LANAI METEOROLOGICAL TOWERS

HABITAT CONSERVATION PLAN

PERMIT NO. TE194350-0 AND LICENSE NO. ITL-09

SEVENTH ANNUAL REPORT

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1.0 Introduction

In August 2008, Castle & Cooke Properties, Inc. (Castle & Cooke) and Tetra Tech, Inc. (Tetra Tech), in collaboration with the U.S. Fish and Wildlife Service (USFWS) and Hawaii Division of Forestry and Wildlife (DOFAW), finalized a joint Habitat Conservation Plan (HCP) for the construction and operation of six meteorological (met) towers on the island of Lanai (Project; Tetra Tech 2008). The HCP was developed to obtain an incidental take permit and incidental take license (ITP/ITL) issued by USFWS and DOFAW in September and October 2008, respectively, for four federally and state-listed species including the Hawaiian petrel (*Pterodroma sandwichensis*), the Hawaiian hoary bat (*Lasiurus cinereus semotu*), the Hawaiian stilt (*Himantopus mexicanus knudseni*), and the Newell's shearwater (*Puffinus newelli*).

The met tower HCP established an incidental take limit for each of the covered species during the period the met towers are in operation. The initial term of the HCP was for 2 years through March 1, 2010. The ITP/ITL was amended twice:

- On December 7, 2009, Castle & Cooke requested a minor amendment to the ITP/ITL to extend the period of coverage for an additional 2 years (through March 1, 2012) and to reduce the monitoring and reporting requirements. The amendment was authorized for the ITL on March 11, 2010. USFWS and DOFAW agreed to the requested changes to the monitoring protocols and reporting. In February 2010, five of the six met towers were taken down, leaving only tower 1 in operation (see the Lanai Meteorological Towers HCP 4th annual report for details).
- A second, minor amendment was on granted on February 28, 2012 to extend the period of coverage under the ITL to March 1, 2016. On April 13, 2012, a minor amendment to the ITP was granted extending coverage over the same period.

On July 3, 2014 Castle & Cooke requested termination of the HCP and the associated ITP/ITL due to the removal of the single remaining met tower from the Project on April 29, 2014. This is the final report prepared per ITP/ITL commitments as outlined in the HCP, covering activities conducted in Fiscal Year (FY) 2014 from fall 2013 through the beginning of spring 2014.

The two primary programs implemented as part of the HCP included a Post-construction Monitoring Plan (PCMP) at the met towers and an offsite mitigation plan. The PCMP, which has been implemented since 2008, was developed as a means to document impacts, if any, to the covered species as a result of operation of the Project, and to ensure compliance with the authorized provisions and take limits of the HCP and the associated ITP/ITL. Take has not occurred for any of the covered species over the life of the Project. The offsite mitigation plan, which consisted of a combination of predator control and habitat restoration on Lanai, was designed to compensate for potential incidental take of the four covered species during the period of the ITP/ITL, and provide these species a net benefit. The Tier 1 mitigation plan has been fully implemented by DOFAW and is not addressed further here.

2.0 Study Area

The Lanai met tower project is located on the northwestern portion of Lanai (Figure 1). Lanai is generally a hilly island that rises gradually to 1,027 meters (3,369 feet) above sea level at Lanaihale, or Mount Palawai. The project area is remote with a few dirt roads providing access to the shoreline and the met tower locations. There are no nearby existing structures. Lanai City is located about 3 kilometers (5 miles) southeast of met tower 1. Much of the terrestrial habitat on Lanai has been disturbed by several factors, including the establishment of the Cook Island pine (*Araucaria columnaris*), 100 years of island-wide Dole pineapple plantations, cattle grazing, the release of non-native game species, and the incidental release of non-native terrestrial species such as house cats (*Felis domesticus*), Norway rats (*Rattus norvegicus*), and black rats (*Rattus rattus*). Habitat within the footprint of the met tower and in the surrounding area ranges from barren eroded soils to shrub/scrub, interspersed with areas of open grassland.

Met tower 1 is in a badlands area and the central portion of the search plot consists of bare ground, beyond which is grassland where Angleton grass (*Dichanthium aristatum*) predominates (AECOS 2007). Grass height is approximately 1 meter (3 feet) or lower. Scattered shrub growth, located on the eastern and western margins of the search plot, consists of ‘a‘ali‘i (*Dodonaea viscosa*), lantana (*Lantana camara*), uhaloa (*Waltheria indica*), and Brazilian pepper (*Schinus terebinthifolius*). This vegetation typically ranges from approximately 1 to 2 meters (3 to 7 feet) in height. However, vegetation is maintained each year as needed in order to keep growth at a lower height for increased visibility.

