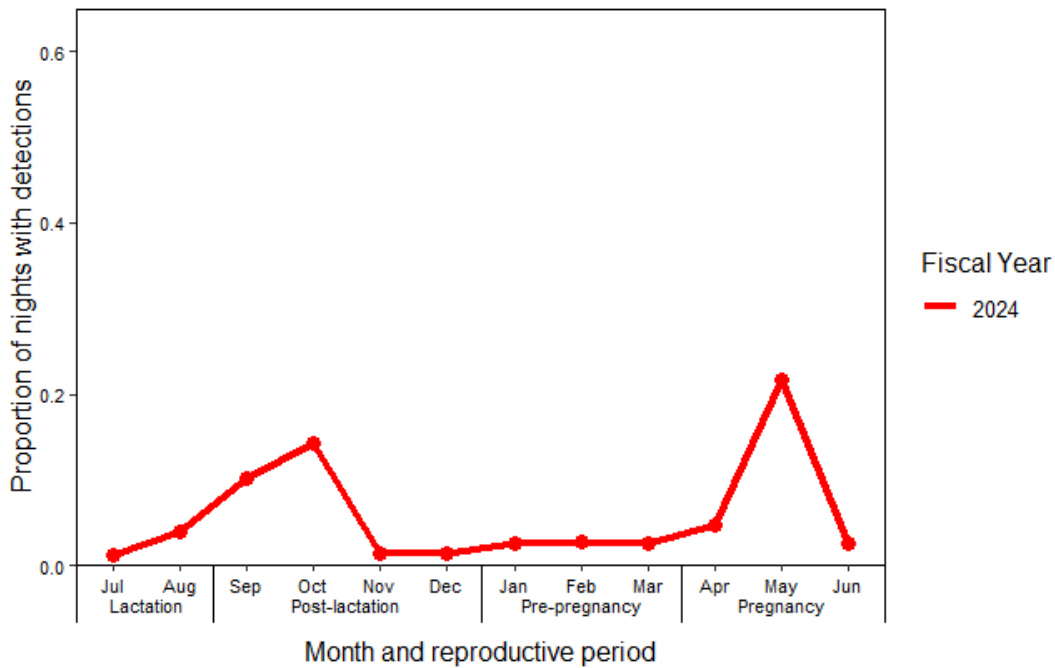


Figure 2. Monthly Detection Rates at the Project in FY 2024 with Corresponding Reproductive Periods

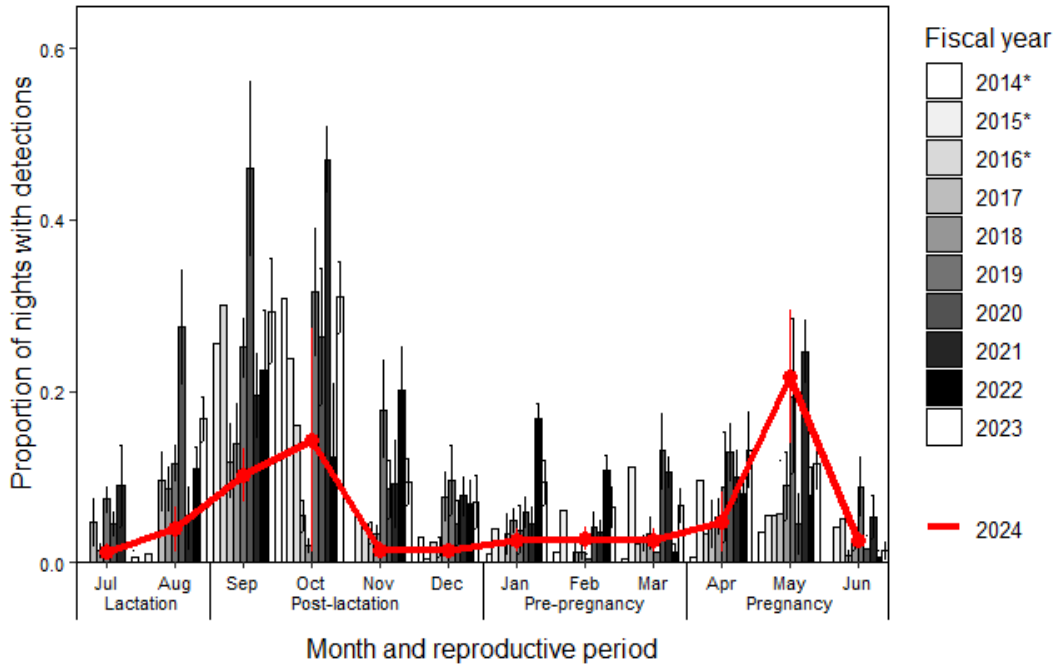


Figure 3. Monthly Bat Detection Rates at the Project for FY 2014 to FY 2024 with Corresponding Reproductive Periods

*Note: Error bars (SE) not available for fiscal years 2014, 2015, and 2016.

Table 4. Number of Nights Sampled, Number of Nights with Detections and Proportion of Nights with Bat Detections Between FY 2014 and FY 2024

Dates ¹	No. of Nights Sampled	No. of Nights with Detections	Proportion of Nights with Detections
FY 2014 (October 2013 - June 2014)	2,700	101	0.037
FY 2015 (July 2014 - June 2015)	3,203	249	0.078
FY 2016 (July 2015 - June 2016)	2,426	175	0.072
FY 2017 (July 2016 - June 2017)	2,827	131	0.046
FY 2018 (July 2017 - June 2018)	2,989	162	0.054
FY 2019 (July 2018 - June 2019)	2,906	372	0.128
FY 2020 (July 2019 - June 2020)	1,853	280	0.151
FY 2021 (July 2020 - June 2021)	1,680	225	0.134
FY 2022 (July 2021 - June 2022)	1,756	167	0.095

Dates ¹	No. of Nights Sampled	No. of Nights with Detections	Proportion of Nights with Detections
FY 2023 (July 2022 - June 2023)	1,778	214	0.121
FY 2024 (July 2023 - June 2024)	1,715	92	0.054

¹Number of monitoring sites: FY 2014 - 2019 (*n* = 9), FY 2020 - 2023 (*n* = 5)

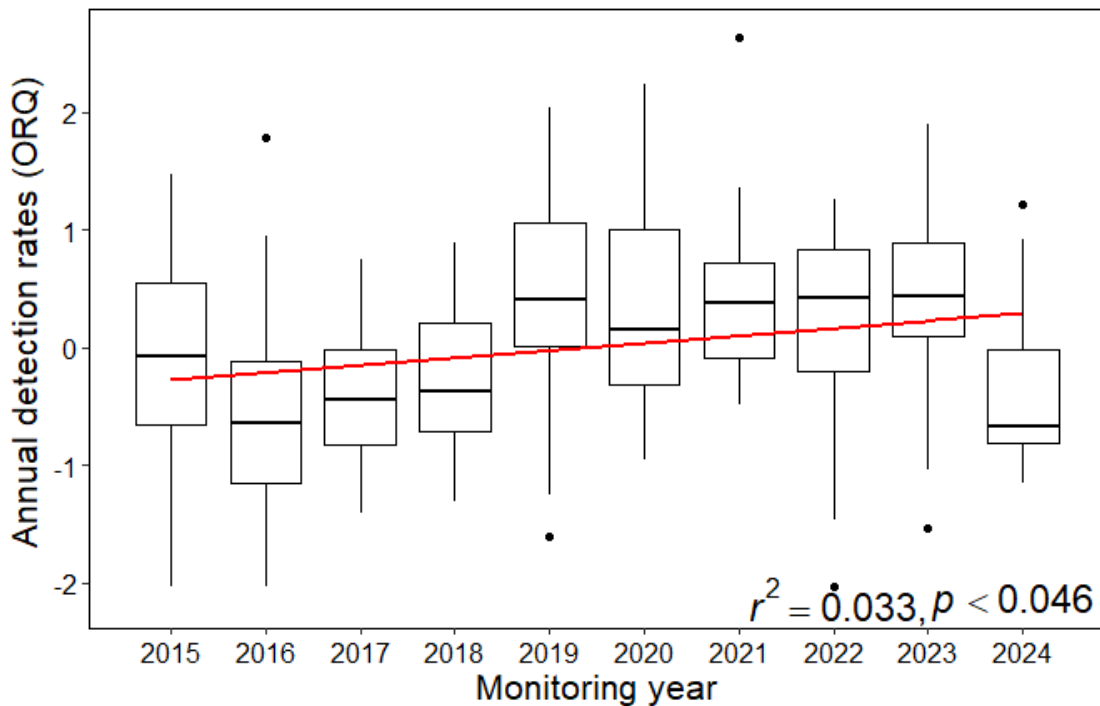


Figure 4. Box-plot with Linear Regression Showing the Increasing Trend in the Annual Detection Rate at the Project Between FY 2015 and FY 2024

*Note: Ordered Quantile normalization transformation (ORQ). All data were normalized using this transformation.

9.2 Nēnē – Haleakalā Ranch Release Pen

In 2009, the Project provided \$264,000 to DOFAW to fund construction and management of the Haleakalā Ranch nēnē release pen as part of Project nēnē mitigation. DOFAW constructed the release pen three years later. Funding has been used by DOFAW to perform fence maintenance, predator control, vegetation management, and monitoring at the Haleakalā Ranch pen. Nēnē have been translocated from Kaua’i to the Haleakalā Ranch pen since 2011, and several benefits have

accrued based on the effects of these actions including production of fledglings and increases adult survival rates.

