Final Habitat Conservation Plan
For the Construction and Operation of the
Lānaʻi Meteorological Towers, Lānaʻi, Hawaiʻi

Location: Lānaʻi, Maui County, Hawaiʻi

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Acronyms and Abbreviations

Applicant	Castle & Cooke Resorts, LLC
BLNR	Board of Land and Natural Resources
CDUA	Conservation District Use Application
CDUP	Conservation District Use Permit
CFR	Code of Federal Regulations
DLNR	Department of Land and Natural Resources
DOFAW	Department of Forestry and Wildlife
EA	Environmental Assessment
ESA	Endangered Species Act
ESRC	Endangered Species Recovery Committee
FEMA	Federal Emergency Management Agency
HAR	Hawai‘i Administrative Rules
HCP	Habitat Conservation Plan
hr	hour
HRS	Hawai‘i Revised Statutes
ITL	Incidental Take License
ITP	Incidental Take Permit
Landowner	Castle & Cooke, Inc.
MBTA	Migratory Bird Treaty Act of 1918
met	meteorological
MISC	Maui Invasive Species Committee
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
PVC	polyvinyl chloride
TNC	The Nature Conservancy
TtEC	Tetra Tech EC, Inc.
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WRA	wind resource area

Habitat Conservation Plan For the Construction and Operation of the Lānaʻi Meteorological Towers

1 INTRODUCTION AND PROJECT OVERVIEW

1.1 Summary

Applicant Castle & Cooke Resorts, LLC (Castle & Cooke) has installed six of seven approved meteorological (met) towers on the island of Lānaʻi, Maui County, Hawaiʻi. The met towers are installed, on land owned by Castle & Cooke, Inc. which is affiliated with the applicant, to collect data on wind speeds and patterns throughout the northern portion of the island. This data will be used to determine the suitability of the wind regime to develop a commercially viable wind energy facility on the island of Lānaʻi, Hawaiʻi. Castle & Cooke is committed to developing renewable energy on the island of Lānaʻi while preserving the unique environmental, cultural, and historic resources found on the island. The state Board of Land and Natural Resources (BLNR) issued a Conservation District Use Permit (CDUP) for the installation of one of seven met towers (met tower 6), and conditional approval for the remaining six met towers on August 8, 2007; the Department of Land and Natural Resources (DLNR) authorized Castle & Cooke to install the additional six met towers in a letter dated December 10, 2007.

In accordance with the Endangered Species Act of 1973 (ESA), as amended, and the conditions stated in the CDUP LA-3419, Castle & Cooke is required to "comply with the Incidental Taking Permit requirements of the U.S. Fish and Wildlife Service (USFWS), including the preparation of the Habitat Conservation Plan." Therefore, in accordance with section 10(a)(1)(B) of the ESA and chapter 195-D, of the Hawaiʻi Revised Statutes (HRS), Castle & Cooke has prepared this Habitat Conservation Plan (HCP) in support of the incidental take permit (ITP) and incidental take license (ITL) requirements of the USFWS and DLNR/ Division of Forestry and Wildlife (DOFAW), respectively. Separately, to satisfy National Environmental Policy Act (NEPA) requirements, an Environment Assessment (EA) is being developed.

Four federally and state-listed endangered or threatened animal species have been documented on Lānaʻi within the vicinity of the wind resource area (WRA) where the met towers are located. The incidental take of listed species has the potential to occur as a result of the operation of the seven met towers within the WRA: Hawaiian petrel (*Pterodroma sandwichensis*), Newell's shearwater (*Puffinus auricularis newelli*), Hawaiian stilt (*Himantopus mexicanus knudseni*), and Hawaiian hoary bat (*Lasiurus cinereus semotus*). Individuals of these species may fly in the vicinity of a met tower and could be injured or killed if one collides with a met tower or associated guy wires. No habitat loss for listed wildlife species will occur. Additionally, no other listed, proposed or candidate wildlife species have been found or are known to be present in the project area.

The Hawaiian petrel is known to nest on Maui, Kauaʻi, Lānaʻi, Hawaiʻi, and possibly Molokaʻi. On Lānaʻi, the endangered Hawaiian petrel has been recently rediscovered to nest on the central portion of the island and has been observed flying over the WRA. The take limit for the

Hawaiian petrel, as a result of the operation of the seven met towers, is established by a tiered approach. Tier 1 authorizes a take limit of seven petrels over the 2-year project period. Tier 2 provides a contingency should Tier 1 take limits be reached and authorizes the take of up to 14 petrels over the 2-year project period.

The Newell's shearwater breeds on several of the Hawaiian Islands. Their breeding status on Lānaʻi is unknown. DOFAW has heard vocalizations of Newell's shearwater on Lānaʻi. The take limit of Newell's shearwater is two individuals over the 2-year project period.

The Hawaiian stilt is a permanent resident on Lānaʻi, and is known to occur at the Lānaʻi City wastewater treatment ponds. The Hawaiian stilt was documented once flying over the met tower project area. The take limit of Hawaiian stilt is two individuals over the 2-year project period.

Finally, little is known about the distribution or habitat use of the Hawaiian hoary bat in Hawaiʻi. It is believed to be most abundant on Hawaiʻi and in low numbers on Maui. The Hawaiian hoary bat has been recently sighted on Lānaʻi, but its breeding status on the island is unknown. The take limit of Hawaiian hoary bats, resulting from the operation of seven met towers on Lānaʻi, is two bats over the 2-year project period.

Botanical surveys conducted in April and late-November 2007 determined that no federally or state-listed plant species occur within any of the met tower footprints. Therefore, no impacts will occur to sensitive plant species as a result of this project.

An HCP was approved for the Kaheawa Pastures Wind Energy Generation Facility on Maui, Hawaiʻi in 2006 (Kaheawa Wind Power 2006), which addressed three of the four species covered in this HCP. The activities covered in the Kaheawa Pastures HCP are different than those addressed in this HCP; the Kaheawa Pastures HCP assessed impacts associated with 20, 65-meter turbines rather than the seven, 50-meter met towers. The Lānaʻi met tower project is of a much smaller scale than the Kaheawa Pastures Wind Generation Facility but considers the framework established by the approved Kaheawa Pastures HCP.

1.2 Applicant History and Information

Castle & Cooke is the current applicant/proposed developer of the project and along with its affiliates owns 98 percent of the land on the island of Lānaʻi. Castle & Cooke Hawaiʻi, a division of Castle & Cooke, Inc., was founded in 1851 and is one of the nation's oldest developers built around investing in Hawaiʻi. Castle & Cooke, Inc. was incorporated in Hawaiʻi on October 10, 1995, to be the successor to the real estate and resort business of Dole Food Company, Inc. In addition to wind energy development, Castle & Cooke is engaged in the development of other renewable energy technologies, including a proposed solar facility on the island of Lānaʻi, as well as residential real estate, commercial real estate, and resorts located in Hawaiʻi, California, Arizona, and Florida.

On August 8, 2007, DLNR issued Castle & Cooke CDUP No. LA-3419 to approve the installation of one met tower at site number 6 and conditionally approve installation of the remaining six met towers (**Appendix 1**). Met tower 6 was erected on August 28, 2007, and met towers 1 through 5 were installed between January 7 and February 8, 2008. Met tower 7 has not yet been installed.

1.3 Regulatory Framework and Relationship to Other Plans, Policies, and Laws

The primary laws, regulations, and plans that affect development and implementation of an HCP, ITP, and the proposed activities are summarized below to assist the reviewer by adding additional context for the Lanai Meteorological Towers HCP.

1.3.1 Endangered Species Act

The ESA and its implementing regulations prohibit the take of any fish or wildlife species that is federally listed as threatened or endangered without prior approval pursuant to either section 7 or section 10 (a)(1)(B) of the ESA. Section 3 of the ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." The term "harm" refers to any act that actually kills or injures a federally-listed species and has been extended by case law to include significant habitat modification or degradation (50 Code of Federal Regulations [CFR] §17.3). Section 9 of the ESA also details generally prohibited acts and section 11 provides for both civil and criminal penalties for violators regarding species federally-listed as threatened or endangered.

ESA section 4(f) requires the USFWS to develop and implement recovery plans for the conservation and survival of listed species unless it is found that the plan will not promote the conservation of the species. Recovery plans must describe specific management actions, establish objectives and measurable criteria for delisting, and estimate the time and cost to carry out measures needed to achieve recovery. The USFWS has developed a recovery plan for the Hawaiian petrel and Newell's shearwater, Hawaiian stilt (Hawaiian shorebirds), and Hawaiian hoary bat (USFWS 1983, 2005, and 1998, respectively).

In 1982, Congress amended the ESA to allow a private applicant to commit a taking that would otherwise be prohibited under section 9(a)(1)(B). When a non-federal landowner wishes to proceed with an activity that is legal in all other respects, but that may result in the incidental taking of a listed species, an ITP as defined under section 10 of the ESA is required. Incidental take is defined as take that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." An HCP must accompany an application for an ITP to demonstrate that all reasonable and prudent efforts have been made to avoid, minimize, or mitigate for the effects of the requested incidental take. Although the USFWS and National Marine Fisheries Service (NMFS) have joint authority to administer the issuance of an ITP, the Lāna'i met tower project falls under the exclusive jurisdiction of the USFWS. The goals, criteria, and measures of the HCP and ITP are consistent with the actions and objectives of the recovery plans for the covered species.

The section 10 process for obtaining an ITP begins with the development of an HCP by the project applicant. Required contents of an HCP, defined in section 10 of the ESA, include:

- An assessment of impacts likely to result from the proposed taking of one or more federally listed species.
- Measures the permit applicant will undertake to monitor, minimize, and mitigate such impacts.
- The funding that will be made available to implement such measures.
- The procedures to deal with unforeseen or extraordinary circumstances.

- Alternative actions to the taking considered by the applicant, and the reasons why the applicant did not adopt such alternatives.
- Additional measures that the USFWS may require as necessary or appropriate.

1.3.2 Chapter 195D, Hawai'i Revised Statutes (Endangered Species; Habitat Conservation Plans)

Hawai'i Revised Statutes (HRS) section 195D-4 states that any species of aquatic life, wildlife or land plant that has been determined to be an endangered or threatened species under the ESA shall be deemed so under this State chapter, as well as any other indigenous species designated by DLNR as endangered or threatened by rule. The "take" of any endangered or threatened species is prohibited by both ESA and this state statute [section 195D-4(e)]. Similar to the ESA, section 195D-2 defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect endangered or threatened species of aquatic life or wildlife, or to cut, collect, uproot, destroy, injure, or possess endangered or threatened species of aquatic life or land plants, or to attempt to engage in any such conduct."

After consultation with the Endangered Species Recovery Committee (ESRC), the BLNR may permit a take otherwise prohibited under subsection 195D-4(e) if the take is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. In support of a temporary ITL, an applicant must develop, fund, and implement a BLNR-approved HCP to minimize and mitigate the effects of the incidental take.

Such take may be permitted provided the following criteria of sections 195D-4 and 195D-21, HRS are met:

- The taking will be incidental;
- The applicant, to the maximum extent practicable, shall minimize and mitigate the impacts of the take;
- The applicant shall provide adequate funding and/or guarantee that adequate funding for the implementation of the HCP plan will be provided;
- The applicant shall post a bond or similar financial tool, including depositing a sum of money in the endangered species trust fund created by section 195D-31, or provide other means approved by the BLNR, adequate to ensure monitoring of the species by the State and to ensure the applicant takes all actions necessary to minimize and mitigate the impacts of the take;
- The HCP shall increase the likelihood of survival and recovery of the species in the wild;
- The HCP plan will adequately consider the full range of the species on the island, address potential cumulative impacts on the species by the ITL, and provide net environmental benefits from such impacts;
- The activity permitted under the ITL does not involve the use of submerged lands, mining, or blasting;
- The take is not likely to cause the loss of genetic representation of an affected population of any endangered, threatened, proposed, or candidate plant species; and
- The BLNR may require the applicant to comply with other identified measures.

1.3.3 National Environmental Policy Act

The purpose of NEPA is to "encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation." The NEPA requires Federal agencies to evaluate and disclose the effects of their proposed actions on the human environment in a written statement as either an Environmental Impact Statement (EIS) or an EA. An EA is a concise public document that briefly discusses the need for alternatives to an action and provides sufficient evidence and analysis to support a determination of no significant impacts or a determination to prepare an EIS. With respect to HCPs in general, compliance with NEPA is not a direct obligation or requirement of the applicant for the section 10 permit. However, the USFWS must comply with NEPA when making their decisions on the application and implementing the federal action of issuing an ITP. Consequently, the appropriate environmental analyses must be conducted and documented before a section 10 permit can be issued. Although NEPA requirements include an analysis of impacts to the same species as does the ESA, the scope of NEPA goes beyond that of the ESA by considering the impacts of a Federal action not only on fish and wildlife resources, but also on non-wildlife resources of the human environment such as cultural resources and socioeconomic values.

Projects can be categorically excluded from a higher level of NEPA analysis if their anticipated impacts on the environment are recognized as negligible and any controversy associated with the project is addressed. An EA will also be prepared to evaluate the potential environmental impacts of issuing an ITP and approving the implementation of the proposed Lāna'i met tower HCP. The purpose of the EA is to determine if permit issuance and HCP implementation will significantly affect the quality of the human and natural environment. If the USFWS determines significant impacts are likely to occur, a comprehensive EIS for the proposed action would be required and distributed for public review. Otherwise, a Finding of No Significant Impact (FONSI) will be issued and is the anticipated determination for this Lāna'i met tower project.

1.3.4 Migratory Bird Treaty Act

Under the Migratory Bird Treaty Act of 1918 (MBTA), as amended (16 USC §§703-712), taking, killing or possessing migratory birds is unlawful. Birds protected under the act include all common songbirds, waterfowl, shorebirds, hawks, owls, eagles, ravens, crows, native doves and pigeons, swifts, martins, swallows and others, including their body parts (feathers, plumes etc), nests, and egg. A list of birds protected under MBTA implementing regulations is provided at 50 CFR §10.13. Unless permitted by regulations, under the MBTA it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried, or received any migratory bird, part, nest, egg, or product. The MBTA provides no process for authorizing incidental take of MBTA protected birds. The two seabird species and stilt covered by this HCP are also protected under the MBTA. If the HCP is approved and USFWS issues an ITP to Castle & Cooke, the terms and conditions of that ITP will also constitute a special purpose permit under 50 CFR §21.27 for the take of the Hawaiian petrel, Newell's shearwater, and Hawaiian stilt under MBTA. Therefore, any such take of the covered species also will not be in violation of the MBTA. Although the MBTA provides for no incidental take authorization, other MBTA-listed birds that are not protected by the ESA and that may be adversely affected by the proposed met towers will not be covered by any take authorization. To avoid and minimize impacts to MBTA-listed species, Castle & Cooke plans to minimize the risk of collisions as much as possible by

maximizing the visibility of the met towers and guy wires while ensuring that meteorological data collection is not compromised.