3.0 PCMP Methods

The survey protocol implemented in FY 2014 was consistent with methods previously reported. A description of each survey parameter is provided below. The USFWS Special Purpose Permit, valid through March 31, 2013, was not renewed due to changes in internal USFWS policy. The Protected Wildlife Permit was amended by DOFAW on March 28, 2012 and is valid through March 11, 2016. However, without both permits in effect, any native species found during the carcass searches were to be left in place, and only non-native/game birds were used in the carcass persistence trial.

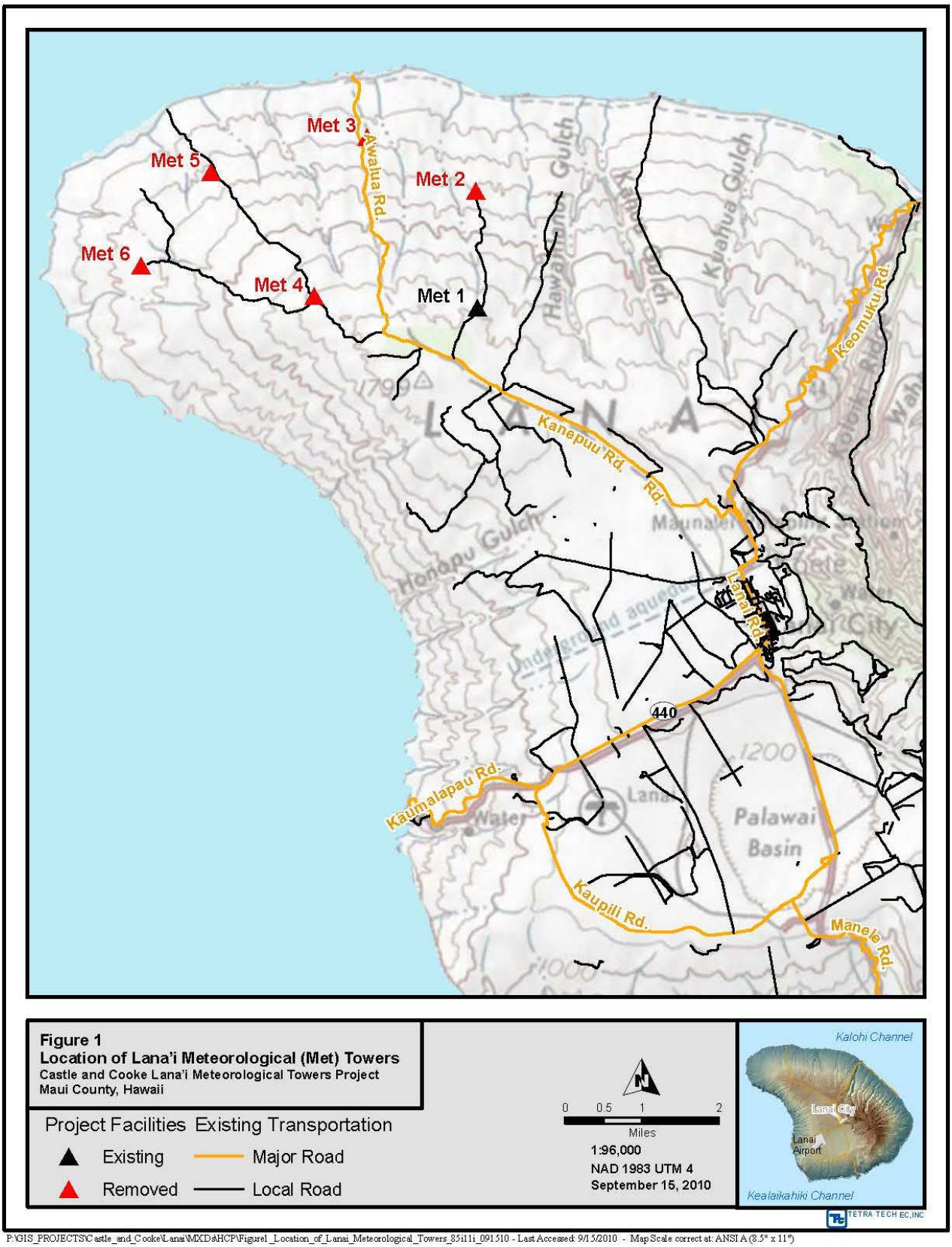

Figure 1
Location of Lana'i Meteorological (Met) Towers
Castle and Cooke Lana'i Meteorological Towers Project
Maui County, Hawaii