In FY 2024 KWP I worked closely with DOFAW and USFWS to develop proposals to allocate previously unspent funds and to provide additional funding for historic shortages. In a letter dated July 12, 2024, DOFAW provided concurrence on allocation of previously unspent funds for management at the Haleakalā Ranch nēnē release pen for FY 2021 through FY 2023. On September 26, 2024, KWP I provided an additional payment of \$228,585 to fund historic shortages from 2012 through 2018 at the Haleakalā Ranch nēnē release pen. KWP I is awaiting the credit allocation letter from DOFAW. The credit allocation from FY 2012 through FY 2023 for the fledglings and increased adult survival (as agreed to by KWP I, DOFAW, and USFWS) at the Haleakalā Ranch release pen are summarized in Appendix 2b.

KWP I acknowledges the Project is still lagging in mitigation credits, and is working with DOFAW and USFWS to adaptively manage the nēnē mitigation program. Cumulatively, the increases in adult and juvenile survival and productivity achieved by KWP I's mitigation project have not been sufficient to fully offset the mitigation obligations of Tier 1. KWP I is currently working on pen habitat and infrastructure improvements at the Haleakalā Ranch release pen for the FY 2025 breeding season in an attempt to increase productivity, in addition to other proposals for nēnē mitigation. Additionally, KWP I is coordinating with DOFAW and Haleakalā Ranch to plan a potential expansion of the existing pen. In FY 2025, KWP I will continue to work with DOFAW and USFWS to adaptively manage nēnē mitigation, including initiation of an additional mitigation project on Moloka'i.

9.3 Seabirds

KWP I is committed to seabird protection and recovery on Maui and Maui Nui. KWP I completed its mitigation obligation for both 'a'o and the 'ua'u prior to FY 2024.

9.3.1 'A'o Survey - East Maui

KWP II funded surveys for potential mitigation sites on east Maui, which were completed in September 2015 (KWP I 2016). These surveys identified potential colony locations, estimated the numbers of birds present, assessed predator activity, and evaluated management feasibility at the colony locations.

9.3.2 'Ua'u and 'A'o - Makamaka'ole

Mitigation efforts at Makamaka'ole began with the construction of the two predator exclosures completed in September 2013. Mitigation efforts at Makamaka'ole involved predator monitoring and trapping, artificial burrow checks and monitoring using game cameras, seabird social attraction using decoys and sound systems, and ongoing maintenance, including vegetation management, of both exclosures through January 2023.

On December 5, 2022, DOFAW provided a letter assessing that after the 2022 breeding season at Makamaka'ole, credit for 148 adults and 2 fledglings translated into 8.53 'a'o mitigation credits for KWP I (in conjunction with KWP II), and that KWP I had completed its mitigation obligation for the 'a'o. On December 8, 2022, USFWS provided a letter assessing credit for 149 adults and 2 fledglings, translating to a 'a'o mitigation credit of 8.54 adult equivalents, and that the mitigation obligation for KWP I (in conjunction with KWP II) had been met. Although Makamaka'ole had been managed to benefit the 'ua'u, as well as the 'a'o, no 'ua'u activity has been detected at burrows within the enclosures since 2017, and mitigation for the 'ua'u was adaptively managed to Lāna'i (Section 9.3.3).

In September 2024, KWP I signed a Memorandum of Agreement (MOA) with DOFAW (in conjunction with KWP II) to provide \$750,000 in funding for a fence replacement at Makamaka'ole and to resume specified management and monitoring activities at the site starting in FY 2025 and throughout the term of the current ITL.

9.3.3 Lāna'i 'Ua'u Protection Project

The 'ua'u have not been observed occupying the Makamaka'ole mitigation site since 2017. Therefore, both KWP projects worked together with USFWS and DOFAW to adaptively manage mitigation efforts for this species to ensure that its mitigation obligations are met.

Beginning in the 2018 'ua'u breeding season, both KWP projects worked with USFWS and DOFAW to adaptively manage 'ua'u mitigation efforts in an interim fashion. As a result of this adaptive management, KWP I provided funding to Pūlama Lāna'i to supplement 'ua'u breeding colony protection efforts on Lāna'i in 2018. The success of this program and difficulties in attracting petrels to Makamaka'ole suggested that both KWP projects could benefit the 'ua'u and make progress on mitigation obligations by continuing support for the Lāna'i petrel breeding program. From FY 2021 to FY 2023 (two breeding seasons), the two KWP projects adaptively managed their seabird mitigation programs by providing funding to Pūlama Lāna'i.

On March 27, 2023, USFWS provided a letter assessing that after the 2022 breeding season, the total estimated benefit provided for the 'ua'u from breeding colony protection efforts on Lāna'i was 89.20 credits based on a previously agreed upon assessment framework (pers. comm. E. Gosliner, USFWS, October 31, 2022 and P. Radley, DOFAW, November 16, 2022). Additionally, based on 'ua'u activity at Makamaka'ole in 2016 and 2017, in their March 27th letter, USFWS approved an estimated benefit for the 'ua'u of 0.56. Thus, the total mitigation benefit achieved across mitigation projects is 89.72 adult 'ua'u for both KWPs. KWP I's Tier 2 'ua'u mitigation obligation per the ITP is 38 'ua'u (including adults, subadults, fledglings, nestlings, and eggs). In the March 27 letter, USFWS acknowledges that KWP I has met its 'ua'u mitigation obligation. DOFAW has yet to provide similar documentation.

10.0 Adaptive Management

In accordance with the HCP, the Project began implementing Low Wind Speed Curtailment (LWSC) at all WTGs up to wind speeds of 5 meters per second (m/s) on July 29, 2014. LWSC is expected to reduce risk of bat take (Section 7.12). LWSC was increased to 5.5 m/s on August 4, 2014 in response to bat take occurring at the Project and at KWP II on March 13, 2013 and February 26, 2014. Curtailment at 5.5 m/s is in effect from sunset to sunrise, annually, from February 15 through December 15. The Project continues site-wide bat activity assessment via acoustic monitoring after the initial HCP-required 12-month monitoring period (Section 9.1.2).

The Project has previously implemented a variety of actions to minimize risk to the nēnē, which continued in FY 2024. Scavenger trapping efforts implemented at the Project to improve persistence of carcasses during fatality monitoring have contributed to reducing the risk of predation of the nēnē, and safety measures to avoid interactions between nēnē and canine search teams have been identified and are implemented as needed. In response to the current projections of potential take of the nēnē at the Project, KWP I has taken practicable actions to minimize the threats to the nēnē. In FY 2023, KWP I implemented a vegetation management plan developed with concurrence from the agencies reducing the amount of woody vegetation on site. The goal was to minimize the attractiveness of onsite habitat to the nēnē (Section 5.0). Because nēnē have a continued breeding presence at the site, KWP I will continue to reduce the amount of woody vegetation on site in FY 2025 in conjunction with agency approval.

KWP I will continue to monitor nēnē activity on site to inform vegetation management success, and continue to work with USFWS, DOFAW, and technical experts to further reduce risk to the species.

11.0 Agency Meetings, Consultations, and Visits

KWP I communicated actively with USFWS and DOFAW throughout FY 2024 through conference calls, site visits, in-person meetings, submittal of quarterly reports, and email communications related to the Project's HCP. The purpose of these communications included the required annual and semi-annual HCP implementation meetings, ESRC review of the annual report, focused discussions regarding mitigation projects, mitigation credits for the nēnē and seabird mitigation programs, and nēnē mitigation opportunities. A summary of agency coordination is presented in Table 5.

Table 5. Summary of Agency Coordination and Communication in FY 2024

Date	Communication	Participants
July 5, 2023	Email requesting clarification on requested Higher Level of Take as presented in the June 28 memo on nēnē take	Email from USFWS to KWP I
July 6, 2023	Email clarifying requested take	Email to USFWS, DOFAW from Tetra Tech on behalf of KWP I
July 12, 2023	Email regarding unspent funding provided by KWP I to DOFAW for management of Haleakalā Ranch release pen starting in February 2022	Email from DOFAW to KWP I
July 25, 2023	Moloka'i Translocation Proposal for Nēnē Mitigation	Submitted to DOFAW, USFWS by Tetra Tech on behalf of KWP I
August 1, 2023	Annual report submission	Submitted by Tetra Tech to DOFAW, USFWS
August 9, 2023	Email requesting DOFAW retain funds already provided for Haleakalā Ranch and apply this funding to past management efforts	Email from KWP I to DOFAW
August 14, 2023	Haleakalā Ranch Pen expansion round table discussion call	KWP I, Tetra Tech, Haleakalā Ranch, DOFAW (with DOFAW Maui), USFWS
September 6, 2023	Cancelled site visit due to Maui wildfires	KWP I, Tetra Tech, DOFAW, USFWS
September 11, 2023	USFWS-provided comments on annual report	USFWS, KWP I, Tetra Tech, DOFAW
September 20, 2023	USFWS response via email to July 25 nēnē mitigation proposal for Moloka'i stating that long-term management is necessary in addition to the proposed translocation funding.	Email from USFWS to KWP I, Tetra Tech, DOFAW
September 21, 2023	Teleconference to discuss Makamaka'ole fencing	KWP I, Tetra Tech, DOFAW, DOFAW Maui, Maui Forest Reserve, MNSRP, USFWS
September 25, 2023	Email response to July 25 proposal rejecting mitigation credit calculations	Email from DOFAW to KWP I
September 25, 2023	DOFAW proposal for allocation of unspent mitigation funds for nēnē	Submitted to KWP I by DOFAW
September 26, 2023	DOFAW-provided comments on annual report	DOFAW, KWP I, Tetra Tech
October 5, 2023	Email response to June 28 memo related to UCL use for compliance and mitigation obligations for nēnē	Email from USFWS to KWP I, Tetra Tech, DOFAW
October 6, 2023	Email requesting decision document from USFWS for requirement of 80 percent UCL	Email to USFWS from Tetra Tech on behalf of KWP I
October 16, 2023	Request for a decision document which outlines the policy around use of the 80% UCL	Email from Tetra Tech to USFWS on behalf of KWP I
October 18, 2023	Email requesting clarification on requested nēnē take	Email from DOFAW to KWP I