1.3.5 National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended (16 U.S.C. §40 et seq.), requires federal agencies to take into account the effects of their actions proposed on properties eligible for inclusion in the National Register of Historic Places. "Properties" are defined herein as "cultural resources," which includes prehistoric and historic sites, buildings, and structures that are listed on or eligible to the National Register of Historic Places. An undertaking is defined as a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency; including those carried out by or on behalf of a Federal agency; those carried out with federal financial assistance; those requiring a federal permit, license or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a federal agency. The issuance of an incidental take permit is an undertaking subject to section 106 of the NHPA. No impacts to cultural resources will occur associated with this project.

1.4 Project Description

Castle & Cooke has approval to install seven 50-meter-tall (165-foot tall) met towers on the island of Lāna'i, Maui County, Hawai'i (**Figure 1-1**). Six met towers have been erected and one is pending. The towers are collecting data on wind speeds and patterns throughout the northern portion of the island. This data will be used to determine the suitability of the wind regime, over the proposed lands described above, to sustain a commercially viable wind energy facility. Met tower locations have been selected based on several factors including (1) adequate vertical and horizontal distribution throughout the wind resource area, (2) suitable erection areas (e.g., area, grade, soils, close proximity to existing access roads), and (3) avoidance of sensitive biological and archaeological resources.

The met towers are a standard design and made specifically for wind energy resource measurements. These lightweight towers are made of galvanized steel tubing. The tubes slide together without bolts or clamps, and are made from a combination of 1.5-meter (5-foot) and 3-meter (10-foot) sections. The sections are assembled horizontally on the ground and then tilted up using a ginpole and winch; the solar panel and communications equipment would then be installed. The towers rest on a steel base plate approximately 0.8 square meter (9 square feet) in size and are supported with aircraft cable guy wires in four directions at each guy level. The guy wire radius is 30.5 to 33.5 meters (100 feet to 110 feet). The guy wires are anchored with standard dead-man type anchors to a depth of 1.5 to 2.4 meters (5 to 8 feet). A figure illustrating a typical meteorological tower structure with associated guy wire locations is included in **Appendix 2**.

Installation of the towers requires minimal ground disturbance. No cranes or concrete foundations are required for the installation of these met towers. No new access roads are created as part of the proposed action. Only minimal excavation is required with a small backhoe to install the anchor points. A small trench approximately 0.61 meter (2 feet) wide by 1.8 meters (6 feet) long by 1.2 to 1.8 meters (4 to 6 feet) deep is excavated so the guy wire steel rod anchors can be inserted into the ground at each site. Tower installation personnel access each tower site via existing roads, existing four-wheel-drive trails, and by foot. A pickup-sized flatbed truck with a trailer is used, although some locations may require manual transport of

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Met 1
Met 2
Met 3
Met 4
Met 5
Met 6
Met 7
Awalua
Polihua
Kaena
Lapalki
Kahua
Kuahua
Mahana
Keomuku
Kanepuu
Lanaihale
Lanai
Kaumalapau
Kaupili
Manele
Hoike
Awehi
440
Lanai
PACIFIC
OCEAN
TETRA TECH EC, INC.

Figure 1-1. Lāna'i Proposed Location of Meteorological Towers

Castle and Cooke Lāna'i Meteorological Towers Project
Maui County, Hawaii

Project Facilities
- Proposed Met Towers
- WRA

Water Bodies
- Streams

Existing Transportation
- Highway
- Major Road
- Local Road

1:70,000

0 0.5 1 2

Miles

June 30, 2008

materials. At each tower site, low-lying brush is removed by hand and the backhoe as required within the guy wire area to allow for safe erection of the towers. Brush is also removed within the temporary tower assembly areas outside of the guy wire areas. The width of these temporary tower assembly areas is approximately 3 meters (10 feet) wide to accommodate assembly of the tower sections. No fencing is proposed for the tower sites, although some non-native vegetation may be cleared after installation to improve the ability to locate carcasses. Installation of each tower requires approximately three to five days once the anchors are installed. Following erection of the towers, all installation equipment is removed from the site.

The six towers were installed by February 8, 2008. The term for the temporary met towers is two years through March 2010. If the take limits established for each species are reached without an approved amendment, however, the met towers will be taken down. Because the wind resource varies greatly depending on the terrain, it is desirable to sample several geographic locations. The deployment plan calls for the met towers to be used to collect data from different locations within the project area.

The type and scale of the activities do not have the potential to alter coastal or marine resources or ecosystems. The data collection would take place from over 0.3 mile (nearest met tower location) to 2.3 miles (farthest met tower location) from the coastline at elevations ranging from 132 to 1,563 feet above mean sea level. It does not involve the installation, erection, or removal of materials near the shoreline or in a place where the material is likely to be carried into the water. Neither does it have the potential to affect beaches or other coastal recreational resources or to increase the exposure to coastal hazards (for example, tsunami, storm waves). Several remote access roads (Kaena, Polihua, Lapaiki, Kahua, and Kuahua) and four-wheel drive trails with access to the shoreline would not be disturbed by the temporary presences of the towers. Additionally, data collection is limited to areas that have been determined not to contain significant natural, archaeological, or cultural resources. The met towers may be visible from public vantage points depending on the topography but are located away from any developed areas of the island. No lighting will be on the towers since they are less than 200 feet tall (FAA 2007).

In order to reduce the potential for listed species to collide with a tower and associated guy wires, Castle & Cooke is implementing measures to make the towers more visible to flying wildlife. White, 1-inch polyvinyl tape is fitted to the guy wires to increase visibility and subsequently increase the likelihood of avoidance. This tape has proven effective in minimizing petrel collisions with fencing and other structures at the Lānaʻi colony when wrapped along the length of the fencing (USFWS and DOFAW, pers. comm. 2007). The polyvinyl tape is cut into 4-foot segments, folded in half over the wire, and attached using ultra-violet light resistant zip ties, leaving at least 6-foot gaps above and below the anemometers. Bird diverters are added between the taped sections. Additionally, two 3-foot sections of yellow polyvinyl chloride (PVC) tubing are placed on each guy wire, starting at the anchor points. This is the maximum amount of PVC tubing that can be applied to the guy wires without causing excessive loading and drag. **Appendix 2** shows a schematic of the how the diverter hardware looks on the met towers.

2 DESCRIPTION OF HABITAT CONSERVATION PLAN

2.1 Purpose

The met towers have the potential to incidentally impact four federally-listed wildlife species known or presumed to fly in the vicinity of the proposed met towers. These species have the potential to collide with the met towers or with the associated guy wires supporting the towers, resulting in injury or mortality. The four species include the endangered Hawaiian petrel, Hawaiian stilt, and Hawaiian hoary bat and the threatened Newell's shearwater. The seabirds only nest on the Hawaiian Islands; and the Hawaiian hoary bat is the only native land mammal in the Hawaiian Islands. Because of their low overall populations numbers and somewhat relatively unknown breeding distributions, these species are protected under the ESA. In accordance with the conditions imposed by the CDUP approving the met tower project, and pursuant to the ESA section 10(a)(1)(B), as amended, and chapter 195-D, HRS, an HCP and ITP/ITL are required if the take of a listed species is anticipated in connection with a proposed action. This HCP has been prepared to fulfill application requirements for a federal ITP and a state ITL. Upon issuance of the permit and license, Castle & Cooke will be authorized for the incidental take of these four species in connection with the construction and operation of the seven met towers for a period of two years.

Purpose: For Castle & Cooke, the purpose of this HCP is to determine the potential impact that the met towers could have on the listed species; to address the potential incidental take of the listed species by setting forth measures that are intended to ensure that any take caused by the met towers will be incidental; that the impacts of the take will, to the maximum extent practicable, be minimized and mitigated; that procedures to deal with changed and unforeseen circumstances will be provided; that adequate funding for the HCP will be provided; and that the take of the listed species will not appreciably reduce the likelihood of the survival and recovery of these species in the wild.

Need: For Castle & Cooke, as a non-federal entity, the ESA allows for the exemption of the "take" of listed species from the prohibitions of section 9 of the ESA when such a taking incidental to an otherwise lawful activity and when such a taking has been authorized under section 10(a)(1)(B) of the ESA. In order to obtain such authorization, Castle & Cooke must prepare an HCP that meets the USFWS issuance criteria for an incidental take permit. Furthermore, Castle & Cooke as a business entity requires a stable operating and regulatory environment. The HCP assists Castle & Cooke with regulatory compliance under the ESA, serving as a vehicle for obtaining regulatory certainty as well as stability.

2.2 Scope and Term

The met towers will enable Castle & Cooke to determine the feasibility of locating the first commercial wind energy generation facility on Lāna'i. The scope of this HCP, however, pertains solely to the construction and operation of the met towers, and the adverse impacts these facilities would potentially have on the four federally listed species: Hawaiian petrel, Newell's shearwater, Hawaiian stilt and Hawaiian hoary bat. Through successful implementation of this HCP, Castle & Cooke proposes to offset the risk of impact and provide a net conservation benefit to these four species.

The goal of this HCP is to balance the potential adverse effects of the met tower project on these four listed species with plans to protect and enhance these populations on Lāna'i and statewide.

One of the challenges in formulating this HCP has been the limited amount of information available concerning the occurrence, behavior, and breeding status of these species in the project area, and in the greater Hawaiian Islands. In order to address these information gaps, Castle & Cooke has responded by conducting site specific surveys, in coordination with USFWS and DOFAW. The understanding gained by pre-construction surveys can then be augmented by post-construction surveys and monitoring that are outlined in this HCP. With monitoring and review by the USFWS and DOFAW, the provisions for adaptive management will allow for the appropriate mitigation of potential project impacts. Castle & Cooke anticipate a 2-year project life, throughout which this HCP would be in effect.

2.3 Survey and Resources

The following sources were used in the preparation of this HCP:

- Previous reports prepared for the applicant by Tetra Tech EC, Inc. (TtEC) that provided general information on biological resources, cultural resources, land use, aviation, meteorology and communications on the project area and vicinity.
- CDUA submitted April 20, 2007.
- An unpublished paper by ABR Inc., "Radar and Audiovisual Studies of Hawaiian petrels near Proposed Met Towers and Wind Turbines on Northwestern Lāna'i Island, May-July 2007" (see **Appendix 3**).
- Brian Cooper, ABR Inc., provided personal communication about the initial results of the pilot avoidance behavior study. This study is critical to document and more fully understand avoidance behavior rates of Hawaiian petrels at met towers, communication towers, and wind turbines.
- A spring 2007 avian study conducted to determine avian use and species composition of the project area. This study, "Spring Avian Survey Lāna'i Resource Area, Maui County, Hawai'i," was conducted by TtEC and is attached as **Appendix 4**.
- Personal communications with various DOFAW and USFWS biologists on the occurrence of these species on Lāna'i and current and/or proposed studies.

3 ENVIRONMENTAL SETTING

3.1 Regional Location

The island of Lāna‘i is the third smallest of the main Hawaiian Islands and covers a land area of about 36,900 hectares (90,000 acres) (**Figure 3-1**). It is protected from extreme northeast trade winds by the islands of Maui and Molokai. It is a generally hilly island that rises gradually to 1,027 meters (3,369 feet) above sea level at Lāna‘ihale, or Mount Palawai. The Kalohi Channel separates the island of Lāna‘i from the island of Molokai to the north, and Auau Channel separates Lāna‘i from the island of Maui to the east. The northeastern coast is fringed by wide sandy beaches, while the southwestern coast is dominated by sea cliffs. Lāna‘i is unusual among the Hawaiian Islands in that the human population is small. The population is concentrated in the central and southern portion of the island away from the project area.

3.2 Characteristics of the Met Tower Sites and Surrounding Lands

The proposed Lāna‘i met towers are situated on private land in the northwestern portion of the island. Much of the terrestrial habitat for biological resources on Lāna‘i 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*). All of these factors have negatively impacted much of the native endemic species and have altered the ecology of the island. However, there are still areas of uninhabited beaches, some native vegetation communities, some of which occur on the coastlines of the island, and relatively pristine coral reefs.

3.3 Land Use

The proposed project area is situated on private land owned by Castle & Cooke in the remote northwestern portion of the island (Figure 1-1). Approximately 98 percent of the island of Lāna‘i is owned by Castle & Cooke (Maui County Council 1998). The proposed project area is remote, with a few dirt roads that allow access to the shoreline. There are no nearby existing structures. Lāna‘i City is located about five miles southeast of the nearest met tower (met tower site 1). The Lāna‘i Airport is located about seven miles south of the nearest met tower (met tower site 1).

Private land use in Hawai‘i is regulated by a dual system of state and county laws, under a statewide zoning law. State land use law (esp. chapter 205, HRS) establish a framework of land use management whereby all lands in the state of Hawai‘i are classified into one of four Districts: conservation, agricultural, rural, and urban. A large portion of the proposed project area is located in the state-zoned conservation district limited subzone land. Under this subzone, met towers are an identified land use that may allow issuance of a CDUP. Under Hawai‘i Administrative Rules (HAR) §13-5-22 and §13-5-23, land in the Protective and Limited subzones require a departmental permit for data collection (P-1) and a board permit for public purpose uses (P-6). The met towers would be permissible uses under P-1 Data Collection, which expressly authorizes under subpart C-1 “basic data collection, research, education, and resource evaluation which involves a land use with incidental ground disturbance from installation of equipment (e.g., rain gauges or meteorological towers).”

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Kaneohe Bay
Kailua
Honolulu
Pearl Harbor
Kaiwi Channel
Kalaupapa Natl Hist Park
Kalohi Channel
Pailolo Channel
Auau Channel
Kahului Bay
Kahului
Lanai City
Haleakala Natl Park
Kealaikahiki Channel
Alenuihaha Channel
Kawaihae Bay
Kailua
Hawaii Volcanoes
Manuka State Park
Pacific Ocean

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Figure 3-1. Vicinity Map

Castle and Cooke Lāna'i Meteorological Towers Project
Maui County, Hawaii

- WRA
- Cities
- Rivers/Streams
- Interstate
- Highway
- Major Road

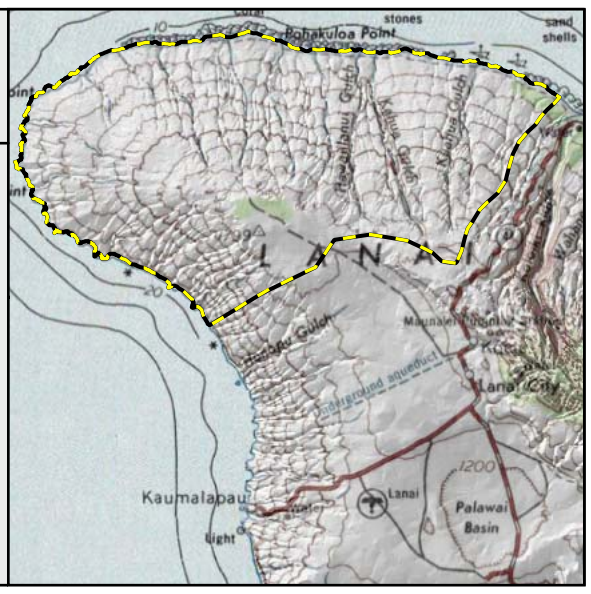
1:1,000,000

0 5 10 20

Miles

Data Sources: ESRI, National Geographic Maps.