P:\GIS_PROJECTS\Castle_and_Cooke\Lanai\MXDs\HCP\Figure1_Location_of_Lanai_Meteorological_Towers_85i11i_091510 - Last Accessed: 9/15/2010 - Map Scale correct at: ANSI A (8.5" x 11")

3.1 Carcass Searches

Standardized carcass searches were conducted at met tower 1 during the seasons when seabirds are expected to be present on Lanai (March through December). For purposes of the survey effort, the seasons are defined as: spring (March 15-June 15), summer (June 16-September 15), and fall (September 16-December 15). Carcass searches were permitted to end prior to December 15 if the seabirds had left the colony. Personnel discontinued surveys if the study area was not accessible as a result of storm events or road conditions, and/or if staff safety was questionable.

Carcass surveys occurred approximately every 30 days at met tower 1. In fall 2013, carcass surveys were conducted between September 15 and December 14, 2013. In spring 2014, a single carcass search was performed on March 27, prior to the removal of the met tower.

3.2 Searcher Efficiency Trials

The objective of searcher efficiency trials is to estimate the percentage of bird fatalities that searchers are able to find. Searcher efficiency trials were conducted during each season in years 1 and 2 of monitoring and documented a high level of searcher efficiency for birds. The revised protocol approved in 2010 did not require searcher efficiency trials if vegetation management continues as needed within the survey plot. As such, vegetation was managed and therefore searcher efficiency trials were not conducted in FY 2014. The high rates of searcher efficiency for birds (93.8 percent, SD = 11.5) documented in 2009 would have been applied had any carcass of a listed species been found during FY 2014 searches.

3.3 Carcass Removal Trials

The objective of the carcass removal trials was to document the length of time carcasses remain in the search area and are thus available to be detected by searchers. Carcass removal trials were conducted once per season to account for changes in weather, climate, and scavenger densities. For carcass removal trials, the protocol required that one carcass be placed near each active met tower at the beginning of each season (defined in section 3.1) and its status monitored until the time of the next monitoring event (30 days later). If a carcass were removed during this time, the search interval would return to once every 10 days and carcass removal trials would be implemented as previously conducted and as defined in the HCP (Tetra Tech 2008).

During each trial, Tetra Tech placed one carcass near met tower 1 at a random distance and direction from a search plot corner stake and checked its status every 10 days. To avoid confusion with potential met tower-related fatalities, planted carcasses were placed outside of the search area boundary. The fall 2013 carcass removal trial was initiated on October 17, 2013, and conducted through November 16, 2013. One adult chicken carcass was placed during the trial. Due to the removal of met tower 1, no carcass removal trials were conducted in spring 2014.

3.4 Statistical Methods

Fatality estimates are based on observed number of carcasses found during standardized carcass searches, searcher efficiency rates, and carcass persistence. Statistical methods for searcher efficiency, carcass removal rates, and mortality estimation are provided in the HCP (Tetra Tech 2008).

4.0 PCMP RESULTS

This section summarizes the results of surveys and trials conducted in FY 2014. Results from spring and summer 2013 are provided for comparison.

4.1 Standardized Carcass Searches

Met tower 1 was searched 4 times in fall 2013 (September 15, October 17, November 16 and December 16) and once in spring 2014 (March 27) before the removal of met tower 1 and completion of the monitoring program in April, 2014. All surveys were completed within the established search intervals. No bird or bat mortalities of any threatened or endangered species were detected during any carcass searches in this time period or throughout the 7-year study period.

4.2 Carcass Removal Trials

The one carcass placed during the fall 2013 carcass removal trial remained intact with some scavenging by insects documented at the first check but then remained as a feather spot until the end of the 30-day trial. Carcass persistence during fall 2013 was calculated at 30 days, consistent with trials conducted in spring and summer 2013 (Table 1). Actual carcass persistence time, however, is longer than the 30-day trial period because carcasses were removed at the end of each trial period but would have continued to persist if left in place. As noted above, no carcass removal trials were conducted in spring 2014 due to the removal of the met tower and completion of the monitoring program.

Although more complex methods are now often used to estimate carcass persistence times for wind farm post-construction monitoring studies (e.g., bootstrapping) they require larger sample sizes of trial carcasses; therefore, the methods outlined and approved in the PCMP remained appropriate for use here.