Date	Communication	Participants
October 19, 2023	Email response clarifying nēnē take	Email to DOFAW from Tetra Tech on behalf of KWP I
October 25, 2023	Submission of Final Annual Report	Submitted to DOFAW, USFWS by Tetra Tech on behalf of KWP I
October 30, 2023	Submission of Q1 report	Submitted to DOFAW, USFWS by Tetra Tech
November 2, 2023	Annual Implementation Meeting (teleconference)	KWP I, Tetra Tech, DOFAW, USFWS
November 28, 2023	Email requesting additional details on DOFAW's proposal to apply unspent nēnē mitigation funds	Submitted to DOFAW by KWP I
December 1, 2023	Email notification of nēnē mitigation planning	Submitted to DOFAW, USFWS by Tetra Tech on behalf of KWP I
December 7, 2023	Teleconference discussing nēnē take and mitigation	KWP I, Tetra Tech, DOFAW, USFWS
December 11, 2023	Hawaiian Hoary Bat Take Estimation Protocols	Sent by USFWS to KWP I
December 13, 2023	Email requesting additional information on use of 80 percent UCL	Sent to USFWS by Tetra Tech on behalf of KWP I
December 19, 2023	Notification of nēnē gosling fatality due to predation within the Haleakalā Ranch release pen	Submitted to DOFAW, USFWS by Tetra Tech
December 21, 2023	Revised proposal for allocation of unspent funding for nēnē mitigation	Submitted to KWP I by DOFAW
January 12, 2024	Downed Wildlife Report for January 9 nēnē fatality	Submitted to DOFAW, USFWS by Tetra Tech
January 31, 2024	Submission of Q2 report	Submitted to DOFAW, USFWS by Tetra Tech
February 16, 2024	Email response regarding justification for 80 percent UCL; request to focus on nēnē mitigation	Email from USFWS to KWP I
February 21, 2024	Rescheduled site visit to KWP I	KWP I, Tetra Tech, DOFAW, USFWS, Hawai'i Attorney General's (AG) Office
February 26, 2024	In-person meeting related to HCP implementation	KWP I, DOFAW, USFWS
February 27, 2024	Email requesting update on KWP I response to DOFAW December nēnē proposal	Email from DOFAW to KWP I
March 1, 2024	Downed Wildlife Report for February 27 nēnē fatality	Submitted to DOFAW, USFWS by Tetra Tech
April 3, 2024	Email regarding DOFAW-controlled shooting operation of axis deer in proximity to KWP I	Email from DOFAW to KWP I
April 5, 2024	Downed Wildlife Report for April 2 nēnē fatality	Submitted to DOFAW, USFWS by Tetra Tech
April 5, 2024	Letter regarding mitigation compliance for KWP I ¹	Sent by Hawai'i Attorney General's Office on behalf of DLNR to KWP I

Date	Communication	Participants
April 19, 2024	Memorandum outlining 8 potential nēnē mitigation options for discussion	Sent by KWP I to DOFAW, USFWS
April 24, 2024	Draft MOU for fence replacement payment to DOFAW for Makamaka'ole Seabird Enclosure	Sent by KWP I legal counsel to AG
April 26, 2024	Email received from AG regarding MOU	Sent by AG to KWP I legal counsel
April 29, 2024	Email received from AG regarding HCP amendments and Makamaka'ole management	Sent by AG to KWP I legal counsel
May 1, 2024	Submission of Q3 Report	Submitted to DOFAW, USFWS by KWP I
May 2, 2024	Call with Haleakalā Ranch and DOFAW-Maui (did not attend) related to potential pen expansion	KWP I, Tetra Tech, Haleakalā Ranch
May 2, 2024	Presentation and discussion of 8 nēnē mitigation options from the April 19 memo	KWP I, Tetra Tech, DOFAW, USFWS
May 3, 2024	Proposal sent accepting DOFAW December 2023 allocation of unspent nēnē funds	Submitted to DOFAW, USFWS by KWP I
May 3, 2024	Letter of intent to seek permit amendment and extension	Submitted to DOFAW, USFWS by KWP I
May 3, 2024	Email regarding potential payments for past work at Pi'iholo Ranch Release Pen	Email to DOFAW from KWP I
May 9, 2024	Call to discuss KWP I HCP amendment and permitting strategy	KWP I, Tetra Tech, DOFAW, USFWS
May 9, 2024	Email received from AG clarifying requests for Makamaka'ole	Sent by AG to legal counsel
May 10, 2024	Draft MOU for management of Haleakalā Release Pen	Submitted to DOFAW, USFWS by KWP I
May 17, 2024	Haleakalā Ranch Statement of Work	Submitted to DOFAW, USFWS by KWP I
May 22, 2024	Nēnē Mitigation Proposal – Payment for Historic Funding Shortages	Submitted to DOFAW, USFWS by KWP I
May 23, 2024	Bi-weekly call	KWP I, Tetra Tech, DOFAW, USFWS
May 23, 2024	Revised Nēnē Mitigation Proposal – Payment for Historic Funding Shortages	Submitted to DOFAW, USFWS by KWP I
May 24, 2024	Email clarifying calculations from Nēnē Mitigation Proposal – Payment for Historic Funding Shortages	Email from KWP I to DOFAW, USFWS
May 28, 2024	Further clarifications regarding calculations from Nēnē Mitigation Proposal – Payment for Historic Funding Shortages	Email from KWP to DOFAW, USFWS
May 31, 2024	Bulleted list of KWP I HCP Amendment items	Submitted to DOFAW, USFWS by KWP I
June 7, 2024	Semi-annual meeting (in person in Honolulu)	KWP I, Tetra Tech, DOFAW, USFWS

Date	Communication	Participants
June 12, 2024	Call with DOFAW-Maui regarding Maui Nui nēnē mitigation proposals (expansion of Haleakalā Release Pen and translocation of birds to Moloka'i)	KWP I, Tetra Tech, DOFAW
June 14, 2024	Second Revised Nēnē Mitigation Proposal – Payment for Historic Funding Shortages	Submitted to DOFAW, USFWS by KWP I
June 17, 2024	Draft Makamaka'ole MOU	Sent by AG to KWP I legal counsel
June 27, 2024	Newly established bi-weekly check in call with agencies	KWP I, Tetra Tech, DOFAW (USFWS provided update via email due to schedule conflict)
June 27, 2024	Third Revised Nēnē Mitigation Proposal – Payment for Historic Funding Shortages	Submitted to DOFAW, USFWS by KWP I
¹ Additional legal correspondence regarding this issue has occurred in FY 2023 and is not included in this table.		

12.0 Expenditures

Total HCP-related expenditures for the Project in FY 2024 were \$287,900 (Table 6).

Table 6. HCP-related Expenditures at the Project in FY 2024

Category¹	Amount
Permit Compliance	\$60,500
Fatality Monitoring	\$87,900
Acoustic Monitoring for Bats	\$17,500
Vegetation Management and Scavenger Trapping	\$32,800
Equipment and Supplies ²	\$20,000
Haleakalā Release Pen ³	\$69,200
Total Cost for FY 2024	\$287,900
¹ Staff labor costs are included in the overall costs for each category except for Equipment and Supplies.	
² Costs in FY 2024 include the purchase of updated acoustic monitoring equipment (see Section 9.1.2)	
³ Mitigation project are co-funded by KWP I and KWP II, this number represents KWP I's portion of the funding.	

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**Appendix 1. Dalthorp et al. (2017) Fatality Estimation for the
'Ōpe'ape'a, Nēnē, and 'Ua'u at the Project through FY 2024**

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Appendix 1a. Dalthorp et al. (2017) Fatality Estimation for the 'Ōpe'ape'a at Project Through FY 2024

Modeling Period	FY	Dates		Period Length (days)	% Year	LWSC	Search Interval (days)	Number of Searches in Modeling Period	Observed Fatalities (X)	K ¹	Canine Searches	DWP ²	ĝ			B		M* ³
		Begin	Ending										ĝ	95% LCI	95% UCI	Ba	Bb	
1	2007	6/22/2006	6/30/2007	373	1.02	no	9	41	0	0.7	No	1	0.445	0.261	0.638	11.21	13.96	1
2	2008	7/1/2007	6/30/2008	365	1	no	9	41	0	0.7	No	1	0.442	0.258	0.636	11.06	13.94	1
3	2009	7/1/2008	6/30/2009	364	1	no	7	52	0	0.7	No	1	0.501	0.312	0.69	12.70	12.64	1
4	2010	7/1/2009	6/30/2010	364	1	no	7	52	0	0.7	No	1	0.45	0.272	0.634	12.37	15.14	1
5	2011	7/1/2010	6/30/2011	364	1	no	7	52	0	0.7	No	1	0.505	0.257	0.752	7.145	7.007	1
6	2012	7/1/2011	6/30/2012	365	1	no	7	52	0	0.7	No	1	0.345	0.149	0.574	6.089	11.56	1
7	2013	7/1/2012	6/30/2013	364	1	no	7	52	2	0.7	No	1	0.414	0.183	0.669	5.894	8.335	7
8	2014	7/1/2013	6/30/2014	364	1	no	7	52	4	0.7	No	1	0.484	0.332	0.638	19.23	20.47	18
9	2015	7/1/2014	6/30/2015	364	1	5.5 m/s	7	52	0	0.7	No	1	0.217	0.128	0.321	14.76	53.30	19
10	2016	7/1/2015	6/30/2016	365	1	5.5 m/s	7	52	0	1	Yes	0.4922	0.44	0.408	0.472	407.9	520.1	19
11	2017	7/1/2016	6/30/2017	364	1	5.5 m/s	7	52	1	1	Yes	0.4922 or 0.573	0.524	0.499	0.549	816.1	741.0	21
12	2018	7/1/2017	6/30/2018	364	1	5.5 m/s	7	52	1	1	Yes	0.573	0.459	0.386	0.533	80.67	95.13	23
13	2019	7/1/2018	6/30/2019	364	1	5.5 m/s	7	52	1	1	Yes	0.573	0.368	0.289	0.45	50.35	86.64	26
14	2020	7/1/2019	6/30/2020	365	1	5.5 m/s	7	53	0	1	Yes	0.573	0.466	0.405	0.529	115.3	132.0	26
15	2021	7/1/2020	6/30/2021	364	1	5.5 m/s	7	52	0	1	Yes	0.573	0.437	0.351	0.522	58.18	75.11	26
16	2022	7/1/2021	6/30/2022	364	1	5.5 m/s	7	52	0	1	Yes	0.573	0.477	0.414	0.54	115.1	126.2	26
17	2023	7/1/2022	6/30/2023	364	1	5.5 m/s	7	52	1	1	Yes	0.573	0.52	0.486	0.555	545.7	500.7	28
18 (current)	2024	7/1/2023	6/30/2024	365	1	5.5 m/s	7	52	0	1	Yes	0.573	0.48	0.422	0.537	137.2	149.0	28