June 30, 2008



3.4 Topography and Geology

Lānaʻi is geologically part of the four-island complex comprising Maui, Molokai, Lānaʻi, and Kahoolawe, known together as Mau Nui (Greater Maui). These four islands were once connected by a broad lowland plain in the last ice age, about 12,000 years ago. Lānaʻi was formed from a single shield volcano built by eruptions at its summit and along three rift zones.

The dominant geologic feature in the met tower study area are the numerous gulches, such as Kahua, Lapaiki and Kuahua gulches, and the puus or hills that dot the high ridgeline (Lānaʻihale). Additional geologic features include the pinnacle rock formations at the far western point of the Lānaʻihale ridge. The coastline along the project area is dominated by sandy beaches such as Polihua and Hulopoe beaches, rather than sea cliffs like those found on the southwestern coast of the island.

The proposed met towers would be placed along the sloping buttes that descend from the Lānaʻihale ridge, mountainside to oceanside along the northwest face of the island (Figure 1-1). The area experiences high winds that blow through the Kalohi channel to the north and wind intensity increases from east to west across the site.

3.5 Soils

The general soil association of the project area is defined as a "Very stony land–Rock land association" and described as gently sloping to very steep, rocky and stony land types on uplands and in gulches and valleys. The predominant soils of the project area in the *ahupuaʻa* of Kaʻā and Paomaʻi are classified as "rVT2 Very Stony Land Eroded", and "rRK Rock Land." The "rVT2" strongly weathered soils consist of large areas of severely eroded soils on Molokaʻi and Lānaʻi. The predominant soils of the *ahupuaʻa* of Kamoku and Mahana are classified as "rVS Very Stony Land" and "KRL Koele Badland Complex." The "rVS" land type consists of stones and boulders underlain by soft, weathered rock and bedrock (USDA 1972).

Based on United States Department of Agriculture (USDA) mapping, soils are generally between less than 0.3 meters (1 foot) and 1.5 meters (5 feet) in depth, consisting mostly of silt to clay with some sand and boulders. In most areas, the soil grades into bedrock and consists predominantly of volcanic ash (tuff) throughout the project area.

3.6 Hydrology and Water Resources

Located in the rain shadow of Maui, Lānaʻi receives very little rainfall, approximately 25 centimeters (10 inches), except in the summit surrounding Lānaʻihale where it can receive as much as 89 centimeters (35 inches). Much of the water in the island's aquifer comes from moisture from fog pulled from clouds by trees and ferns in higher elevations. Natural communities in the project vicinity include intermittent streams and gulches; however, there are no perennial streams or lakes on Lānaʻi.

Federal Emergency Management Agency (FEMA) maps are not available for the island of Lānaʻi (FEMA 2007). The areas proposed for met towers do not appear to be located in any major floodplains given their location along ridges. Additionally, existing roads do not appear to be located in any major floodplains.

3.7 Vegetation

The Lānaʻi met tower project area is located within the Dry Tropical Forest/Tropical Low Shrublands ecoregion in Maui County, Hawaiʻi (National Geographic 2007). The main habitats on Lānaʻi are primarily lowland dry communities and coastal communities. Since the 1920s, most of the central plateau has been in pineapple (*Ananas comosus*) production. The majority of the island's endemic habitat has been disturbed by invasive species, widespread cattle grazing, and habitat loss from pineapple plantations (DOFAW 2005a).

Based on site visits conducted on April 11 and 12, 2007 and throughout 2007-2008 by a Tetra Tech biologist, the vegetation in the project area was found to consist of mixed shrub and grassland. Habitat within the proposed met tower footprints ranges from barren eroded soils to shrub/scrub, interspersed with open grassland areas. The dominant shrub/scrub species included the non-native kiawe (*Prosopis pallida*), verbena (*Lantana camara)*, bull thistle (*Cirsium vulgare*), and the native ʻilima (*Sida fallax*). The open grass areas included alien invasive species such as buffel grass (*Cenchrus ciliaris*) and native grass species such as pili grass (*Heteropogon contortus*). These grasses were interspersed with occurrences of ʻilima (*Sida fallax*), ʻaʻaliʻi *(Dodonaea viscosa)* and ʻuhaloa (*Waltheria indica*) that were observed in the upper elevations throughout the project area.

Located outside the met tower project area is The Nature Conservancy (TNC) Preserve, Kānepu'u. This preserve includes remnants of a dry native lowland dry forest and shrubland that possibly once covered much of that area of Lānaʻi (**Figure 3-2**). The Kānepu'u Preserve contains the largest remnants of olopua/lama dryland forest in Hawaiʻi and is home to 49 plant species found only here, including three species that are federally endangered: the sandalwood ('iliahi-*Santalum* spp.), the Hawaiian gardenia (na'u-*Gardenia brighamii*), and the vine *Bonamia menziesii*.

Critical habitat exists for 37 plant species on Lānaʻi (USFWS 2003). The critical habitat designations on Lānaʻi are in six separate critical habitat units that are designated for the three species; *Bidens micrantha* ssp*. kalealaha, Portulaca sclerocarpa,* and *Tetramolopium remyi*. One of the six designated critical habitat units is located in the dry native shrub and grassland habitat in the met tower project area, and is the largest of the six units: Critical Habitat Unit 1, 373 acres or 151 hectares (USFWS 2003). This critical habitat unit, in the project boundary, is designated for *Tetramolopium remyi*, a multi-island species. Met tower 3 was moved downslope and outside of the critical habitat unit to avoid causing any adverse impacts to this habitat.

In addition to *Tetramolopium remyi*, there is potential for the occurrence of other listed plant species including *Hibiscus brackenridgei* and *Abutilon eremitopetalum*. Many of these rare species can lie dormant in the seed bank until a major rain event. Although no listed plant species were observed during previous field assessments, Castle & Cooke conducted a second, botanical survey within a minimum 100-meter by 100-meter (330 by 330-foot) area surrounding the location of each of the seven met towers to determine the presence of federally or state protected plant species. The surveys were conducted November 26-28, 2007, and the summary report is provided in **Appendix 5**. No rare or listed plant species were observed within the vicinity of the proposed met tower locations.

3.8 Wildlife (General Species)

The wildlife diversity in the Hawaiian Islands was historically high; however, a combination of habitat destruction and invasion by non-native predators has caused the decline of many endemic

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Met 1
Met 2
Met 3
Met 4
Met 5
Met 6
Met 7
Awalua
Polihua
Kaena
Lapaiki
Kahia
Kuahua
Mahana
Keomuku
Kanepuu
Lanihola Lenaihale
Kaumalapau
Kaupili
Manele
Hoike
Miki
Awehi
440
Lanai
Lanai City
Lanai Airport
Kalohi Channel
Kealaikahiki Channel
PACIFIC OCEAN

TETRA TECH EC, INC

Figure 3-2. Biological and Land Use Constraints

Castle and Cooke Lāna'i Meteorological Towers Project
Maui County, Hawaii

- Proposed Met Towers
- WRA
- Nature Conservancy Preserve
- USFWS Designated Critical Habitat

NWI Wetlands

- Freshwater Pond
- Freshwater Emergent Wetland
- Estuarine and Marine Deepwater
- Streams

State Land Use Districts

- Conservation
- Agriculture
- Rural
- Urban

Remaining Native Vegetation

- Lowland Dry Shrubland & Grassland
- Lowland Dry Forest & Shrubland
- Lowland Mesic Forest & Shrubland
- Dry Cliff

Existing Transportation

- Highway
- Major Road
- Local Road

1:70,000

0 0.5 1

Miles

June 30, 2008

avian species (Hirai 1978). There are currently 37 threatened or endangered avian species in Hawai'i (Bishop Museum 2002). The dry shrub and grasslands that dominate vegetation on the met tower sites provide habitat for endemic and exotic bird species.

Avian point count surveys were conducted by TtEC in spring 2007 (**Appendix 4**) and continued in fall 2007 to evaluate avian use, behavior, and species composition at the WRA. A total of 5,464 acres of the Lāna'i WRA were surveyed during spring point count surveys, covering approximately 20 percent of the total area of the WRA. Nineteen bird species were observed during the spring and fall 2007 avian surveys conducted by Tetra Tech (**Table 3-1)**. No threatened or endangered species were observed during these avian surveys.

Table 3-1. Bird Species Observed at the Proposed Met Tower Sites During Spring and Fall Point Count Surveys

Scientific Name	Common Name	Season	State Status
Birds			
Acridotheres tristis	common myna	S/F	
Francolinus pondicerianus	gray francolin	S/F	
Fregata minor	great frigate bird	S	
Carpodacus mexicanus	house finch	S/F	
Lonchura malabarica	Indian silverbill	S	
Cettia diphone	Japanese bush-warbler	S	
Zosterops japonicus	Japanese white-eye	S/F	
Cardinalis cardinalis	northern cardinal	S/F	
Mimus polyglottos	northern mockingbird	S/F	
Lonchura punctulata	nutmeg manikin	F	
Pluvialis fulva	Pacific golden plover	F	SoC
Phasianus colchicus	ring-necked pheasant	S/F	
Arenaria interpres	ruddy turnstone	F	SoC
Asio flammeus sandwichensis	short-eared owl	S/F	SoC
Streptopelia chinensis	spotted dove	F	
Alauda arvensis	sky lark	S/F	
Phaethon lepturus	white-tailed tropicbird	S/F	SoC
Meleagris gallopavo	wild turkey	S	
Geopelia striata	zebra dove	S/F	

Season: S=spring, F=fall; Status : SoC= state species of concern

Of the birds detected, the most abundant birds were common mynas (20.4 percent), northern mockingbirds (14.7 percent), sky larks (12.4 percent), and Japanese white-eyes (11.0 percent). All of these are non-native species. Each remaining species comprised 7.4 percent or less of the total number of birds detected (Table 3-1). A single species of raptor, the short-eared owl, was detected during the surveys. Short-eared owls primarily flew at low altitudes; however, males are known to perform higher altitude aerial displays when mating. The short-eared owl has been listed as a bird of conservation concern by the USFWS and is a state listed endangered species on the island of O'ahu (DOFAW 2007). Introduced mammal species are also present on the met tower project area. Game species such as European mouflon sheep and axis deer were introduced to Lāna'i, and feral cats and rats have been observed during site surveys.

The shore areas of Lāna'i provide suitable beach habitat for some marine wildlife that exit the water, such as sea turtles or monk seals (Baker and Jahanos 2004). However, these beaches that include Shipwreck Beach and Polihua Beach are outside the met tower project area. The proposed met towers would be located upslope and away from the coastline and would not impact marine life.

3.9 Wildlife (listed species)

3.9.1 Hawaiian Petrel

The endemic u'au or Hawaiian petrel is one of the larger species in the *Pterodroma* group. This species formerly nested in large numbers on all of the main islands in the Hawaiian chain except Ni'ihau. Currently, Hawaiian petrels nest at high elevations on Maui, primarily in Haleakala National Park, and in smaller colonies on Kaua'i, Hawai'i, Molokai, and in a more recent discovery, on Lāna'i. Population estimates for the species are mainly based on at-sea numbers with the total population of Hawaiian petrels estimated to be 20,000, with an estimated 4,500 to 5,000 nesting pairs on Kauai and Maui (DOFAW 2005b). The estimated number of nesting pairs on Lāna'i is currently not known.

During the non-breeding season, Hawaiian petrels are found far offshore, primarily in equatorial waters of the eastern tropical Pacific. The breeding season occurs over a period of 9 months each year, from pre-breeding activities to fledging of chicks. Adult Hawaiian petrels return to their colonies, and to the same burrows, each year between March and April. Petrels create burrows in the soil beneath uluhe fern (*Dicranopteris linearis, Diplopterygium pinnatum*), 'ohi'a (*Metrosideros polymorpha*) forests, or in cracks in lava tubes. One egg is laid by the female, which is incubated alternately by both parents, for approximately 55 days. The egg is not replaced if it is lost to predation. When eggs hatch in July or August, both adults make nocturnal flights out to sea to bring food back to the nestlings. In October and November, the fledged young depart for the open ocean. Hawaiian petrels do not breed until age 5 or 6. Although only an estimated 89 percent of birds breed each year, they all return to the colony (USFWS 1983; DOFAW 2005b).

A variety of threats have been documented for the Hawaiian petrel but predation remains one of the most serious threats to the species (USFWS 1983; DOFAW 2005c**)**. Depredation of eggs and young by feral predators, notably cats, barn owls, and mongooses can decimate a nesting colony. Predation therefore is a serious threat to adult seabirds and their eggs and chicks. In addition, fledgling petrels sometimes collide with power lines, fences, and other structures (Hodges 1994) or become disoriented by lights (Telfer et al. 1987). On Lāna'i, petrels were observed colliding with a watershed protection fence (USFWS and DOFAW, pers. comm. 2007). Adults apparently are not attracted to lights to the same degree as fledglings, but adults do collide with power lines. Development of new fisheries may directly or indirectly harm seabird populations; harvest of skipjack and yellowfin tuna (*Thunnus albacares*) could eliminate predatory fish needed to drive prey species to surface. Also, live bait needed for the fishery could potentially decrease prey items. Development of a fishery for squid, their primary food source, could also impact Hawaiian petrels (USFWS 1983). Finally, avian malaria was found in blood samples of Hawaiian petrels in the 1960s and this disease may have killed off low elevation breeders.

The USFWS' "Recovery Plan for the Hawaiian Dark-rumped Petrel (*Pterodroma sandwichensis*) and Newell's Townsend's shearwater (*Puffinus auricularis newelli*)" includes three objectives: (1) reduce annual fallout (when seabirds become disoriented around bright lights and crash or fall to the ground), (2) provide long-term protection for the known nesting colonies, and (3) develop efficient predator control methods for use in and around isolated nesting sites (USFWS 1983). Several measures are currently being implemented or considered to better understand and protect the Lāna'i colony. These measures include predator control, the use of artificial nesting burrows, restoration of key habitats, radar studies, and creation of Bird Salvage-Aid Stations.