Table 1. Results of carcass removal trials conducted for the Lanai met tower project during FY 2014, including spring and summer 2013 trial results for comparison.

Carcass Size Class	Season	No. Carcasses Placed	Mean Persistence (days)[1/]
Birds 2014[2/]	Spring	NA	NA
Birds 2013	Spring	1	30
	Summer	1	30
	Fall	1	30
	Overall	3	30

1/ Note that actual persistence times are longer because carcasses were present at the end of the 30-day trial period and were then removed, but would have persisted longer if left in place.
2/No trials were conducted in 2014 due to the removal of the met tower and completion of the monitoring program.

5.0 PCMP Discussion and Conclusions

5.1 Mortality

Over the course of the entire study (2008-2014) no carcasses of the four covered species or any other listed species were found during standardized carcass searches or incidentally by searchers. The operation of the met tower does not appear to have had a direct effect on Hawaiian petrels, Newell's shearwaters, Hawaiian stilts, Hawaiian hoary bats, or any other species (Table 2). The flagging and bird diverter hardware installed on the met tower may have increased visibility of the met tower and contributed to birds and bats avoiding collisions.

5.2 Carcass Removal

The bird carcass removal rates for the Lanai met tower project in FY 2014 continued to be low in comparison with other published post-construction mortality monitoring studies (Table 2). Although most of the carcasses were scavenged by insects relatively quickly, no carcasses were removed. These results are consistent with carcass removal rates documented from 2008 to summer 2013 on Lanai. This is likely due to the few predators that live on the island. Feral cats and rats are the most likely scavengers in the project area, and cat tracks and scat have been documented near the met towers in previous years.

Table 2. Comparison of overall (seasons combined) carcass persistence and mortality estimation between the Lanai met tower project and similar post-construction monitoring studies.

	Carcass Persistence (days)		Mortality Estimation (per tower or turbine)	
Study Site[1, 2]	**Avian**	**Bat**	**Avian[7]**	**Bat**
Lanai 2014	-	-	0.0	0.0
Lanai 2013	30.0	-	0.0	0.0
Lanai 2012	30.0	-	0.0	0.0
Lanai 2011	30.0	-	0.0	0.0
Lanai 2010	30.0	-	0.0	0.0
Lanai 2009	28.0	8.7	0.0	0.0
Lanai 2008	27.6	-	0.0	0.0
Bighorn[3]	34.9	20.6	3.81	2.86
Judith Gap (2006-2007)[4]	12.3	9.1	4.52	13.4
Biglow I[5]	14.0	10.1	2.90	3.29
Judith Gap (2009)[4]	9.7	8.9	3.33	7.20
Biglow II[6]	6.6	3.5	12.73	6.24
Top of Iowa[7]	-	-	-	4.45 – 7.14
Kaheawa Wind Power II[8]	-	-	-	0.06
Kaheawa Wind Power[9]	14.0	9.4	-	-
Kaheawa Wind Power[10]	11.3	5.6	0.29	-

1/ Sites used for comparison are operating wind farms and are most similar in habitat to Lanai among sites with published post-construction monitoring results (i.e., shrubland, short-grass prairie, and other grassland habitat types).
2/ Some comparison sites used a combination of small and large birds for trials and analysis. Small birds often used as surrogates for bats.
3/ Kronner et al. (2008)
4/ Poulton and Erickson (2010)
5/ Jeffery et al. (2009)
6/ Enk et al. (2011)
7/ Jain et al. (2011)
8/ SWCA (2011)
9/First Wind (2011)
10/First Wind (2012); avian estimate includes only Hawaiian goose and Hawaiian petrel fatalities.

5.3 Conclusions

No carcasses of the four covered species or any other threatened or endangered species, or any other wildlife species, have been found during standardized carcass searches or incidentally by searchers since the beginning of the post-construction monitoring program in 2008. The carcass persistence time for birds indicates that the 30-day search interval was an adequate time frame to minimize losses due to scavenging. Searcher efficiency documented in 2009, which would have been applied to any carcasses found in subsequent years, was high, indicating that searchers would have been able to detect carcasses if they occurred. Thus, the operation of the Lanai met tower project did not appear to have a direct effect on Hawaiian petrels, Newell's shearwaters, Hawaiian stilts, Hawaiian hoary bats, or any other flying wildlife species during its nearly 7 years of operation.

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