1. Searches performed by canine teams increases the probability that a missed carcass will be detected on the next search.

2. Where two values are represented, the searched area changed within the modeled period. Detection probability represents the cumulative detection for the year. See annual reports for details.

3. Cumulative value representing estimate of total direct take from the start of operations through the identified monitoring period at the 80 percent UCL.

Appendix 1b. Dalthorp et al. (2017) Fatality Estimation for the Nēnē at Project Through FY 2024

Modeling Period	FY	Dates		Period Length (days)	% Year	Search Interval (days)	Number of Searches in Modeling Period	Observed Fatalities (X)	K	Canine Searches	DWP ¹	\hat{g}			B		M ^{*2}
		Begin	Ending									\hat{g}	95% LCI	95% UCI	Ba	Bb	
1	2007	6/22/2006	6/30/2007	373	1.02	9	41	0	1	No	0.95	0.923	0.871	0.962	120.8	10.14	0
2	2008	7/1/2007	6/30/2008	365	1	9	41	2	1	No	0.95	0.923	0.871	0.962	120.8	10.14	2
3	2009	7/1/2008	6/30/2009	364	1	7	52	1	1	No	0.95	0.928	0.886	0.961	162.5	12.60	4
4	2010	7/1/2009	6/30/2010	364	1	7	52	1	1	No	0.95	0.928	0.886	0.961	162.5	12.60	5
5	2011	7/1/2010	6/30/2011	364	1	7	52	5	1	No	0.95 or 0.7	0.773	0.748	0.797	889.3	261.5	11
6	2012	7/1/2011	6/30/2012	365	1	7	52	1	1	No	0.7	0.678	0.633	0.72	299.4	142.5	13
7	2013	7/1/2012	6/30/2013	364	1	7	52	4	1	No	0.7	0.666	0.58	0.748	79.75	39.93	18
8	2014	7/1/2013	6/30/2014	364	1	7	52	3	1	No	0.7	0.683	0.626	0.737	183.9	85.39	23
9	2015	7/1/2014	6/30/2015	364	1	7	52	4	1	No	0.7	0.691	0.658	0.722	548.7	245.9	28
10	2016	7/1/2015	6/30/2016	365	1	7	52	1	1	Yes	0.29	0.284	0.265	0.302	661.2	1671	32
11	2017	7/1/2016	6/30/2017	364	1	7	52	0	1	Yes	0.29 or 0.35	0.327	0.314	0.341	1474.3	3031	34
12	2018	7/1/2017	6/30/2018	364	1	7	52	1	1	Yes	0.35	0.344	0.336	0.352	4420	8438	37
13	2019	7/1/2018	6/30/2019	364	1	7	52	2	1	Yes	0.35	0.339	0.282	0.399	84.70	165.3	42
14	2020	7/1/2019	6/30/2020	365	1	7	53	0	1	Yes	0.35	0.33	0.301	0.359	337.8	686.5	43
15	2021	7/1/2020	6/30/2021	365	1	7	52	0	1	Yes	0.35	0.336	0.315	0.357	674.4	1280	45
16	2022	7/1/2021	6/30/2022	364	1	7	52	1	1	Yes	0.35	0.345	0.315	0.375	327.5	622.8	49
17	2023	7/1/2022	6/30/2023	364	1	7	52	1	1	Yes	0.35	0.345	0.323	0.368	598.0	1133	52
18	2024	7/1/2023	6/30/2024	365	1	7	52	0	1	Yes	0.35	0.344	0.326	0.361	994.265	1898.82	53

1. Where two values are represented, the searched area changed within the modeled period. Detection probability represents the cumulative detection for the year. See annual reports for details.

2. Cumulative value representing estimate of total direct take from the start of operations through the identified monitoring period at the 80 percent UCL.

Appendix 1c. Dalthorp et al. (2017) Fatality Estimation for 'Ua'u at Project Through FY 2024

Modeling Period	FY	Dates		Period Length (days)	% Year	Search Interval (days)	Number of Searches in Modeling Period	Observed Fatalities (X) ¹	K	Canine Searches	DWP ²	ĝ			B		M ^{*3}
		Begin	Ending									ĝ	95% LCI	95% UCI	Ba	Bb	
1	2007	6/22/2006	6/30/2007	545	1.02	9	61	0	0.9	No	1	0.807	0.602	0.948	14.64	3.512	0
2	2008	7/1/2007	6/30/2008	365	1	9	41	1	0.9	No	1	0.786	0.593	0.928	16.78	4.580	2
3	2009	7/1/2008	6/30/2009	364	1	7	52	0	0.9	No	1	0.847	0.717	0.942	31.55	5.682	2
4	2010	7/1/2009	6/30/2010	364	1	7	52	0	0.9	No	1	0.861	0.706	0.963	22.06	3.566	2
5	2011	7/1/2010	6/30/2011	364	1	7	52	0	0.9	No	1 or 0.75	0.798	0.752	0.841	244.5	61.78	2
6	2012	7/1/2011	6/30/2012	365	1	7	52	2	0.9	No	0.75	0.581	0.431	0.724	24.57	17.70	5
7	2013	7/1/2012	6/30/2013	364	1	7	52	0	0.9	No	0.75	0.646	0.511	0.77	32.73	17.93	5
8	2014	7/1/2013	6/30/2014	364	1	7	52	1	0.9	No	0.75	0.714	0.668	0.758	281.2	112.6	6
9	2015	7/1/2014	6/30/2015	364	1	7	52	2	0.9	No	0.75	0.65	0.555	0.74	65.57	35.30	10
10	2016	7/1/2015	6/30/2016	365	1	7	52	0	1	Yes	0.204	0.197	0.18	0.214	414.2	1690	10
11	2017	7/1/2016	6/30/2017	364	1	7	52	0	1	Yes	0.204 or 0.246	0.232	0.221	0.243	1272	4216	11
12	2018	7/1/2017	6/30/2018	364	1	7	52	0	1	Yes	0.246	0.24	0.203	0.28	114.8	362.8	12
13	2019	7/1/2018	6/30/2019	364	1	7	52	1	1	Yes	0.246	0.239	0.196	0.284	85.2	272	14
14	2020	7/1/2019	6/30/2020	365	1	7	53	0	1	Yes	0.246	0.218	0.192	0.244	210.7	757.7	15
15	2021	7/1/2020	6/30/2021	365	1	7	52	0	1	Yes	0.246	0.2096	0.12	0.316	13.62	51.37	16
16	2022	7/1/2021	6/30/2022	364	1	7	52	0	1	Yes	0.246	0.24	0.225	0.254	814.0	2584	17
17	2023	7/1/2022	6/30/2023	364	1	7	52	0	1	Yes	0.246	0.239	0.224	0.255	671.1	2135	18
18 (current)	2024	7/1/2023	6/30/2024	365	1	7	52	0	1	Yes	0.246	0.242	0.230	0.254	1257	3940	18

1. FY 2013 fatality was mistakenly included in previous analyses. Based on the contemporaneous fatality report, the carcass was recovered outside of the designated search plots.
 2. Where two values are represented, the searched area changed within the modeled period. Detection probability represents the cumulative detection for the year. See annual reports for details.
 3. Cumulative value representing estimate of total direct take from the start of operations through the identified monitoring period at the 80 percent UCL.