A breeding colony of the Hawaiian petrel was rediscovered on Lānaʻi in 2006, near the summit of Lānaʻihale. Although the petrel colony was historically known to occur, its status was unknown and thought to have dramatically declined until surveys were conducted in 2006 (DOFAW, pers. comm. 2008). These birds attend the colony at night and nest in burrows in the ground, under dense uluhe ferns. The nesting habitat used by the Hawaiian petrel colony on Lānaʻi is delineated by the approximate area of the uluhe ferns. While the population size has not been estimated with statistical confidence, it is estimated that at least a thousand birds are using the habitat within the Lānaʻihale (Penniman, pers. comm. 2007).

To better understand the potential presence and movement of Hawaiian petrel, Newell's shearwater, and Hawaiian hoary bat within the WRA, Castle & Cooke contracted to have radar and audio-visual surveys conducted within the project vicinity. ABR, Inc. conducted surveys to collect data on the movements, behavior, and flight altitudes of the seabirds and bat to estimate fatality rates, exposure risks, and use of the area by these species. The initial survey was conducted in late May-June 2007 at three sites within the WRA (**Figure 3-3**). The late May-June sampling was conducted at three sites for 15 nights of sampling. During subsequent meetings with DOFAW and USFWS, the agencies requested revisions to the survey protocol. DOFAW and USFWS recommended that the surveys be conducted to correspond with the periods of time when the maximum number of birds are expected to be on the island, during the fledging period, and at all seven met tower locations. Three survey windows were established: pre-breeding/spring (April–May), breeding/summer (July–August), and fledging/fall (late October–December). DOFAW's initial studies of the petrel colony indicated this population may breed and fledge approximately one month behind petrel colonies on other islands (Penniman, pers. comm. 2007). The summer sampling survey was conducted late June to July 2007 at the seven proposed met tower sites for 35 nights of sampling. Radar surveys were conducted early November through early-December 2007 (fledging) and April through May 2008 (spring). Fledging season radar surveys ended on December 7, 2007 upon confirmation from DOFAW that petrels had fledged and most birds had left the island. A summary report for the May-June and June-July 2007 surveys is provided in **Appendix 3**. The summary report for all data collected to date is not yet available.

The Lānaʻi Hawaiian petrel colony is located approximately seven miles from the nearest proposed met tower location and approximately 11 miles from the westernmost met tower location. During the spring and summer surveys, audio-visual observations were recorded of 33 petrels and two unidentified petrels/shearwaters. The radar sampling recorded 170 petrel/shearwater targets and 427 probable petrel targets in spring and summer surveys, respectively. Movement rates showed that fewer targets flew over the western portion of the study area during both surveys. The overall movement rates observed on Lānaʻi (0.5 to 7.1 targets/hr) tended to be much lower than the rates observed during similar radar studies on Kauai (8 to 569 targets/hr) and East Maui (3.6 to 134 targets/hr). Movement rates were similar to Hawaiʻi (0 to 25.8 targets/hr). Mean movement rates in the western portion of the WRA on Lānaʻi were lower than rates recorded at nearly all other locations studied on the Hawaiian Islands (**Appendix 3**).

Seabirds are known to show avoidance of objects. For example, petrels must navigate and avoid trees and other objects when flying into and away from their burrows in the colony at night. However, no data is available to document their avoidance behavior rate. This is an important element used in the models to estimate fatality rates. Castle & Cooke has commissioned an avoidance behavior study by ABR, Inc. to initially include two smaller communication and weather towers at the Lānaʻihale colony and at met tower 6. The objectives of this study are to

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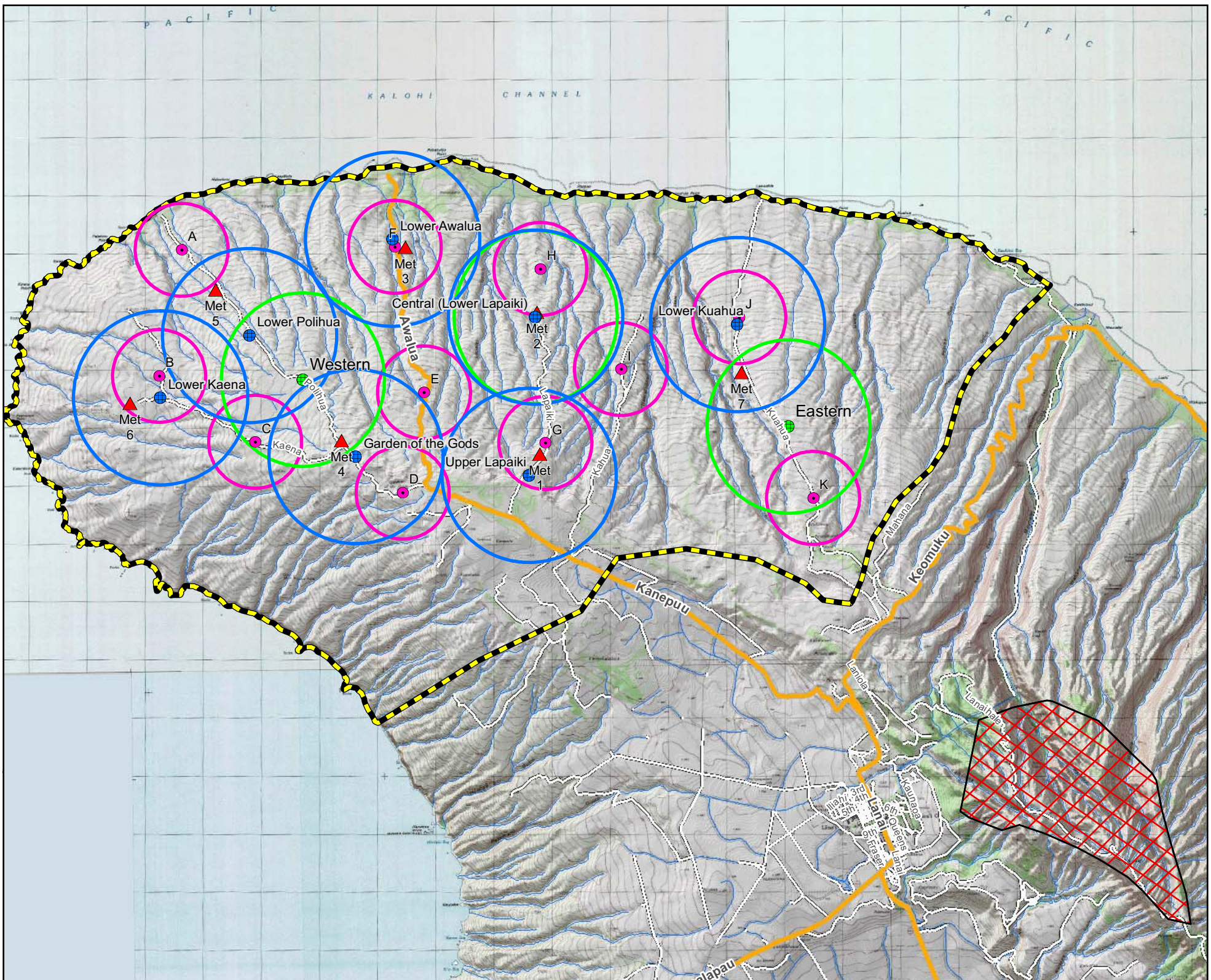

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Figure 3-3. Lāna'i Survey Sampling Locations

Castle and Cooke Lāna'i Meteorological Towers Project
Maui County, Hawaii

Project Facilities

- Proposed Met Towers
- WRA
- Radar Sampling Locations (May/June 2007)
- Radar Sampling Coverage - 1.5 km radius
- Radar Sampling Locations (June/July 2007)
- Radar Sampling Coverage - 1.5 km radius
- Avian Point Count Locations
- 800m Buffer Avian Point Counts
- Petrel Colony

Water Bodies

- Streams

Existing Transportation

- Highway
- Major Road
- Local Road

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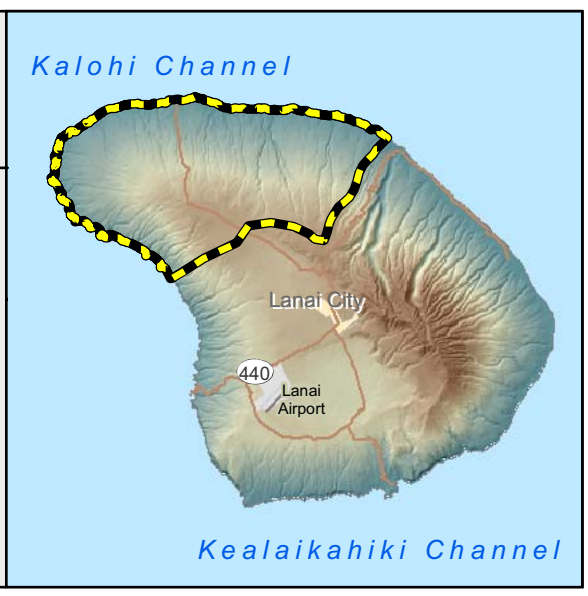
Miles

June 30, 2008



document whether petrels are able to see and avoid collision with towers. This study began in September 2007. During the late summer and fall surveys, 25 nights were sampled at the communication towers and met tower 6. Twenty petrels were observed approaching the communication towers and exhibiting avoidance behavior by changing their flight path or reversing their direction (Cooper, pers. comm. 2007). No petrels were observed at met tower 6. Although the communication towers are not the same type of structure as the met towers, the data are important to demonstrating that petrels can exhibit avoidance behavior. The applicant aims to continue this study and publish its findings.

3.9.2 Newell's Shearwater

A highly pelagic species, Newell's shearwater forages over deep water east and south of Hawai'i. Historically, Newell's shearwater was once abundant on all the main Hawaiian Islands. Newell's shearwater is known to nest on Kaua'i and Hawai'i and may also nest in small numbers on Maui, Moloka'i, O'ahu and Lehua (off Ni'ihau), but breeding has not been confirmed on these smaller sites. Numbers of both colonies and individuals are greatest on Kaua'i where shearwaters nest in mountains in terrain between elevations of 500 and 2,300 feet. Newell's shearwaters are not known to nest on Lāna'i.

The breeding season for this species begins in April when Newell's shearwater return to prospect for sites. The Newell's shearwater nest in burrows under ferns on forested mountain slopes. Nesting burrows are used year after year and usually by the same pair of birds (DOFAW 2005a). Most Newell's shearwater breeding colonies are found at high elevations in areas of open native forest dominated by 'ohia with a dense understory of uluhe ferns. Pairs produce one egg that is incubated for an average of 53 or 54 days and most chicks fledge in October-November. Parents forage hundreds of kilometers offshore and return to the colony at night to feed their chick. First breeding occurs at approximately six years of age and a relatively high rate of non-breeding is reported even by experienced adults present at the summer colony.

From at-sea counts conducted in 1994, the total population for Newell's shearwater was estimated to be 84,000 birds (Spear et al. 1995). Recent radar target data (Day et al. 2003), however, from 1993 to 1999-2001 indicate the population may have declined approximately 60% from those estimates (Day et al. 2003; Nick Holmes pers. comm. 2008). The current breeding population size is estimated to be 14,600 birds (DOFAW 2005 unpubl.) with approximately 75 percent occurring on the island of Kaua'i. When variables describing the anthropogenic mortality suffered by Newell's shearwater (predation, light attraction and collision) were included, models predicted a population decline of 30 to 60 percent over 10 years (Ainley et al. 2001). As noted by DOFAW (2005a), it is evident that an attraction to lights and collision with power lines and other structures exacts a significant mortality on fledglings and breeding adults.

The USFWS' "Hawaiian Dark-rumped Petrel and Newell's Manx Shearwater Recovery Plan" (USFWS 1983) and the DOFAW Comprehensive Wildlife Conservation Strategy (DOFAW 2005c) include three objectives: (1) reduce annual fallout, (2) provide long-term protection for the known nesting colonies, and (3) develop efficient predator control methods for use in and around isolated nesting sites. In order to meet these goals, DOFAW (2005c) recommend the following short-term goals be accomplished first:

1. Increase reproductive success at a minimum of two Newell's shearwater colonies.
2. Increase fledging success by decreasing fallout at a specified location such as the north shore of Kaua'i.

3. Assess the effects of predators on Newell's shearwater reproduction.
4. Monitor overall population trends on Kaua'i and improve knowledge of Newell's shearwater breeding distribution throughout Hawai'i, especially on O'ahu, Lāna'i, Moloka'i, and Maui.
5. Monitor results of restoration/conservation activities at specific sites.

ABR (see **Appendix 3**) indicated that other researchers consider Newell's shearwater to be rare and doubt the species nest on Lāna'i. Jay Penniman, DOFAW biologist, has heard Newell's shearwater vocalizations during night time surveys at the Hawaiian petrel colony on Lāna'i but does not know whether they are breeding at the colony (Penniman, pers. comm. 2007). No Newell's shearwaters were observed during the 2007 audio-visual survey or confirmed during the radar surveys on Lāna'i.

3.9.3 Hawaiian Stilt

The Hawaiian stilt, a waterbird, is considered a distinct subspecies from the complex of North and South American stilts. This slender wading bird forages in ephemeral wetlands and feeds opportunistically on a variety of shallow water animals. The Hawaiian stilt frequently moves between wetland habitats, although little is known of their movement patterns on Lāna'i.

Hawaiian stilts were historically documented on all the major islands except Lāna'i and Kahoolawe. Currently, Hawaiian stilts inhabit seven of the Hawaiian Islands; Hawai'i, Kaua'i, Maui, Moloka'i, O'ahu, Ni'ihau, and Lāna'i**.** The existence of Hawaiian stilts on Lāna'i may be due to recent re-colonization from other islands (Englis and Pratt 1993). The Lāna'i population is permanent breeding residents at the Lāna'i City wastewater treatment plant (WWTP) ponds. They have been recorded there since the ponds were operational in 1989. Nesting and breeding habitat differ, and the stilts move between these two habitat types daily during the breeding season. The nesting season extends between March and August but varies between years based on water levels. Hawaiian stilts nest on freshly exposed mudflats interspersed with vegetation or on islands in fresh or brackish ponds. Both parents incubate three to four eggs and fledglings remain with their parents for several months.

The Hawaiian stilt uses ephemeral wetlands, below 660 feet, for foraging and they are quick to colonize newly created wetlands. Hawaiian stilts require specific wetland conditions with a water depth of thirteen centimeters or less for optimal foraging (USFWS 2005). There is some evidence that Hawaiian stilts move seasonally between islands as they travel between wetland habitats and that those movements can be extensive (Reed et al. 1998).

Semi-annual waterbird counts for all the islands between 1993 and 2003 document an average annual population of approximately 1,300 Hawaiian stilts. Counts from across the Hawaiian Islands for the Hawaiian stilt suggest the population is stable to increasing; however, count numbers are variable. The population on Lāna'i is small with a yearly average of 55 adults between 1999 and 2003 from winter counts, with a high of 100 birds (USFWS 2005). The main threats to the population include habitat loss of coastal plain wetlands and introduced predators such as feral cats, rats and dogs.

Although Hawaiian stilts are known to occur in Lāna'i City, they are believed to have a low potential for occurrence in the project area. Spring and summer 2007 radar surveys recorded a Hawaiian stilt flying near met tower site 1. The Hawaiian stilt was observed flying south at 200 m above ground level at dusk on 3 July 2007. Only one stilt was recorded during 485 radar

sampling sessions (0.005 stilts/hr), and no stilts were observed during spring and fall avian point count surveys.

3.9.4 Hawaiian Hoary Bat

The Hawaiian hoary bat is the only fully terrestrial native mammal in the Hawaiian Islands. This species is half the size of its North American relatives and primarily forages for flying insects between sunset and sunrise. Relatively little research on this has been conducted on this endemic Hawaiian bat and data regarding its habitat and population status are very limited.

Reports of the Hawaiian hoary bat are known from all the main islands except Ni'ihau (HBMP 2007), although this species is most often seen on Hawai‘i, Maui and Kaua‘i (Kepler and Scott 1990). Today, the largest populations and only known breeding populations are thought to occur on Kaua‘i and Hawai‘i. Breeding activity takes place between April and August with pregnancy and birth of twin young occurring from April to June, lactation from June to August and post-lactation from September to December (Menard 2001). While the Hawaiian hoary bat may migrate inter-island and within topographical gradients on the islands, long distance migration like that of the North American hoary bat are unknown (USFWS 1998). Seasonal and altitudinal differences in bat activity have been suggested (Menard 2001) but the timing and extent of this variation are unknown.

The Hawaiian hoary bat has been observed in a variety of habitats that include open pastures and more heavily forested areas in both native and non-native habitats. Typically, this species feeds over streams, bays, or along the seacoast, over lava flows or at forests edges. Hawaiian bats are known to roost solitarily in tree foliage and have only rarely been seen exiting lava tubes, leaving cracks in rock walls, or hanging from man made structures. They are found in both wet and dry areas from sea level to 13,000 feet elevation, with most observations occurring up to 7,500 feet.

Population estimates for this species have ranged from hundreds to a few thousand; however, these estimates are based on limited and incomplete data due to the difficulty in estimating patchily distributed bats (USFWS 2007). The main threats to the Hawaiian hoary bat may be reduction in tree cover, pesticide use, prey availability due to the introduction of nonnative insects and predation. It is unknown what effect these threats have on the population. Observation and specimen records do suggest, however, that these bats are now absent from historically occupied ranges. The magnitude of any population decline is unknown.

At the beginning of the met tower project planning phase, in early 2007, Hawaiian hoary bats were believed to have the potential to occur on Lāna‘i because of its proximity to Maui where hoary bats have been documented. On July 3 near the Garden of the Gods, ABR, Inc. made one visual sighting of a Hawaiian bat. This one sighting was the only bat recorded during 485 sampling sessions (0.005 bats/hr) (**Appendix 3**). During the avoidance behavior study, ABR recorded four sightings of Hawaiian bats during that survey period near the summit of Lāna‘ihale. Jay Penniman, a DOFAW biologist, noted two bat visual sightings near met tower 6 in September 2007 (Penniman, pers. comm. 2007). Although Hawaiian hoary bat presence has been documented on Lāna‘i, their breeding status is not known.

4 CONSERVATION MEASURES AND GOALS

4.1 General

The HCP addresses potential incidental impacts to individuals of a species rather than habitat-based potential impacts. The proposed met towers will have only negligible or no impacts on the amount or quality of habitat for the listed species of concern: Hawaiian petrel, Newell's shearwater, Hawaiian stilt, and Hawaiian hoary bat. No major alternation, degradation, or loss of habitat will occur from operation of the existing and six proposed met towers. However, the met towers have the potential to directly impact the four listed wildlife species if an individual were to collide with a met tower or associated guy wires. HCP avoidance and minimization measures, goals, and objectives are therefore based on individuals or populations of these species rather than habitat.

Castle & Cooke has been working with USFWS and DLNR/DOFAW to identify the potential for incidental impacts to the four protected wildlife species. Castle & Cooke is in the process of implementing species- and site-specific studies to assess the occurrence of these species within the project area and to identify appropriate measures to minimize the potential for impacts.

The biological goals of this HCP are to:

- Minimize and mitigate the effects of take caused by potential collisions of these four federally- and state- listed wildlife species with one or more of the seven met towers.
- Adhere to the goals of the existing recovery plans for the Hawaiian petrel, Newell's shearwater, Hawaiian stilt, and Hawaiian hoary bat.
- Increase the knowledge of these four listed wildlife species population biology and behavior in the project vicinity and on Lāna‘i.
- Adhere to the goals of DOFAW and USFWS for increasing the knowledge and understanding of the Hawaiian petrel colony on Lāna‘i.
- Provide a net conservation benefit to each of the four species.

The biological objectives for accomplishing these goals are to:

- Minimize potential collisions by attaching bird diverters and flagging to the met tower guy wires to increase visibility to avian and bat species.
- Continue to conduct radar and avoidance behavior studies to increase the level of knowledge concerning these listed species on Lāna‘i.
- Provide immediate and long-term benefit to the covered species by implementing a mitigation plan that includes both predator control and habitat restoration. The objective of the predator control in the vicinity of the petrel colony is to increase the survival of both chicks and adult birds, and the objective of the habitat restoration adjacent to the colony would produce additional breeding opportunities for three of the four species to more than offset take levels.
- Increase the survival of Hawaiian stilt chicks and adults by conducting predator control in the vicinity of the WWTP where the Hawaiian stilt is known to occur.

- Document the effectiveness of habitat restoration as a tool for listed seabird recovery on Lāna‘i through implementation of a mitigation and monitoring plan.

4.2 Project Alternatives

Section 10(a)(2)(A)(iii) of the ESA requires that alternatives to the taking of listed species be considered and that reasons such alternatives are not implemented be discussed. For this project and HCP, the No Action and Proposed Action alternatives are the two alternatives considered and are presented below.

4.2.1 Alternative 1: No Action Alternative

NEPA requires the evaluation of a No Action Alternative, defined in CEQ regulations as a continuation of present conditions (40 CFR § 1502.14). Under the No Action Alternative for this project, the ITP/ITL would not be granted, and therefore the condition of the CDUP requiring an ITL/ITP would not be met. As a result, the six installed towers would be removed, met tower 7 would not be installed, and no additional information on wind patterns would be available to assess the area's potential to provide wind-generated electricity. Without the additional information on wind resources in the area, Castle & Cooke would be unable to evaluate whether this site meets standards for a viable operation to provide renewable energy to energy consumers.

Hawai‘i has established a renewable portfolio standard (RPS) (sections 269-91 through 269-95, HRS) from which the electric utilities are to provide 10 percent of their electricity from renewable sources and energy efficiency by the year 2010, 15 percent by 2015, and 20 percent by 2020. It is anticipated that the addition of renewable energy will lessen the need for imported fossil fuels and will result in dependable electricity benefiting the public. Wind energy is among the most cost-competitive renewable resources but there is limited land available on the Hawaiian Islands for this use. Should data collected via the proposed met towers provide evidence that a wind farm is feasible on Lāna‘i, it could provide a significant contribution towards the State of Hawai‘i's RPS goal.

4.2.2 Alternative 2: Proposed Action

The Proposed Action consists of issuance of an ITP/ITL to address potential impacts to four listed wildlife species associated with the operation of seven 50-meter tall met towers on privately owned lands by Castle & Cooke (see Figure 1-1). The towers collect data on wind patterns; these data would be used to determine the suitability of the wind regime to sustain a wind energy facility. Minor adjustments to these locations (that is, micro-siting) were implemented in the field if necessary to avoid unexpected sensitive resources or installation issues. Seven towers are required to best assess the wind data across the entire wind resource area.

No feasible alternatives to the Proposed Action were found other than the No Action alternative. Alternate locations for the seven tower sites were considered and dismissed because the towers must be located where the representative wind resource is likely to occur. A single alternative, the No Action alternative, is therefore the only alternative to the Proposed Action.

DLNR issued Castle & Cooke CDUP No. LA-3419 on August 8, 2007, to conditionally approve the installation of one met tower at site number 6 and preliminarily approve installation of the remaining six met towers (**Appendix 1**). Pursuant to DLNR approval on December 10, 2007, five additional met towers were erected by February 8, 2008. Two of the permit conditions provided below and subsequent coordination with DOFAW and the USFWS resulted in the

determination that an EA and HCP should be prepared for the met tower project to address potential impacts to federal- and state-listed wildlife species under section 10 of the ESA. The pertinent CDUP conditions state:

> "7. Should an impact with flying wildlife occur, the applicant shall remove the tower(s) until such time as the tower(s) are covered by an Incidental Take License and accompanying (amended) Habitat Conservation Plan;
>
> 8. Subsequent tower construction shall proceed only after review and approval by the Division of Forestry and Wildlife and the Office of Conservation and Coastal Lands, based on positive avian survey results and the successful actions of the applicant to mitigate potential avian impacts;"

Condition 7 was clarified by DLNR in a letter dated September 7, 2007, that "flying wildlife" only pertained to listed wildlife species (**Appendix 1**).

With a steadily increasing demand for power, Hawai'i currently uses fossil fuels for 90 percent of its electric generation, which results in very high electricity prices. The proposed met towers are critical to making an informed decision on whether a wind farm is feasible on Lāna'i. It is anticipated that an additional source of renewable energy would lessen the need for fossil fuels and will result in dependable electricity benefiting the public. Castle & Cooke is dedicated to assisting the state in meeting its renewable energy requirements and goals.

4.3 Avoidance and Minimization of Impacts

Complete avoidance of risk to the four listed wildlife species is not possible for the project. Therefore, Castle & Cooke plans to minimize the risk of collisions as much as possible by maximizing the visibility of the met towers and guy wires while ensuring that meteorological data collection is not compromised. These measures include the following:

- Towers are sited primarily on the western side of the WRA to maximize the distance from the petrel colony.
- Each of the met towers are painted white and utilize white, 1-inch poly tape, fitted to the guy wires, to increase visibility and subsequently increase the likelihood of avoidance by the seabirds and bat. This tape has proved effective in minimizing petrel collisions with fences on other projects within the Hawaiian Islands when wrapped along the length of the wire (USFWS and DOFAW, pers. comm. 2007; **Appendix 2**).
- The poly-vinyl tape are cut into 4-foot segments, folded in half over the wire, and attached using ultra-violet light resistant zip ties, leaving at least 6-foot gaps above and below the anemometers. Bird diverters are added between the sections of white tape. Additionally, two, 3-foot sections of yellow PVC tubing are placed on each guy wire, starting at the anchor points. This is the maximum amount of PVC tubing that can be applied to the guy wires without causing excessive loading and drag; more tubing could significantly impact the quality of the meteorological data collected (**Appendix 2**).
- Castle & Cooke removed met tower number 8 from further consideration to minimize the number of towers erected and to reduce the potential for collision with a met tower or guy wire.
- No lighting is needed for the met towers because they are less than 200 feet high (FAA 2007).

- Vegetation clearing is minimal for the erection of each tower.
- Radar and visual studies are being conducted to identify the movements, behavior, and flight altitudes for the seabirds and bats.
- Established take limits to ensure that take does not exceed the expected levels, and that mitigation more than compensates for any impacts.
- Three or six acres of native habitat will be restored that is expected to provide nesting habitat for Hawaiian petrels and Newell's shearwaters and roosting and foraging habitat for Hawaiian hoary bats.
- A monitoring and adaptive management program will be implemented to ensure that take limits are not exceeded and that the habitat restoration and predator control programs are achieving their expected benefits.

5 ASSESSMENT OF POTENTIAL IMPACTS AND MITIGATION

5.1 Assessment of Potential Impacts to Listed Species

Studies summarized by Erickson et al. (2005) show that millions of birds each year are killed in the U.S. by a variety of anthropogenic causes. These sources include collision with human-made structures such as buildings, windows, communication towers, power lines, wind turbines, electrocution, cat predation, pesticides and other contaminants. This and other studies reviewed show that the magnitude of bird mortality at wind energy facilities is low compared to mortality resulting from collisions with other man-made structures. Erickson et al. (2005) estimated annual avian mortality from wind turbines was 20,000 to 37,000 birds. In comparison, the National Audubon Society estimates that over 100 million birds are killed each year by house cats alone (Erickson et al. 2005). Most of the available literature focuses on mortality associated with wind turbines or other structures rather than met towers. However, a few studies summarizing results of mortality monitoring at turbines have made reference to carcasses found at met towers if monitored. Young et al. (2003) reported bird fatalities at guyed met towers at Foote Creek Rim wind power project in Wyoming.

To better understand the potential presence and movement of Hawaiian petrels, Newell's shearwaters, Hawaiian stilts, Hawaiian hoary bats, and other avian species within the WRA, Castle & Cooke contracted to have radar and audio-visual surveys and avian point count surveys conducted within the project vicinity. These surveys are described in **Appendices 3 and 4** and summarized in Section 3.9.

The issuance of an ITP/ITL requires establishing the number of individuals authorized for take during a defined period. The met towers are temporary structures that will be operated up through March 1, 2010. Rather than estimating a take limit per year for each listed species, USFWS and DOFAW recommended establishing a maximum take for each species over the 2-year period and providing appropriate mitigation that would compensate for these maximum take limits. A take limit of two individuals has been established each for the Hawaiian stilt, Hawaiian hoary bat, and Newell's shearwater. Based on radar data and expected avoidance behavior, a tiered approach to the take limit and associated compensatory mitigation was established for the Hawaiian petrel. Should the Tier 1 take limit for the petrel be reached before the end of the 2-year period, a higher, Tier 2 take limit would be established. Tier 2 mitigation would be implemented as a contingency to account for greater than anticipated Tier1 take levels. Tier 1 mitigation developed for the petrel will also mitigate for potential impacts to Newell's shearwater and Hawaiian hoary bat.

If Tier 2 take limits are reached without an approved amendment to the HCP, the towers will be taken down. However, if Tier 2 take limits are reached at the end of the fledging season but prior to the following years' spring breeding season, the met towers would be removed approximately two weeks prior to the beginning of the seabird breeding season, pending approval by DLNR and USFWS. In the event towers need to be removed before project completion, tower removal would be initiated within 3 days and be completed 10 days after initiation of tower removal.