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**Appendix 2. Indirect Take for the ‘Ōpe‘ape‘a, Nēnē, and ‘Ua‘u at
the Project through FY 2024**

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Appendix 2a. Indirect Take for the 'Ōpe'ape'a at the Project through FY 2024

Parameter	Description	Fiscal Year																		
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024 (current)	Total
A	Observed Breeding Female Take	0	0	0	0	1	0	0	2	0	0	0	1	0	0	0	0	1	0	5
B	Indirect Take from Observed Breeding Female Take	0	0	0	0	1.8	0	0	3.6	0	0	0	1.8	0	0	0	0	0	0	7.2
	(A x 1.8)																			
C	Observed Breeding Unknown Sex Take	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	Indirect Take from Observed Breeding Unknown Sex Take	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	(C * 0.5 * 1.8)																			
E	All Observed Take (Search and Incidental)	0	0	1	0	1	0	2	4	0	0	2	1	1	0	0	0	1	0	13
F	Estimated Take Multiplier (28/13=2.15)	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	2.15	
G	Estimated Direct Take	0	0	2.15	0	2.15	0	4.31	8.62	0	0	4.31	2.15	2.15	0	0	0	2.15	0	28
	(E x F)																			
H	Unobserved Direct Take (G - E)	0	0	1.15	0	1.15	0	2.31	4.62	0	0	2.31	1.15	1.15	0	0	0	1.15	0	15
I	Indirect Take Calculated from Unobserved Take	0	0	0.26	0	0.26	0	0.52	1.04	0	0	0.52	0.26	0.26	0	0	0	0.26	0	3.38
	(H * 0.5 * 0.25 * 1.8)																			
Total Indirect Take (B + D + I; juveniles)																				10.58
Total Indirect Take (B + D + I)*0.3 (adults)																				3.17

Appendix 2b. Indirect Take and lost productivity for the Nēnē at the Project through FY 2024

Parameter	Description	Fiscal Year																							
		2007	2008	2009	2010	2011		2012	2013	2014		2015		2016	2017	2018	2019	2020	2021	2022	2023		2024		Total
A1	Observed Adult Take	0	3	1	1	3	2	1	4	2	1	3	1	1	1	2	2	0	1	1	2	1	2	1	36
A2	Observed Juvenile Take	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
B	Estimated Take Multiplier (53/36= 1.47)	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	N/A
C	Estimated Adult Direct Take (A1 x B)	0.00	4.42	1.47	1.47	4.42	2.94	1.47	5.89	2.94	1.47	4.42	1.47	1.47	1.47	2.94	2.94	0.00	1.47	1.47	2.94	1.47	2.94	1.47	53
D	Observed Indirect Take Multiplier (Season Defined)	0	0.09	0	0	0.09	0	0.09	0.09	0.09	0	0.09	0.04	0.09	0.04	0.09	0.09	0	0.09	0.09	0.09	0.04	0.09	0.04	N/A
E	Observed Indirect Take (D x A1)	0.00	0.27	0.00	0.00	0.27	0.00	0.09	0.36	0.18	0.00	0.27	0.04	0.09	0.04	0.18	0.18	0.00	0.09	0.09	0.18	0.04	0.18	0.04	2.59
F	Unobserved Direct Take (C - A1)	0.00	1.42	0.47	0.47	1.42	0.94	0.47	1.89	0.94	0.47	1.42	0.47	0.47	0.47	0.94	0.94	0.00	0.47	0.47	0.94	0.47	0.94	0.47	17
G	Unobserved Indirect Take (F x 0.3*0.375*0.5)	0.000	0.080	0.027	0.027	0.080	0.053	0.027	0.106	0.053	0.027	0.080	0.027	0.027	0.027	0.053	0.053	0.000	0.027	0.027	0.053	0.027	0.053	0.027	0.956
H	Accrued Adult Take ([Previous Year's Accrued C]- N - L) (beginning 1/1/2011)							2.76	4.04	9.62		12.58	14.51	12.14	10.90	8.93	4.87	4.72	5.46		1.99		5.89	N/A	
I	Lost Productivity from accrued adult take (Current year's H x 0.1) (fledglings)							0.28	0.40	0.96		1.26	1.45	1.21	1.09	0.89	0.49	0.47	0.55		0.20		0.59	9.84	
J	(Indirect Take) + Lost Productivity ([E + G]+ I +A2), for fledglings							0.39	0.87	1.22		1.67	1.57	1.28	1.32	1.13	0.49	0.59	0.66		0.50		0.89	12.58	
K	Mitigation fledglings (fledglings) ¹							3.00	8.00	8.00		6.00	11.00	14.00	1.00	1.36	10.00	1.00	10.00		1.77		6.00	81.13	
L	Mitigation adult survival (adults) ¹							0.19	0.19	0.31		0.12	0.31	0.37	0.50	0.08	0.50	0.31	0.62		0.07		0.31	3.87	
M	Net fledglings remain (Current Year K - J)							2.61	7.13	6.78		4.33	9.43	12.72	-0.32	0.23	9.51	0.41	9.34		1.27		5.11	68.54	
N	Net adults 3 yrs. later (3 Years' Previous M*0.512)											1.34	3.65	3.47	2.21	4.83	6.51	-0.17	0.12		4.87		0.21	27.05	
Total Direct Take from Collisions with WTGs (adults; C)																									53.00
Total Indirect Take (fledglings; E + G)																									3.55
Total Indirect Take (adults; [E + G] x 0.512)																									1.82
Total Lost Productivity (fledglings; I)																									9.84
Total Lost Productivity (adults; I x 0.512)																									5.04
1. Based on Haleakalā Ranch annual outcomes; FY 2019 and FY 2023 are adjusted to account for partial crediting due to sharing of credits with KWP II, all other years are allocated 100 percent to KWP I.																									

Appendix 2c. Indirect Take for the 'Ua'u at the Project through FY 2024

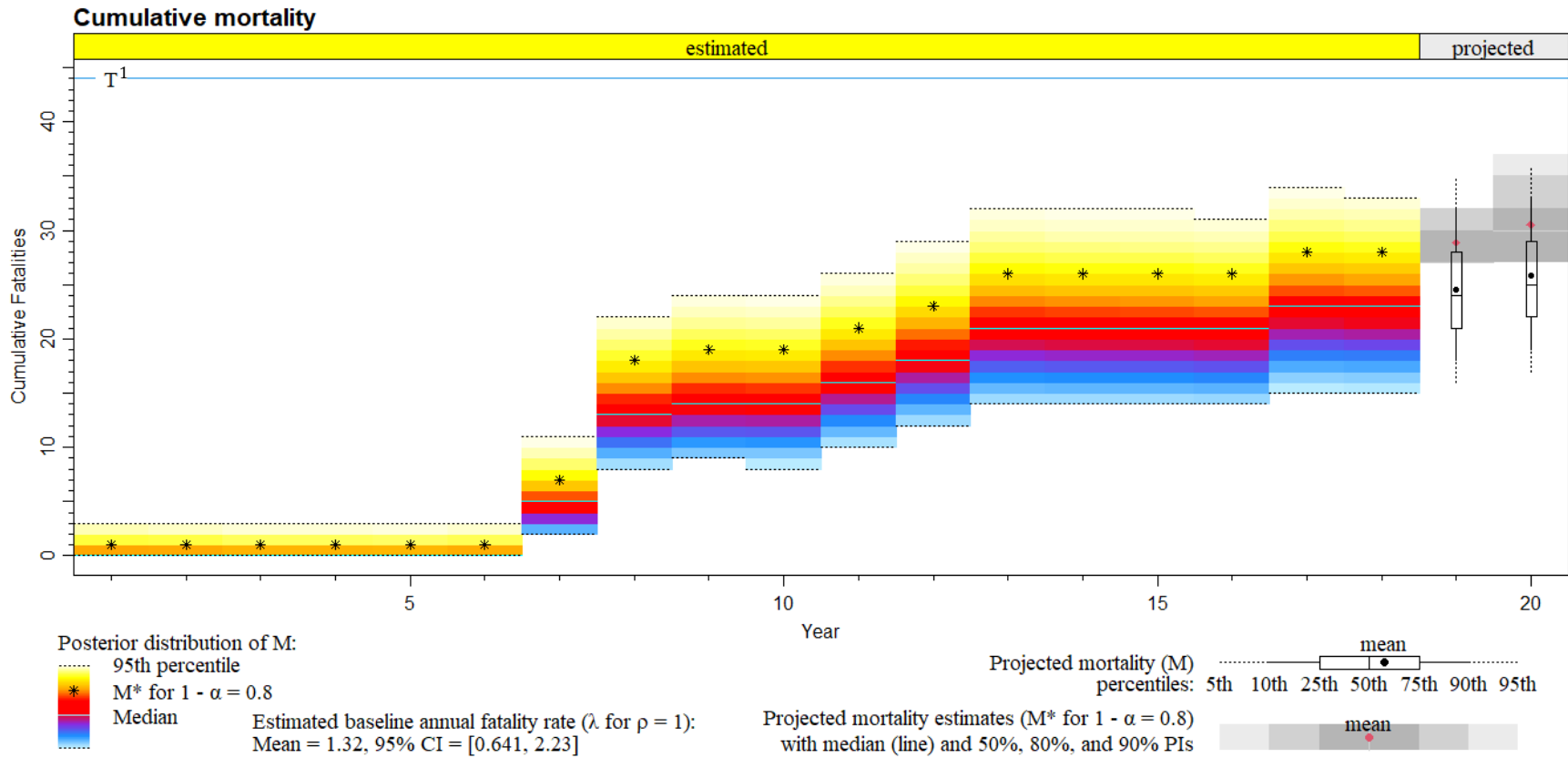
Parameter	Description	Fiscal Year																			Total	
		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2022	2023			
A	Observed Take	0	1	0	0	0	1	1	1	1	1	1	0	0	0	1	0	0	0	0	0	8
B	Estimated Take Multiplier (18/8=2.25)	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	N/A
C	Estimated Direct Take (A x B)	0	2.25	0	0	0	2.25	2.25	2.25	2.25	2.25	2.25	0	0	0	2.25	0	0	0	0	0	18
D	Observed Indirect Take Multiplier (Season defined)	0	0.66	0	0	0	0.66	0.5	0.89	0.89	0.89	0.66	0	0	0	0.89	0	0	0	0	0	N/A
E	Observed Indirect Take (A x D)	0	0.66	0	0	0	0.66	0.5	0.89	0.89	0.89	0.66	0	0	0	0.89	0	0	0	0	0	6.04
F	Unobserved Direct Take (C - A)	0	1.25	0	0	0	1.25	1.25	1.25	1.25	1.25	1.25	0	0	0	1.25	0	0	0	0	0	10
G	Unobserved Indirect Take (D x F)	0	0.83	0	0	0	0.83	0.63	1.11	1.11	1.11	0.83	0	0	0	1.11	0	0	0	0	0	7.55
Total Indirect Take (E + G) chicks/eggs																					13.59	
Total Indirect Take (E + G) x 0.3 adults																					4.08	