5.1.1 Hawaiian Petrel

The Lānaʻi Hawaiian petrel colony is located approximately seven miles from the nearest proposed met tower location and approximately 11 miles from the westernmost met tower location. During the spring and summer 2007 radar surveys, audio-visual analyses recorded 33 petrels and two unidentified petrel/shearwater targets. Radar sampling documented 170 petrel/shearwater targets and 427 probable petrel targets during spring and summer surveys, respectively. Movement rates showed that fewer targets flew over the western portion of the study area during both surveys. The overall movement rates observed on Lānaʻi (0.5 to 7.1 targets/hr) tended to be much lower than the rates observed during similar radar studies on Kauaʻi (8 to 569 targets/hr) and East Maui (3.6 to 134 targets/hr). Movement rates were similar to Hawaiʻi (0 to 25.8 targets/hr). Mean movement rates in the western portion of the Lānaʻi WRA were lower than rates recorded at nearly all other locations studied in the Hawaiian Islands (**Appendix 3**).

Although there is no petrel-specific literature data on avoidance of met towers or other structures, data is available indicating that other seabird species detect and avoid wind turbines and other manmade structures in low-light conditions (Dirksen et al. 1998, Winkleman 1995, Desholm and Kahlert 2005, Desholm et al. 2006). For example, seaducks in Europe have been found to detect and avoid wind turbines >95% of the time (Desholm 2006). Further, natural anti-collision behavior (especially alteration of flight paths) is seen in migrating Common and King Eiders (*Somateria mollissima* and *S. fischeri*) approaching human-made structures in the Beaufort Sea off of Alaska (Day et al. 2005) and in diving ducks approaching offshore wind turbines in Europe (Dirksen et al. 1998).

Hawaiian petrels have flight characteristics different from these other species. However, they are adept at flying through forests to and from their nests during low-light conditions. Preliminary results of an avoidance behavior study for the Lānaʻi project indicate that petrels do see and are able to avoid objects such as communication towers when in their flight path. For example, two different petrels avoided a communications tower on the Lānaʻihale by turning 180 degrees on approaching the tower and flying in the opposite direction. Other petrels observed avoided the tower by adjusting their flight direction away from the structure (Cooper, pers. comm. 2007 and 2008). It is reasonable to assume that a fairly high proportion of petrels would detect and avoid other large structures under average conditions of weather and visibility due to the following elements: 1) petrels have the behavioral and physical capabilities to avoid towers, and 2) although a small sample size, petrels have demonstrated a high avoidance rate of structures at the Lānaʻihale during summer and fall avoidance studies.

Using movement-rate (see **Appendix 3**) and flight height data collected during the spring and summer of 2007, Castle & Cooke developed a range of estimated annual fatality rates for each met tower by assuming that 0, 50, 95, and 99 percent of all Hawaiian petrels flying near a proposed met tower see and avoid the tower. The estimated range of petrel fatalities at met towers 1 through 7 over a 2-year period is 5 to 25 birds, using avoidance rates of 95 and 99 percent and avian data. These fatality rates do not take into account several factors including the results of the recent 2007 fledging season radar surveys where lower numbers of birds were observed, compared to spring and summer. Also, petrels had fledged by December 7, and the model used to estimate the fatality rates assumed the fledging period ends at the end of December. Finally, the model assumptions do not consider the use and effects of flagging, diverters, and tower painting, all of which increase tower visibility and likely reduce the risk of

collisions. Thus, these three factors would lower estimated annual fatality rates presented for the spring and summer surveys (Cooper, pers. com. 2007).

In consultation with USFWS and DOFAW, Castle & Cooke established Tier 1 and Tier 2 take limits of seven and fourteen Hawaiian petrels, respectively, as a result of collision with one or more of the proposed met towers over a 2-year period. Since an active breeding colony of petrels exists at the Lāna‘ihale, there is the potential that indirect take of petrels could occur if an adult is killed while incubating an egg or rearing a chick. However, because petrels can abandon young several weeks prior to fledging, and young die from natural causes such as predation, loss of an adult during the nesting season may not always be associated with the loss of that year's young. During the spring season, a large number of non-breeders may also be present on the island. Indirect take of petrels is accounted for through the Tier 1 and 2 mitigation in an analysis conducted to determine the area to be restored within the colony (see Section 5.3.5).

5.1.2 Newell's Shearwater

Radar and visual studies to date have not verified the presence of Newell's shearwaters within the WRA, although a few unidentified petrel/shearwater targets were documented. This species has not been confirmed to breed on the island. Thus, the potential for take of shearwaters as a result of collision with the met towers is extremely low. However, because DOFAW has documented their presence by vocalizations on at least one occasion in the Lāna‘ihale petrel colony, the potential for take must be considered. In consultation with USFWS and DOFAW, Castle & Cooke established a take limit of two Newell's shearwaters as a result of collision with one or more of the proposed met towers over a 2-year period.

5.1.3 Hawaiian Stilt

Hawaiian stilts on Lāna‘i reside at the WWTP ponds in Lāna‘i City, which are roughly 12 miles from the closest met tower. Although no foraging or nesting habitat occurs within the vicinity of the met tower locations, Hawaiian stilt would have the potential to collide with met towers or guy wires while traveling between wetland sites or to tidal flats on other parts of Lāna‘i or other islands. Reports of waterbird fatalities associated with met towers are limited, but some wind turbine facility studies have documented waterbird fatalities, such as grebes and coots (Johnson et al. 2002, Anderson et al. 2005).

One Hawaiian stilt was observed flying over near met tower 1 (at 200 meters above ground level) during 485 radar sampling sessions, and no observations were made during spring and fall point count surveys. Thus, the potential for take of Hawaiian stilts as a result of collision with met towers is very low if any. However, in the slight chance that a Hawaiian stilt would collide with one of the met towers, the stilt has been included as a covered species in this HCP. In consultation with USFWS and DOFAW, Castle & Cooke established a take limit of two Hawaiian stilts as a result of collision with one or more of the met towers over a 2-year period.

5.1.4 Hawaiian Hoary Bat

One Hawaiian hoary bat was recorded during 485 radar sampling sessions (0.005 bats/hr) within the WRA (**Appendix 3**), and there have been limited observations of the bat on the island. Thus, the potential for take of a hoary bat as a result of collision with the met towers is low. Hawaiian hoary bats forage for insects in open areas such as grasslands and shrublands at variable heights but tend to roost in tree foliage, which is absent from the met tower locations. Hawaiian hoary

bats are not known to roost on Lāna‘i and are believed to occur on the other Hawaiian Islands in greater numbers. Population estimates range from hundreds to a few thousand (USFWS 2007).

A Hawaiian hoary bat would have the potential to collide with the tower or guy wires while foraging. Reports of bat fatalities associated with met towers are limited, but some studies discuss bat mortality as a result of collision with turbines. Monitoring studies completed since 2001 have indicated that some wind energy facilities have killed a number of bats. Studies seem to indicate that bats are struck by the moving rotor blades rather than colliding with the turbine or non-operational turbine (Kunz et al. 2007). Therefore, it may be that moving parts represent the larger threat to the bats rather than collisions with stationary structures such as met towers. Furthermore, tree-roosting bats that migrate long distances are more commonly killed by turbines than other bat species. The highest number of bat fatalities in North America at wind energy facilities appears to be along forested ridge tops in the eastern US and lowest in relatively open landscapes in the mid-west and western states (Kunz et al. 2007). Hawaiian hoary bats do not migrate to any degree as hoary bats do on the mainland, and roosting habitat is absent from the met tower locations. Therefore, potential impacts from collision with met towers are expected to be very low if any. However, in the slight chance that a bat would collide with one of the met towers, the Hawaiian hoary bat has been included as a covered species by this HCP. In consultation with USFWS and DOFAW, Castle & Cooke established a take limit of two hoary bats as a result of collision with one or more of the met towers over a 2-year period.

5.1.5 Listed Plant Species

No listed plant species were observed during biological surveys of the met tower locations conducted in April 2007 and November 2007. Therefore, no impacts to federally listed plant species are anticipated as a result of met tower installation and operation.

5.2 Take Limits

The take limits were established for each of the four listed species based on the 2007 spring and summer radar survey data, spring and fall point count surveys, and consultation with DOFAW and USFWS. The estimated range of petrel fatalities at met towers 1 through 7 over the 2-year period is 5 to 25 birds, using avoidance rates of 99 and 95 percent, respectively. Observations of one Hawaiian stilt and one Hawaiian hoary bat were recorded, and no shearwaters were observed during these surveys. Thus, based on these data and consideration of the avoidance measures implemented, the following take limits were derived:

Table 5-1. Tiered Take Limits

Species	Tier 1 Take Limit	Tier 2 Take Limit
Hawaiian Petrel	7	14
Newell's Shearwater	2	N/A
Hawaiian Stilt	2	N/A
Hawaiian Hoary Bat	2	N/A

Take of a particular species includes not only the direct take that is observed (for example, injury or mortality), but may also include unobserved direct take and indirect take. Each of the following components are considered to determine estimated take for each species and establish the appropriate level of mitigation to compensate for direct and indirect take:

1. **Observed Direct Take**. Regular carcass searches will be conducted at each of the met towers during the operation period to document the number of individual birds and/or

bats that have been killed or injured as a result of collision with one of the met towers. The detailed, post-construction or downed wildlife monitoring protocol is provided in **Appendix 6**.

2. **Unobserved Direct Take**. Downed wildlife may be overlooked by searchers, or scavenged by local predators such as cats. The monitoring protocol presented in **Appendix 6** includes methods for estimating searcher efficiency and scavenging rates, which together provide a basis for estimating the number of individuals that are taken but that go undetected. Scavenging and searcher efficiency data will be used to assess the frequency at which carcass searches should be conducted so as to minimize removal of any downed birds or bats by scavengers. Any changes to the monitoring protocol will be approved by DOFAW and USFWS and reviewed by the ESRC.
3. **Indirect Take.** These are individuals that are indirectly taken as the result of a direct take of another individual. For example, eggs or young may be lost due to the loss of a parent. Indirect take is accounted for in the mitigation plan.

Searcher efficiency trials will be conducted a minimum of three times per season and will be applied to the results from the carcass surveys (observed direct take) to calculate the adjusted direct take for seabird species. When (and if) carcasses are found, the searcher efficiency results will be applied to the total number of carcasses found, up to that point, to determine whether the take limit has been reached for a particular species. Searcher efficiency will not be applied to observed direct take for bats or stilts because it is highly unlikely that incidental take of one of these species would occur. There is a very low probability that bats or stilts would be using the project area based on radar studies, location of sitings on Lāna'i, lack of habitat within the project area, and other literature. However, searcher efficiency trials will be conducted for bats but not for stilts.

As an example, if a second petrel carcass is found in the ninth month of the project, and searcher efficiency up to that point is 75 percent, then the adjusted direct take would be calculated as follows:

Component	**Take**
Direct Observed Take = 2 Hawaiian petrels	-2.0
Direct Unobserved Take = Take of 2 based on 75% detection rate	-0.66
Adjusted Take	**-2.66**

Therefore, an adjusted direct take of 2.66 petrels would be applied to the Tier 1 take limit of seven. Please note that this example does not incorporate search frequency and scavenging removal times that would be used to calculate real adjusted take estimates (see **Appendix 6**).

Take of listed species is not limited to mortality. By its definition in the ESA, take of a listed species also includes "harassment". In the case of the Lāna'i meteorological project, one or more of the four listed species may be required to alter their flight patterns and/or behavior due to the presence of the met towers. Additionally, the potential exists that birds or bats may avoid areas where met towers are located. The petrel, shearwater, and bat also have the potential to be harassed as a result of habitat restoration activities in the Lāna'ihale. The majority of habitat restoration work will be conducted during the winter and spring, before the petrels return to the colony, to minimize the risk of harassment to petrels. Restoration work that occurs in the summer and fall will be conducted in areas that are not in close proximity to active nesting areas within the colony. Further, habitat restoration monitoring will be conducted in a manner that

minimizes harassment of petrels and other listed species. Therefore, no additional take or disturbance is expected for any of these four species.

5.3 Mitigation for Potential Impacts

Mitigation measures under an HCP may include a wide variety of options. In considering mitigation for this project, several criteria were considered in developing the proposed mitigation plan. These include:

- Mitigation programs should be based on sound biological principles, be practical, and commensurate with the impacts to be addressed.
- Mitigation should be species-specific.
- Mitigation measures can contribute to recovery or have a net benefit to the species.
- Mitigation can include habitat enhancement or restoration of degraded or former habitats.
- Mitigation alternatives may include studies/strategies that provide new information for a poorly documented species, which could in turn have merit when this information helps identify efforts to improve survival and productivity.

The take for all four species would have a low risk of adverse population impacts on the Lānaʻi populations. As discussed in meetings with DOFAW and USFAW, the basic population biology (e.g., distribution, abundance, population, and threats) has not been established for the Hawaiian petrel, Newell's shearwater, Hawaiian stilt, and Hawaiian hoary bat on Lānaʻi. Additionally, the petrel colony at Lānaʻihale was only recently rediscovered in 2006, and the presence of Hawaiian stilts, Hawaiian hoary bats, and Newell's shearwaters was only recently documented on the island. While the petrel population size has not been estimated with statistical confidence, it is estimated that at least a thousand birds are using the habitat within the Lānaʻihale (Penniman, pers. comm. 2007). The Newell's shearwater population was estimated at 84,000 birds at-sea (Spear et al. 1995) but current numbers are expected to be lower in Hawaiʻi (Day et al. 2003; Nick Holmes pers. comm. 2008). The Hawaiian stilt occurs primarily on the island as a result of man-made habitat at the city WWTP but larger numbers are documented on the other Islands. Research is ongoing to more fully document the extent of the Hawaiian hoary bat population, although it is expected to occur in higher numbers on Hawaiʻi and Kauai. Mitigation is proposed to provide a net benefit to these species as on-going studies will serve to better understand each species' population biology.

5.3.1 Tiered Mitigation Approach

Castle & Cooke consulted with biologists from DOFAW and USFWS to identify appropriate mitigation measures to compensate for potential take of the four listed wildlife species. This mitigation plan outlines a two-tiered approach, based on the recommendations provided by DOFAW and USFWS. DOFAW and USFWS determined that the recommended mitigation measures would address potential impacts to all four species. Therefore, a comprehensive mitigation plan is provided below rather than four separate mitigation plans for each species.

The first tier of mitigation (Tier 1) would compensate for a take limit of seven Hawaiian petrels, two Newell's shearwaters, two Hawaiian stilts, and two Hawaiian hoary bats. The mitigation has been structured to compensate for direct take and indirect take. Should the Tier 1 take limit be reached for the petrel, additional mitigation would be implemented (Tier 2). Thus, Tier 2 mitigation would compensate for the take of 14 Hawaiian petrels.

Castle & Cooke proposes to fund a project-specific mitigation plan that will be integrated into the on-going interagency seabird conservation project and the watershed enhancement program on Lāna‘i. This collaboration ensures that a coordinated and cost effective program will be implemented by DOFAW. The mitigation plan includes two primary components: predator control and habitat restoration. The combination of these two mitigation measures will provide immediate- and long-term benefits for each species by increasing adult and juvenile survival, nest success, and suitable nesting habitat required for the long-term productivity of these species.

Subsequent monitoring of the mitigation measures implemented by DOFAW will allow the agencies to assess the effectiveness of the mitigation methods. The monitoring results can be used to enhance the effectiveness of the management activities here and at other seabird colonies throughout Hawaii. This could result in a greater net benefit to bird and bat populations beyond the initial net benefit to the birds and bats on Lāna‘i.

Castle & Cooke does not anticipate reaching the maximum Tier 1 authorized take limits but will fund the mitigation measures proposed that compensate for the Tier 1 take limits established in this HCP. Castle & Cooke will also implement a wildlife education and observation program for all staff members who will be at the project area on a regular basis.

5.3.2 Predator Control

Predation of young and adults is considered one of the primary threats to all four species. Feral cats, barn owls, and rats are the predators known to occur on Lāna‘i that may kill adult or young Hawaiian petrels or Newell's shearwaters. Although the total impact of cats on the colony is not known at this time, preliminary data indicates that cats are a threat to petrels and shearwaters. An active feral cat population has been documented in the vicinity of the petrel colony, and DOFAW has established traps in locations around the colony. Ungulates have created trails throughout Lāna‘ihale that have increased access to the colony for cats. Increasing the trapping efforts for predators would logically have the potential to decrease the number of adult and juvenile petrels and Newell's shearwaters killed and have a net positive effect on both populations. Increases in survival and productivity at seabird colonies through predator control are well-documented in Hawai‘i and elsewhere (Winter and Wallace 2006).

As part of the Tier 1 mitigation plan for the met towers, Castle & Cooke will provide funding to augment DOFAW's current predator-control program at the petrel colony (**Appendix 7**). Tier 1 funding provides for materials and for the hire of two DOFAW staff members to set and monitor 20 additional traps throughout the Lāna‘ihale for the 2-year period; locations will be determined by DOFAW. Care will be taken to locate traps in previously disturbed areas; creating new trails through the colony would only provide increased access for the cats to the birds and burrows. In addition to funding for personnel to set and monitor traps, Castle & Cooke will provide DOFAW with the full-time use of a vehicle on Lāna‘i during the 2-year period to implement the predator control program.

DOFAW confirmed that cats are present and have been trapped in the vicinity of the WWTP. Therefore, it can be assumed that predation of stilts by cats occurs and could have an adverse effect on the resident stilt population (DOFAW, pers. comm. 2007 and 2008). DOFAW does not currently have the staff or resources to implement a regular predator control program at the WWTP to protect the Hawaiian stilt. Castle & Cooke will provide DOFAW 12 additional traps to be placed around the perimeter of the WWTP. DOFAW staff implementing the petrel colony predator control and habitat restoration program will maintain these traps at the WWTP. This program will be implemented with the Tier 1 funds and would provide a net benefit to the stilts.

If Tier 2 mitigation is required, the efforts of the predator control program will be increased at the colony. An additional 15 traps will be set in the vicinity of the colony for a total of 35 traps. More traps would increase the potential to remove more predators preying on the colony and provide a net benefit to the seabirds.

5.3.3 Habitat Restoration

At Lāna'ihale, much of the potential nesting habitat for Hawaiian petrels and Newell's shearwaters has been degraded by the introduction of ungulates and subsequent establishment of invasive species such as strawberry guava (*Psidium cattleianum*). Restoration of degraded habitat through the removal of invasive species and reintroduction of uluhe fern and other native species should ultimately increase the size of the breeding population. DOFAW identified an appropriate area of degraded habitat for restoration that has existing access as shown in the scope of work provided in **Appendix 7**. DOFAW may consider installing artificial burrows to encourage colonization, thus reducing the time needed to recognize a net benefit to the species.

This habitat restoration program would also benefit the Hawaiian hoary bat by increasing foraging and roosting habitat. The following provides a summary of the restoration measures to be implemented by DOFAW and the Maui Invasive Species Committee (MISC).

- Invasive species such as strawberry guava will be cleared from the identified area. This includes manual labor to remove the plants and treat stumps with herbicide.
- If the natural seed bank does not facilitate regeneration of native uluhe fern and other native species such as *Metrosideros*, *Rubiaceae* or *Tetraplasandra*, uluhe fern, and other native plants may need to be planted in select locations after invasive plant removal.
- The restoration area will require maintenance for the 2-year period to control weeds and other invasive species and protect the native plant species. Tier 1 funding also will support DOFAW staff to maintain and monitor habitat restoration activities.
- DOFAW may consider installing artificial burrows to encourage colonization if the birds do not start using the restored habitat on their own.
- Restoration activities will be conducted so as to minimize any disturbance to the petrel colony during the breeding season and potentially to Hawaiian hoary bats if indeed bats breed on Lāna'i. Clearing activities will not occur in the vicinity of active petrel burrows during the breeding season. The sensitive period for bats is July 1 through September 30. During that time period, five consecutive days of negative bat detections must occur for DOFAW to be able to cut trees greater than three meters in height.

Appendix 7 provides a detailed scope of work and milestones for the predator control and habitat restoration work. A Memorandum of Agreement (MOA) was developed between Castle & Cooke and DOFAW that outlines the responsibilities for each party associated with the mitigation plan.

Should the Tier 1 take level for petrels be reached, Tier 2 mitigation would be implemented. Tier 2 mitigation would double the acreage of Tier 1 habitat restoration. Additional funds would be provided to DOFAW/MISC to clear the additional acreage of invasive vegetation. DOFAW has the option to restore the entire six acres in 2009 with the Tier 1 funds. Tier 2 funds would be provided to DOFAW only if the petrel Tier 1 take limit is reached. The three- or six-acre restoration area(s) will be maintained by the DOFAW employees hired under the Tier 1

mitigation plan. DOFAW may choose to reallocate the Tier 1 staffing funds to conduct and maintain the entire six-acre restoration parcel for the project period if Tier 2 is not initiated.

5.3.4 Net Benefit of Mitigation to Listed Species

Mitigation proposed for each of the four listed species is designed to not only compensate for take that may occur as a result of collision with met towers but also provide a net conservation benefit for the species addressed. Site-specific radar and avian point count surveys have determined that, of the four listed species addressed within this HCP, the Hawaiian petrel represents the species at greatest risk of take from collisions with met towers; observations of the other three species within the WRA were extremely low. Castle & Cooke consulted with DOFAW and USFWS to determine that, of the mitigation strategies available, a combination of habitat restoration and predator trapping in the Lāna'ihale would both compensate for take and result in a net conservation benefit for the petrel. These mitigation measures also would provide a net benefit for shearwaters and bats, incidentally, as these species occur within the same habitat. Similarly, predator trapping at the WWTP ponds would provide a net benefit for stilts.

As the Hawaiian petrel colony on Lāna'i was only recently rediscovered, DOFAW has not yet identified the size of the colony or its population dynamics. However, DOFAW speculates that the colony may number in the thousands. While DOFAW cannot identify with certainty the amount of acreage needed to mitigate for a take limit of seven Hawaiian petrels (Tier 1), DOFAW biologists have collected some colony-specific data which can be used in combination with values provided in the literature to estimate an approximate acreage.

The following equation illustrates the method by which the restoration acreage was calculated:

$$T_{ha} = T_t P_f F_{ha} + T_t P_a (A_{ha} + FA_{ha})$$

Where:

T_{ha}	=	Restoration acreage needed to offset take of 7 petrels
T_t	=	Tier 1 take limit of 7 petrels; total number of observed and unobserved (i.e. observed adjusted for search efficiency and scavenge removal) birds taken
P_f	=	Percent of petrels that are fledglings
F_{ha}	=	Sufficient acreage to compensate for one fledgling killed by a tower
P_a	=	Percent of petrels that are adults
A_{ha}	=	Sufficient acreage to compensate for one fledgling killed by a tower
FA_{ha}	=	Sufficient acreage to compensate for possible loss of a fledgling when an adult is killed

The calculation assumes that for every fledgling killed by a tower, a sufficient acreage of habitat would need to be restored to produce one fledgling. This acreage is calculated as

$$F_{ha} = [(FS)\ (BD)]^{-1}$$

Where

FS	=	Fledging success or 0.55 fledglings/attempt (DOFAW unpublished data)
BD	=	Breeding density or 25 attempts/ha (DOFAW data per 10/4/07 DLNR letter)

Recent surveys conducted by DOFAW suggest that breeding densities on Lāna'i may be one burrow per 400 square meters. This is a very high breeding density in comparison to what has been reported on Haleakala (nearly 3 times higher). However, preliminary data at Lāna'ihale suggest that these densities can be achieved with appropriate habitat management.

Thus, the acreage needed to mitigate the loss of a fledgling is

$$F_{ha} = (0.55)^{-1} (25)^{-1} = 0.07 \text{ ha}$$

The calculation also assumes that for every adult killed by a tower, a sufficient acreage of habitat would need to be restored to mitigate the loss of that adult plus any fledgling that may die as a result of the loss of that parent. Thus, the acreage needed to mitigate the loss of the adult is

$$A_{ha} = [(S_A) (FS) (BD)]^{-1} = 0.27 \text{ ha}$$

Where:

SA = Survival to adulthood, or 0.269 (Simons 1984)

For any fledgling whose parent is killed, it also is assumed that the fledgling will also perish. The acreage needed to mitigate for the possible loss of a fledgling when an adult is killed is

$$FA_{ha} = (F_{ha}) (P_B) = 0.065 \text{ ha}$$

Where

PB = the probability that the adult is breeding = 0.89

Simon 1984 found that 89 percent of adults that return to the colony breed each year. The calculation also assumes that half of the birds killed by the tower are adults and half are fledglings, or

$$P_a = P_f = 0.50$$

Thus, for a take limit of seven Hawaiian petrels (T_t = 7 birds), the restoration acreage estimated to mitigate for that take is 1.4 ha or 3.5 acres. DOFAW's existing predator control program within the Lānaʻihale will be augmented with the Tier 1 funding, and this program, in combination with the three acres of Tier 1 habitat restoration, will provide a net benefit for the seabirds and bats.

Predator control has been proven to significantly enhance seabird populations on islands. Alien predators such as cats, rats, and mongoose can have devastating effects on bird populations especially seabirds, as the native birds did not evolve with these mammalian predators and have no effective defenses against them (Winter and Wallace 2006). A number of studies have documented the effects of predation on the reproductive success of bird species including seabirds. Winter and Wallace also summarized studies that document the impact of feral and free-ranging cats in Hawaiʻi on seabirds and other native bird species. A single cat can have a devastating effect on a breeding seabird colony while "cat colonies" (such as on Lānaʻi) pose an even greater threat. The Bonin petrel on the Midway Atoll has declined dramatically as a result of black rat predation (Seto and Conant 1996).

Nogales et al. (2004) conducted a review of feral cat eradication programs in island communities worldwide to provide information for future island conservation programs. On Marion Island (sub-Antarctic island, South Africa), it was estimated that cats preyed on approximately 455,199 seabirds per year (including Guadalupe Storm Petrel), which constitutes a kill rate of more than 200 birds per cat (Veitch 1985). On Mauna Loa, Hawaiʻi, Hawaiian petrel burrows were monitored for cat predation. A single cat was removed and no evidence of predation was noted following the capture. Nest success that year (1995) was 61.5 percent. The following year when trapping was not conducted, nest success dropped to 41.7 percent primarily due to cat predation (Hu et al. 2001). Cat predation was also documented to have a negative effect on Hawaiian stilt and other water bird species in Hawaiʻi (Winter and Wallace 2006).

DOFAW currently conducts cat trapping on the Lāna‘ihale to protect and increase the numbers of Hawaiian petrels in the Lāna‘i colony. Of cats trapped by DOFAW, 20 percent contained petrel remains in their stomachs. As part of the mitigation strategy for the Lāna‘i met towers project, Castle & Cooke will augment DOFAW's current predator trapping program. While it is clear from the literature that the removal of one cat from the Lāna‘ihale might more than compensate for the Tier 1 and Tier 2 take limits for the Hawaiian petrel, the goal is to remove as many cats as is feasible within the 2-year project timeline. Thus, the combination of restoring three acres (or six acres if the Tier 1 limit is reached) of habitat and conducting predator removal within the Lāna‘ihale will compensate for Tier 1 and Tier 2 take limits and provide a net conservation benefit for the Hawaiian petrel and, incidentally, Newell's shearwater and Hawaiian hoary bat. As DOFAW has documented the presence of cats at the WWTP, predator control at the WWTP ponds in Lāna‘i City also will provide a net benefit for the Hawaiian stilt.

5.3.5 Funding

Castle & Cooke will provide DOFAW funding to implement the proposed mitigation measures as outlined above and detailed in **Appendix 7** as well as a vehicle and chipper for their use on Lāna‘i during the 2-year period. DOFAW, in turn, will coordinate the mitigation efforts with the MISC and the Pacific Cooperative Studies Unit, University of Hawai‘i. The design and scope of each year's effort are determined in consultation with USFWS and DOFAW biologists and formalized in writing in the MOA. The details of the funding are outlined in Section 6.7.

5.4 Other Measures

Castle & Cooke will prepare a Wildlife Education and Observation Program for all staff members who will be on the property on a regular basis. This will enable staff to identify the listed native species that may occur in the area and understand the appropriate steps to be taken when a downed bird or bat is discovered. This program includes a handout that shows a photograph of each of the listed species and the protocol to follow when a downed bird or bat is found.

6 PLAN IMPLEMENTATION

6.1 Responsibilities

Castle & Cooke is responsible for providing the identified funds to DOFAW to implement the mitigation measures expressly described in this HCP. Management of the monies set aside to cover the costs associated with the HCP mitigation measures will be the responsibility of DOFAW. DOFAW will provide a detailed report that accounts for the money spent to implement the specific mitigation activities identified in the HCP and will provide annual reports to Castle & Cooke that summarize the results of mitigation and monitoring activities.

Castle & Cooke must submit annual reports to DLNR and USFWS by August 31 each year of the project to summarize overall findings and status. Therefore, DOFAW must submit the monitoring reports summarizing the progress of the mitigation activities to Castle & Cooke by August 15 of each year during the project. DOFAW will also provide Castle & Cooke with monthly status reports regarding the habitat restoration and predator control activities. The annual reports to DOFAW and USFWS will summarize 1) the results of the post construction mortality monitoring, 2) any take that has occurred, 3) the progress of the mitigation activities as provided by DOFAW, and 4) any recommended changes to the monitoring protocols to be considered by these agencies. These reports will also be reviewed by the Endangered Species Recovery Committee. Any incidental take of one of these covered species will be reported within 24 hours and the cumulative adjusted take reported within two weeks.