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**Appendix 3. 'Ōpe'ape'a, Nēnē and 'Ua'u 20-year Projected Take
at the Project as of FY 2024**

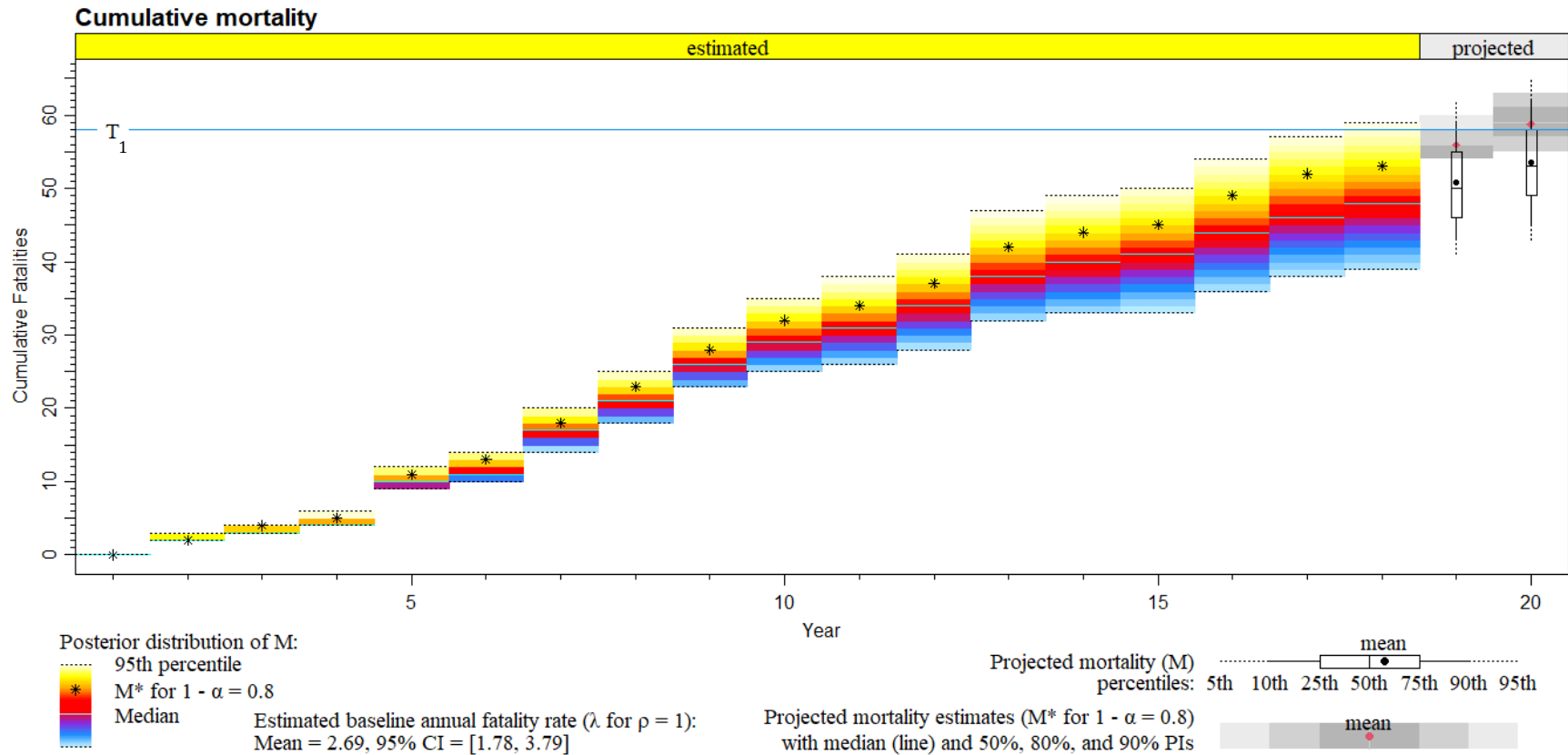
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Appendix 3a. Projected Cumulative Mortality for the 'Ōpe'ape'a at the Project



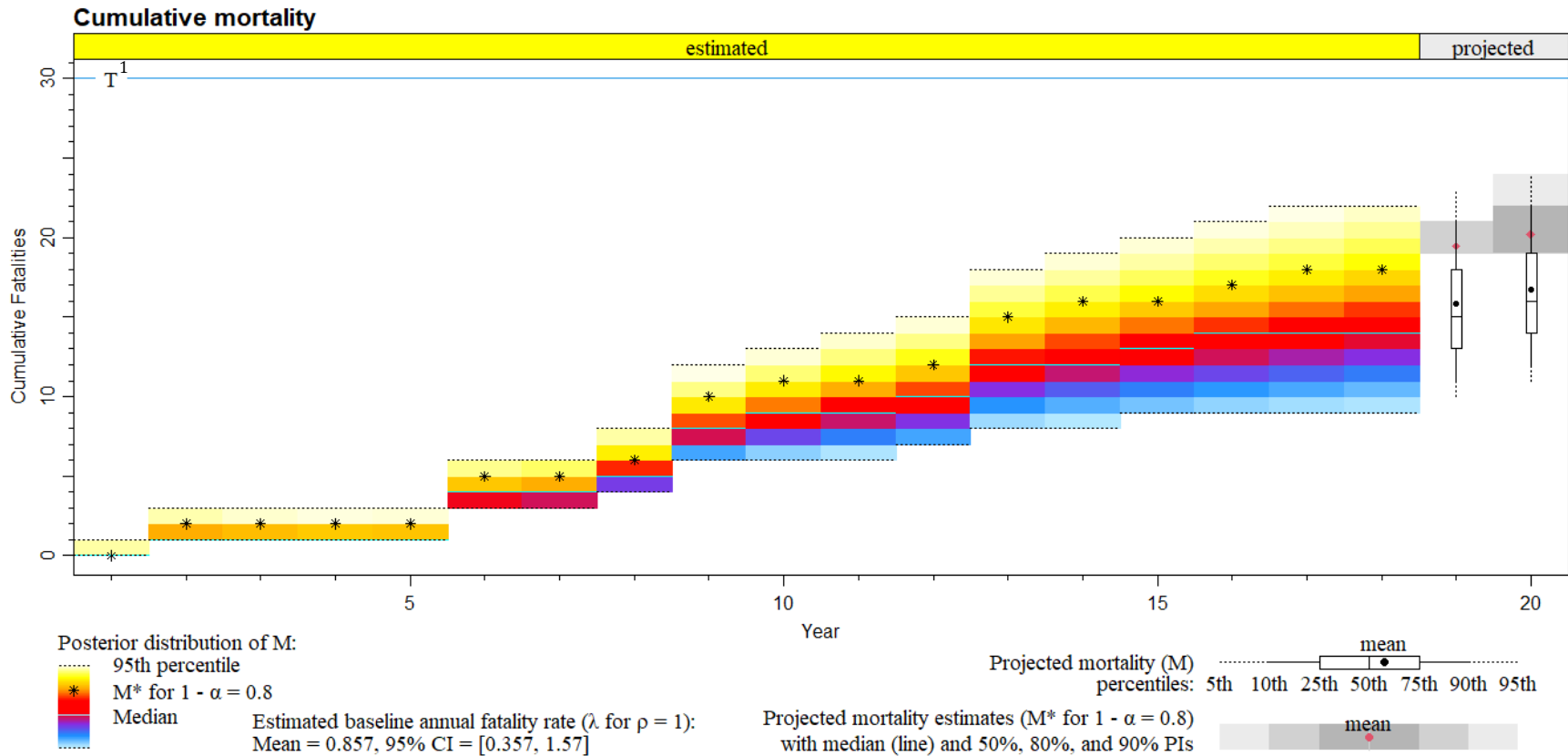
1. Permitted take for the 'ōpe'ape'a at the Project is 50; however, take as calculated from EoA only includes direct take. To account for indirect take in this figure, an approximate take threshold (T) of 44 is shown, representing authorized bat take (50) minus 6 adult equivalents of indirect take (12.0 percent of the authorized limit). Currently, the proportion of total take that is attributable to indirect take is 10.2 percent.

Appendix 3b. Projected Cumulative Mortality for the Nēnē at the Project with Tier 1 Threshold



1. Permitted take for Tier 1 of the nēnē at the Project is 60; however, take as calculated from EoA only includes direct take. To account for indirect take in this figure, an approximate take threshold (T) of 58 is shown, representing permitted nēnē take (60) minus 2 adult equivalents of indirect take (3.3 percent of the requested authorized limit). Currently, the proportion of total take that is attributable to indirect take is 3.4 percent.

Appendix 3c. Projected Cumulative Mortality for the 'Ua'u at the Project



1. Permitted take for the 'Ua'u at the Project is 38; however, take as calculated from EoA only includes direct take. To account for indirect take in this figure, an approximate take threshold (T) of 30 is shown, representing authorized petrel take (38) minus 8 adult equivalents of indirect take (21.1 percent of the authorized limit). Currently, the proportion of total take that is attributable to indirect take is 18.5 percent.

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Appendix 4. Documented Fatalities at the Project during FY 2024

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Species	Date Documented	WTG	Distance to WTG (meters)	Bearing from WTG (degrees)
<i>Francolinus francolinus</i> (Black francolin)	07/04/23	17	10	246
<i>Phasianus colchicus</i> (ring-necked pheasant)	07/25/23	2	1	105
<i>Francolinus pondicerianus</i> (Gray francolin)	08/01/23	13	1	294
<i>Zosterops japonicus</i> (Warbling white-eye)	10/17/23	Ops building	N/A	N/A
<i>Branta sandvicensis</i> (nēnē, Hawaiian goose) ²	01/09/24	12	25	100
<i>Phaethon lepturus</i> (koa'e kea; white-tailed tropicbird) ¹	01/09/24	13	40	188
<i>Branta sandvicensis</i> (nēnē, Hawaiian goose) ²	02/27/24	17	50	33
<i>Phasianus colchicus</i> (ring-necked pheasant)	03/05/24	20	93	30
<i>Phasianus colchicus</i> (ring-necked pheasant)	03/21/24	16	1	153
<i>Branta sandvicensis</i> (nēnē, Hawaiian goose) ²	04/02/24	15	27	221
<i>Francolinus francolinus</i> (Black francolin)	05/14/23	20	1	253
<i>Francolinus pondicerianus</i> (Gray francolin)	05/14/24	11	2	14
1. MBTA-protected species. 2. Covered Species.				

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**Appendix 5. Nēnē Monitoring and Predator Control
Management at Haleakalā Ranch, Maui Annual Report, FY 2023**

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Haleakalā Ranch
Maui
DOFAW FY 2024 Report

July 1, 2023 – June 30, 2024

Sighting:

Management of the Haleakala Ranch pen was turned over to KWP/TetraTech, as is completed by a local contractor as of January 2023. This includes mowing, weed control, fence maintenance, water maintenance, predator control trapping, and road maintenance. DOFAW conducts monthly nēnē monitoring surveys, tracks nesting success, and banding.

During this period a total of twenty (25) banded adult birds were observed at the pen with additional six (6) unbanded adults.

Nesting:

A total of nine (9) nests were found with four (4) being abandoned and five (5) successful nests. A total of thirteen (13) eggs hatched and six (6) were fledged and banded.

Banding:

A total of fourteen (14) individuals were banded at the Haleakala Ranch pen this past season, eight (8) adults and six (6) fledglings.

Pen Maintenance:

Maintenance conducted by the contractor, AES, year-round. The one-acre pen was mowed 33 times this past year.

Habitat Management:

Approximately 1 acre of alien vegetation were mechanically removed including lantana, strawberry guava, Bocconia, fireweed, and bur.

Trapping:

Predator control conducted by AES maintained sixteen (16) live cage traps, ten (10) DOC200s, and five (5) A24s. Of these traps a total of twenty (20) mongoose, two (2) rats were removed. Multiple observations of pueo in person and on game cameras were noted throughout the nesting season. No aerial predator control was conducted.

Deaths: Five (5) goslings were predated by either aerial predators or possibly mongoose, no carcasses were found in the area. Two (2) goslings died of natural causes and bodies were salvaged and placed in DOFAW freezer.

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**Appendix 6. Haleakalā Ranch Nēnē Release Pen Program
Annual Report FY 2024**

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INTRODUCTION OF NĒNĒ TO HALEAKALĀ RANCH, MAUI

ANNUAL REPORT

FY 2024 (JULY 1, 2023, through JUNE 30, 2024)

1.0 Introduction

In May 2011, the Hawai‘i Department of Land and Natural Resources—Division of Forestry and Wildlife (DOFAW), with funding from the Kaheawa Wind Power I (KWP I) project, established a Nēnē Introduction Program (Program) at Haleakalā Ranch (Ranch), Maui. The purpose of this Program was to establish a population of the endangered nēnē, or Hawaiian goose (*Branta sandvicensis*), at the Ranch. The Program included construction of a release pen, where ongoing management includes efforts to keep predators excluded from the approximately one acre pen.

The Program contributes to the mitigation requirements for the nēnē as identified in the KWP I and Kaheawa Wind Power II (KWP II; collectively, the Projects) Habitat Conservation Plans (KWP I 2006, SWCA 2019). As part of the Program, Haleakalā Ranch, LLC committed to maintaining or improving the Ranch premises, which are considered to provide a significant amount of habitat that may be suitable for nēnē, for renewable periods of 10 years over the 50-year term of the Haleakalā Ranch Safe Harbor Agreement (SHA; USFWS et al. 2019). The Program has successfully produced fledglings at the Ranch since 2012. Efforts are focused on the open-top release pen that was constructed in 2011, though nēnē observed outside this pen are also recorded.

From 2012 through 2022, KWP I (sometimes in conjunction with KWP II) provided DOFAW with funding to maintain and manage the release pen at the Ranch. In 2021, DOFAW requested that the Projects assume direct management of the release pen. Both parties agreed that the Projects would assume management activities on December 8, 2022, while the Parties work to finalize a Memorandum of Understanding (MOU). The Projects contracted Aloha Environmental Services (AES) to conduct the work as laid out in the Statement of Work (SOW), to be appended to the MOU. Key needs for establishing a population of nēnē at the Ranch were identified in the SHA as nest monitoring, pen maintenance, habitat management, and predator control. This report and the activities described herein are in compliance with the Ranch’s SHA (USFWS et al. 2019). This report provides details of the 2023 – 2024 breeding season at the Ranch through the end of Fiscal Year (FY) 2024 (June 30, 2024).

2.0 Funding

Table 1 shows the expenditures during FY 2024.

Table 1. Expenditures During July 1, 2023 – June 30, 2024 for the Nēnē Release Pen Mitigation Program at Haleakalā Ranch, Maui

Category	KWP I Funded Amount	KWP II Funded Amount	Other Funding/Source
Road Improvement	\$5,900	\$4,100	n/a
Nēnē Monitoring	\$12,400	\$0	
Banding	\$0	\$0	
Pen Maintenance	\$7,000	\$0	
Habitat Management	\$18,040	\$0	
Predator Control	\$14,806	\$0	
Reporting	\$8,000	\$0	
Adaptive Management Actions	\$3,000	\$0	n/a
Total Cost for FY 24	\$69,146	\$4,100	

3.0 Mitigation Actions

3.1 Road Improvement

The road to the pen was maintained periodically by AES staff, as needed, by moving rocks and backfilling holes with dirt and rocks. Per Right of Entry agreement with Haleakala Ranch, LLC, the Projects provided \$10,000 to the ranch for road repair activities in May 2024 (see Table 1).

3.2 Nēnē Monitoring

3.2.1 Sightings

AES personnel at the Ranch began biweekly observations (every 2 weeks) in July 2023 and transitioned to weekly observations and monitoring from August 1, 2023 to April 30, 2024. All visits were weather dependent and required Ranch personnel approval. AES personnel transitioned back to biweekly observations and monitoring from May 1 to June 30, 2024. A biweekly frequency is used during the non-breeding season to minimize impacts to the road to the release pen.

Observations of banded and unbanded birds were recorded at the Ranch to monitor movements, distribution, and survival of nēnē using both visual, binocular surveys, as well as footage from three strategically placed game cameras within the pen. In FY 2024, 25 distinct banded adults and, at minimum, six unique un-banded adults were observed at the Ranch.

3.2.2 Nesting

During nesting season, records were kept on mated pairs and the breeding status of females found at the Ranch. Nests found at the Ranch were marked using GPS and checked weekly to determine their status. Nesting activities, nest outcomes, hatching, and fledgling success were recorded for the nesting season. Survey methods for nesting activity/success included both weekly visual (binocular) surveys, as well as daily data collection by on site game cameras.

Nine nests or nesting attempts were located within the Ranch open-top release pen this year (Table 2/Map 1. Appendix A). Five of these nests successfully hatched goslings and four nesting pairs were able to raise goslings to fledging success. A total of 13 nēnē hatched between the five successful nests, and six juvenile nēnē successfully fledged from the Ranch open-top release pen this season. AES personnel confirmed the fledging of all six goslings by compiling data from both visual observations, as well as by daily photo documentation taken by game cameras between January 1 and June 30, 2024 (Appendix A). No nests were observed outside of the nēnē pen in the 2023 – 2024 breeding season.

Table 2. Nēnē Nesting Summary for 2023-2024 Breeding Season at Haleakalā Ranch, Maui

Total Number of Nests	
Located in open-top pen	9
Successful	5
Abandoned	4
Depredated	0
Failed (other reason)	0
Renests	0
Total Number of Eggs	
Known	14
Destroyed naturally	1
Depredated	0
Salvaged	0
Hatched	13
Total Number of Goslings/Fledglings	
Known goslings	13
Goslings depredated	5¹
Goslings died (other reason)	2
Fledglings fledged from pen (credited for mitigation)	6
¹ Suspected depredation by aerial predators, but unconfirmed by direct evidence. See section 3.6.	

3.3 Banding

This year DOFAW staff banded a total of 14 nēnē at the open-top release pen. This included six fledglings and eight adults. Of the eight adults that were banded, six were re-bands, and two were newly banded individuals. Banding took place on 3/12/24, and data were compiled and sent to AES on 4/1/24.

3.4 Pen Maintenance

The open-top pen’s fence line was continuously monitored and maintained by AES throughout the fiscal year. The fence line was weed-whacked and mowed for weed control, and trees were trimmed along the exterior boundary to prevent bridge entry by predators. The large pond was cleaned and flushed twice a month, and smaller baths were cleaned and maintained weekly. The water system’s shutoff valve was replaced for a second time after it was found to be leaking. The electric fence insulators, solar batteries, and grounding stakes/wires were maintained and operational throughout the nēnē nesting period.

3.5 Habitat Management

Short grass habitat was maintained at the open-top release pen. The 1-acre pen was mowed 33 times this year to maintain nēnē short grass habitat. During the pre-breeding and breeding season

(August 1st – May 1st), the 1-acre open-top pen was mowed up to once a week and the area around the outside of the pen was maintained as needed. During the non-breeding season (May 1st – June 30th), the open-top pen and the surrounding perimeter was mowed approximately every other week and non-native/overgrown vegetation was cleared around potential nesting areas as needed. Approximately 1 acre of alien vegetation was mechanically removed, including lantana (*Lantana camara*), strawberry guava (*Psidium cattleianum*), Bocconia (*Bocconia frutescens*), fireweed (*Senecio madagascariensis*), and bur from both open top pens and covered secondary enclosures.

3.6 Predator Control

Predator traps are used to control rats (*Rattus rattus*), mongoose (*Herpestes javanicus*), and feral cats (*Felis catus*) that may pose a threat to nēnē and their nesting sites. Traplines were baited and checked weekly at the Ranch during the breeding season, and biweekly during non-breeding season using 16 Tomahawk live traps, 10 DOC 200 traps, and 5 A24s.

In FY 2024 at the Ranch, 20 mongoose and two rats were removed through predator trapping. Of the 20 mongoose removed, 18 were trapped by Doc 200s outside of the nēnē pen, one mongoose was caught in a cage trap outside of pen, and one was caught inside nēnē pen in a Doc 200 trap while nēnē were actively sitting on nests between the months of December and February (Table 3). No avian predators were controlled this season at the Ranch, and no cats were caught.

Multiple observations were made of pueo (Hawaiian short-eared owl, *Asio flammeus sandwichensis*) pairs hunting above and around the nēnē pen during nesting season. Game camera traps were able to catch a still photo of a pueo inside of pen on December 27th, 2023. Between the months of December and January, five hatched goslings disappeared from the site. No gosling carcass or remains of any kind were recovered after extensive searching, indicating cause of predation may be avian. There is currently no formal program in place for the removal of avian predators; pueo is a culturally significant species.

Table 3. Traps Deployed and Predators Removed during 2023 – 2024 Breeding Season

Location	Trap Type	Trap nights per trap	Mongoose	Cat	Rat
Outside Pen	DOC200 (5)	365	18	0	0
	Cage (16)	228 ¹	1	0	0
Inside Pen	DOC200 (5)	365	1	0	2
	A24 (5)	365	0	0	0

1. Live traps were closed and moved inside after all goslings were confirmed fledged. Traps were moved to avoid damage by cattle moved to the area for grazing.

3.7 Relocations

No nēnē were reported to be relocated by DOFAW personnel throughout the 2023-2024 breeding season (FY 2024).

3.8 Injury, Fatalities, Disease

The only documentable nēnē deaths that occurred this season at the Ranch were those of two goslings due to failed/unsuccesful nests. A total of two gosling deaths were attributed to abandonment and inclement weather factors. The first documented gosling fatality was discovered on December 15th, 2023 by AES staff, one meter from where the first hatched nest was documented that same day (Map 1, Appendix A). A detailed fatality report of the incident was supplied to DOFAW on December 19th, 2023. The carcass was not predated and looked to be less than 1 week old. The second carcass was found and collected by DOFAW during a site visit on January 29th, 2024. Reporting stated that this carcass did not look to be predated and looked to be age G2. In addition to these two documented gosling deaths, there were also a total of five hatched goslings that seemingly disappeared with no trace of predation left behind. Suspected depredation by aerial predators is a hypothesized cause for this but is still unconfirmed by direct evidence.

3.9 Adaptive Management Actions

During the breeding season, Biologists on site witnessed numerous occurrences of competition/aggressive behavior between nesting pairs within close proximity to each other. Attempts were made to expand the short grass habitat as well as to create new short vegetation corridors leading to favorable nesting locations inside of the pen. After time, nēnē were seen regularly utilizing these new areas, helping to alleviate some of the pressures of other breeding pairs within close proximity. Mechanical issues with the riding lawn mower arose early in the fiscal year. Onsite technicians were able to trouble shoot a faulty starter solenoid and complete all maintenance work onsite.

4.0 Results

4.1 Calculation of Nēnē Produced (Mitigation Credit)

Six nēnē were produced and successfully fledged at the pen during the 2023 – 2024 breeding season. These fledglings, and the increased adult survival for the five breeding pairs at the pen will contribute to mitigation credits for the Projects. Mitigation credits accrued with the 2023 – 2024 breeding year will be allocated to KWP I for this year.

5.0 Literature Cited

KWP I (Kaheawa Wind Power, LLC). 2006. Kaheawa Pastures Wind Energy Generation Facility Habitat Conservation Plan. January 2006.

SWCA (SWCA Environmental Consultants). 2011. Kaheawa Wind Power II Wind Energy Generation Facility Habitat Conservation Plan. Prepared for Kaheawa Wind Power II, LLC. December 2011.

USFWS (U.S. Fish and Wildlife Service), Haleakala Ranch, and Department of Land and Natural Resources (DLNR). 2019. Safe Harbor Agreement for Nēnē at Haleakala Ranch, Island of Maui.

Appendix A

Haleakalā Ranch Nēnē Release Pen Mitigation Program
Annual Report
[KWP LLC and KWP II LLC]



Photo 1. Bulldozer conducting access road maintenance in September 2023.



Photo 2. On going weed-eating and hauling out overgrown grass to create more usable habitat

Haleakalā Ranch Nēnē Release Pen Mitigation Program
Annual Report
[KWP LLC and KWP II LLC]

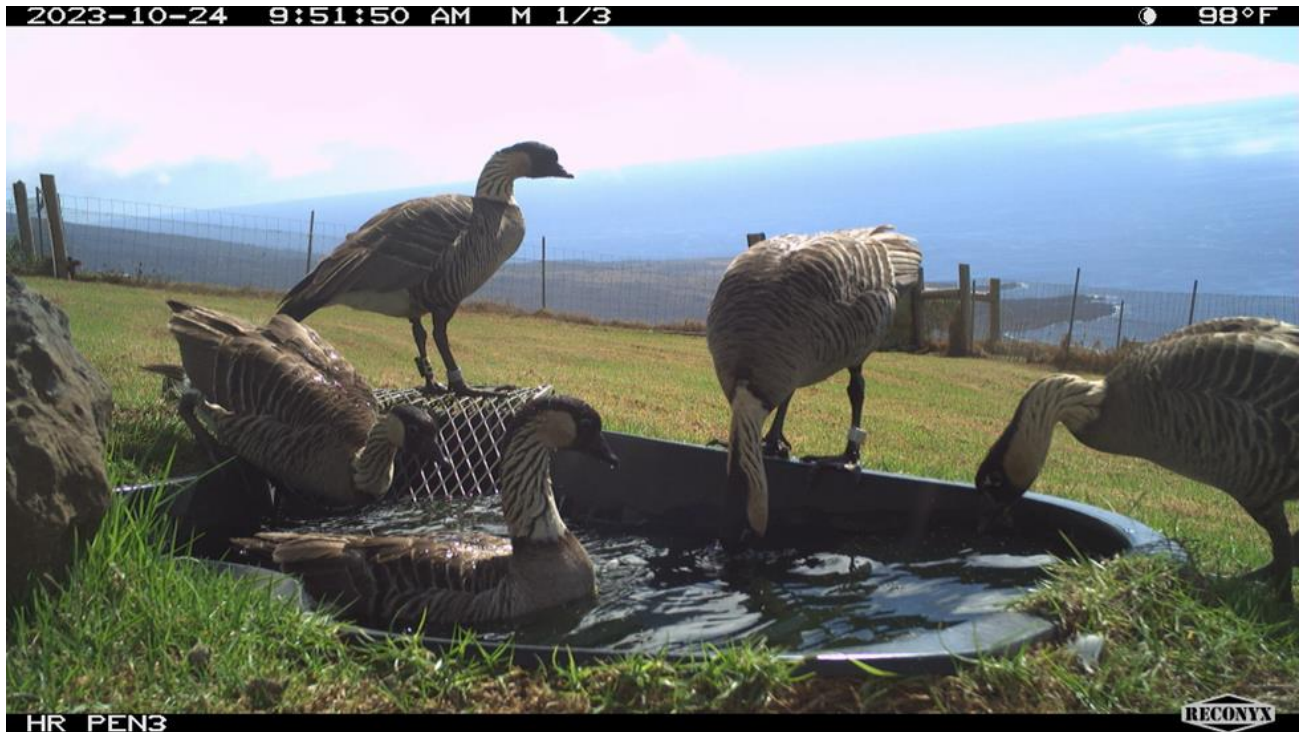


Photo 3. ACJ/AL(female), AL/--(male) and three un-banded individuals on 10/24



Map 1. Nēnē nests/gosling fatality locations detected in 2023-2024 breeding season.

Haleakalā Ranch Nēnē Release Pen Mitigation Program
Annual Report
[KWP LLC and KWP II LLC]



Photo 4. Group of nēnē inside pen enjoying a freshly mowed lawn.



Photo 5. Freshly mowed fence perimeter

Haleakalā Ranch Nēnē Release Pen Mitigation Program
Annual Report
[KWP LLC and KWP II LLC]



Photo 6. Fresh water and fresh mowing



Photo 7. Pueo owl caught on game camera footage inside pen.

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[KWP LLC and KWP II LLC]



Photo 8. ACJ/AL(female), AL/--(male) with their four goslings before two disappeared.



Photo 9. AL/-, -/AL Pair with their two goslings, practicing take offs.



Photo 10. Fourteen newly banded individuals observed on March 15, 2024