Castle & Cooke is responsible for implementation of the HCP and shall have completed its involvement for this project once the stipulations identified in this HCP are fulfilled during the two-year project period. Castle & Cooke is responsible for providing data collected in relation to the HCP within 30 days of request by DOFAW and USFWS unless otherwise identified. DOFAW and USFWS will provide Castle & Cooke and/or its consultants sufficient notice prior to conducting a site visit to enable appropriate project staff to participate. Agency staff may also conduct compliance monitoring without prior notice. The MOA between Castle & Cooke and DOFAW will serve as a cooperative agreement to be executed between the two parties to ensure that 1) DOFAW is completing the mitigation and maintenance activities as identified in this HCP, 2) DOFAW is providing Castle & Cooke with regular updates on the status of the mitigation, maintenance, and monitoring activities, and 3) DOFAW is provided access to the mitigation site for maintenance and monitoring up to February 2018 or the time nesting and/or fledging success in the restoration area is achieved, whichever occurs first. All maintenance and monitoring activities and costs associated with the restoration area after the term of this HCP will be the responsibility of DOFAW. Castle & Cooke will not be responsible for any additional actions or costs that are not identified in the HCP, as long as the HCP is properly implemented and functioning.

6.2 Scope and Duration

This HCP is designed to address the authorized potential incidental take of four listed wildlife species. Tier 1 and Tier 2 incidental take limits for Hawaiian petrels are seven and 14 birds, respectively. The incidental take limits established for the other three species are two Newell's shearwaters, two Hawaiian stilts, and two Hawaiian hoary bats. The first tier of mitigation (Tier 1) would compensate for two Newell's shearwaters, two Hawaiian stilts, two Hawaiian hoary bats, and the Tier 1 take limit of seven Hawaiian petrels. Should Tier 1 take levels be reached

for the petrel, Tier 2 mitigation would be implemented, compensating for take of 14 Hawaiian petrels.

Castle & Cooke proposes to enter into the met tower HCP to cover the potential take of these four listed species as a result of operation of seven met towers within the WRA. The term of the HCP is for a period of two years, through March 1, 2010. If no amendment is in place, and the Tier 2 take limit for the Hawaiian petrel is reached, the towers will be taken down and removed upon reaching a take limit.

6.3 Monitoring

Monitoring is an important tool in an adaptive management approach and should be designed in a way that ensures data will be properly collected, analyzed, and used to adjust management strategies, as appropriate. Monitoring is required at each of the met tower locations to ensure that the authorized levels of take are not exceeded, and that the effects of take are minimized and mitigated to the extent possible.

Castle & Cooke will conduct post-construction mortality monitoring (downed wildlife surveys) to document injuries or fatalities of listed and non-listed species. Post-construction monitoring is being conducted at each of the met tower locations according to the protocol approved by USFWS and DOFAW (**Appendix 6**). The monitoring protocol is adapted from standardized protocols used in peer-reviewed literature, available technical reports, other Tetra Tech EC projects, and the monitoring plan previously approved for met tower 6 (**Appendix 6**; Arnett et al. 2005, Erickson et al. 2004, Johnson et al. 2002, Young et al. 2003). A Downed Wildlife Protocol is included in the plan for the recovery, handling, and reporting of downed wildlife based on the protocol approved by DOFAW for met tower 6 (**Appendix 6**). All on-site personnel will be trained in the protocol.

Post-construction monitoring will identify whether threatened or endangered bird and bat species are injured or killed from collision with one or more of the towers and will document impacts to other non-listed species. In the event an injured or dead petrel, shearwater, stilt, or bat is documented, Castle & Cooke would immediately assess the impact and adapt the program accordingly. Should monitoring reveal that authorized take of petrels is higher at one of the tower locations as a result of collision with a met tower, Castle & Cooke would closely evaluate the data and consider removing the tower in question.

Brief, quarterly reports will be submitted to DOFAW and USFWS. These reports will summarize the results of the post-construction monitoring surveys, document take, if any, of each species, and identify any recommended changes to the monitoring protocols. Any incidental take of one of these covered species will be reported within 24 hours and the cumulative adjusted take reported within two weeks. Castle & Cooke will also conduct semi-annual meetings with DOFAW and USFWS to discuss the monitoring program, compare the monitoring results to estimated take levels, discuss the progress of the mitigation measures, and develop any recommendations for revising on-going activities. As Castle & Cooke will be funding efforts for DOFAW to implement predator control and habitat restoration activities, DOFAW will be responsible for monitoring these efforts. Castle & Cooke must submit annual reports to DLNR and USFWS by August 31 each year of the project to summarize overall findings and status. Therefore, DOFAW must submit monitoring reports summarizing the progress of the mitigation activities to Castle & Cooke by August 15 of each year during the project.

6.4 Performance and Success Criteria

The 2-year time frame of this HCP corresponds to the maximum expected time frame data is collected from the met towers in order to determine the viability of a wind farm at this location. The Tier 1 and Tier 2 take limits for Hawaiian petrels are seven and 14 petrels, respectively. The take limit for the three other species is two Newell's shearwater, two Hawaiian stilts, and two Hawaiian hoary bats over the 2-year period, as stated in this HCP.

Castle & Cooke will coordinate with DOFAW during this period regarding the status of these mitigation activities. A cooperative agreement will be developed between DOFAW and Castle & Cooke for a vehicle and chipper to be provided and committed to DOFAW full-time on Lāna'i for the 2-year period. The vehicle will be maintained in good operating condition and fuel will be provided by DOFAW. This equipment is required to implement the mitigation measures.

A minimum, nonrefundable endowment of $252,203 (Total Tier 1 Costs) will be disbursed by Castle & Cooke to DOFAW. An initial payment was made in February 2008 so that the restoration work could begin in 2008. The remainder will be submitted within 10 working days of the permittee's receipt of the approved ITL/ITP.

If potential take of individuals of any of these four listed species exceeds the established take limits stated in this HCP without an approved modification of the HCP, any excess taking will be considered in violation of the ESA and HRS and enforcement actions will be at the discretion of the USFWS. If Tier 2 take limits are reached for the Hawaiian petrel without an approved amendment to the HCP, the met towers will be removed.

6.5 Unforeseen/Changed Circumstances/No Surprises

Section 10 regulations require that an HCP specify the procedures to be used for dealing with unforeseen circumstances that may arise during the implementation of the HCP. In addition, the HCP Assurances ("No Surprises") Rule (50 CFR §17.22[b][5], Federal Register 63 8859) defines "unforeseen circumstances" and "changed circumstances" and describes the obligations of the permittee and USFWS.

Changed Circumstances

Changed circumstances means changes in circumstances affecting a species or geographic area covered by a conservation plan or agreement, that can reasonably be anticipated by plan or agreement between developers and the USFWS, and that can be planned for (e.g., the listing of new species, or a fire, hurricane, major storm event, other natural catastrophic event in areas prone to such events, or when access to met tower sites is not available due to these type events).

Given the limited term of this HCP and the infrequency of events such as hurricanes and fires which could affect the implementation of the HCP, the only circumstance that is identified as a changed circumstance is a storm event that could prevent access to the met tower sites for monitoring purposes. Such a change is, therefore, provided for in this HCP and does not constitute unforeseen circumstances or require the amending of this HCP. Castle & Cooke will notify DLNR and USFWS within two days of such an event. Castle & Cooke owns the necessary equipment and has sufficient staff to commit to repair the roads or provide other access as necessary as soon as possible and will assist DLNR and USFWS in any related response or remediation efforts. It is anticipated that access will be restored within 5 days of any such event, and that monitoring will resume within 24 hours of reestablishing access. In the unlikely event that a storm occurs that affects the benefits of the habitat restoration efforts, the

DOFAW staff funded by Castle & Cooke under the Tier 1 take limit scenario is expected to be sufficient to address such effects without additional staff or funding. Castle & Cooke will implement additional conservation and mitigation measures deemed necessary to respond to changed circumstances as provided for and specified in the HCP's adaptive management strategy (50 CFR § 17.22(b)(5)(i and ii) and 50 CFR § 17.32(b)(5)(i and ii). If such measures were not provided for the HCP, and the HCP is otherwise being properly implemented, the USFWS will not require any conservation and mitigation measures in addition to those provided for in the HCP without the consent of Castle & Cooke (50 CFR §17.22(b)(5)(i and ii) and 50 CFR §17.32(b)(5)(i and ii).

Unforeseen Circumstances and "No Surprises"

Unforeseen circumstances means changes in circumstances surrounding an HCP that were not or could not be anticipated by HCP participants and the USFWS and DLNR that result in a substantial and adverse change in the status of a covered species.

- The purpose of the No Surprises Rule is to provide regulatory assurances to non-federal landowners participating in habitat conservation planning under the ESA that no additional land restrictions or financial compensation will be required for species adequately covered by a properly implemented HCP, in light of unforeseen circumstances, without the consent of the permittee. The "No Surprises" policy provides certainty for private landowners in ESA and HRS Habitat Conservation Planning through assurances.
- In negotiating "unforeseen circumstances" provisions for HCPs, the USFWS and DLNR shall not require the commitment of additional land or financial compensation beyond the level of mitigation which was otherwise adequately provided for a species under the terms of a properly functioning HCP. Moreover, the USFWS and DLNR shall not seek any other form of additional mitigation from a permittee, except under extraordinary circumstances.
- If additional mitigation is subsequently deemed necessary to provide for the conservation of a species that was otherwise adequately covered under the terms of a properly functioning HCP, the obligation for such measures shall not rest with the permittee.

The Hawaiian petrel, Newell's shearwater, Hawaiian stilt, and Hawaiian hoary bat are considered adequately addressed under this HCP and are, therefore, covered by the USFWS' No Surprises policy assurances. In the event that it is demonstrated by the USFWS and DLNR that Unforeseen Circumstances exist during the life of the ITP, and additional conservation and mitigation measures are deemed necessary to respond to Unforeseen Circumstances, the USFWS may require additional measures of the Permittee where the HCP is being properly implemented, but only if such measures are limited to modifications within the HCP or related permit documents, and maintain the original terms of the HCP to the maximum extent practicable. Notwithstanding the foregoing, the USFWS and DLNR shall not:

- Require the commitment of additional land, water, or financial compensation by the Permittee without the consent of the Permittee; or
- Impose additional restrictions on the use of land, water, or natural resources otherwise available for use by the Permittee under the original terms of the HCP, including additional restrictions on covered actions that are permitted under the HCP.

- The USFWS and DLNR shall have the burden of demonstrating that such extraordinary circumstances exist, using the best scientific and commercial data available. Their findings must be clearly documented and based upon reliable technical information regarding the status and habitat requirements of the affected species.
- In determining whether any event constitutes an unforeseen circumstance, the USFWS and DLNR will consider, but not be limited to, the following factors: (a) size of the current range of affected species; (b) percentage of range adversely affected by the HCP; (c) percentage of range conserved by the HCP; (d) ecological significance of that portion of the range affected by the HCP; (e) level of knowledge about the affected species and the degree of specificity of the species' conservation program under the HCP; and (f) whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the affected species in the wild.
- The USFWS and DLNR shall not seek additional mitigation for a species from an HCP permittee where the terms of a properly functioning HCP agreement were designed to provide an overall net benefit for that species and contained measurable criteria for the biological success of the HCP which have been or are being met.
- Nothing in this policy shall be construed to limit or constrain the USFWS, DLNR, or any other governmental agency from taking additional actions at its own expense to protect or conserve a species included in an HCP.

6.6 Adaptive Management

The USFWS and DOFAW often incorporate adaptive management concepts into the HCP process. The primary reason for using adaptive management in HCPs is to allow for changes in the management strategies that may be necessary to reach the long-term goals (or biological objectives) of the HCP, and to ensure the likelihood of survival and recovery of the species in the wild.

Adaptive management includes using results of the monitoring and reporting program to evaluate that the level of take is within limits authorized by this HCP. The Tier 1 and 2 levels of take and mitigation outlined for the petrel establishes a contingency should the Tier 1 take limit be reached within the 2-year period. This tiered approach allows for a quick transition to a higher authorized take limit and avoids delays that would be associated with an amendment to the HCP.

Castle & Cooke will utilize monitoring results to evaluate the spatial distribution of take and determine whether one or more of the met towers are contributing higher than anticipated take levels. If it is determined that one or more of the towers is yielding disproportionately higher take levels, Castle & Cooke will consider removal of that tower(s), prior to the completion of the 2-year data collection period.

DOFAW will use an adaptive management approach to implementing the mitigation activities. Staff will adapt management activities in both the habitat restoration and predator control programs as new data or technology becomes available so as to maximize the benefit for the covered species.

The Lānaʻi petrel population and biology is relatively unknown at this time, and the presence of Hawaiian stilt and Hawaiian hoary bat were only recently documented on Lānaʻi in the WRA; Newell's shearwaters have yet to be documented within the WRA. USFWS, DOFAW, and Castle & Cooke will move forward in a cooperative manner recognizing that these studies and

mitigation measures outlined in the HCP will help provide a better understanding of these species population dynamics on Lāna‘i and provide a net benefit to these four covered species.

6.7 Funding and Assurances

The ESA and HRS requires that the HCP detail the funding that will be made available to implement the proposed mitigation program. Measures requiring funding in an HCP typically include onsite measures during project implementation or construction (for example, pre-construction surveys and biological monitors), as well as onsite and offsite measures required after completion of the project or activity (for example, acquisition of mitigation lands).

The estimated costs for the mitigation are provided in **Table 6-1** and are based on a cost estimate provided by DOFAW, garnered from their experience with similar activities associated with the existing interagency seabird conservation program and watershed enhancement partnership. MISC conducted a site visit on November 13, 2007 to develop a site-specific cost estimate to complete the initial habitat clearing and associated activities.

Castle & Cooke has sufficient financial assets to implement the terms of this HCP. Castle & Cooke will be responsible for funding the post construction fatality monitoring and mitigation and understands that failure to provide adequate funding and a consequent failure to implement the terms of this HCP in full could result in a temporary permit suspension or permit revocation.

Castle & Cooke has already funded spring and fall avian point count surveys, several radar and visual surveys, a seabird avoidance behavior study, and a rare plant survey. In addition to expenditures already made, Castle & Cooke will, consistent with the terms of this HCP, cover the costs of having searchers conduct the PCMP. Monitoring was conducted for met tower 6 in 2007 and was initiated in March 2008 to include all met towers from March 15 to December 15 (or when the birds are known to be present on the island) during the period the towers are in operation and according to the PCMP provided in **Appendix 6**. Downed wildlife monitoring costs are estimated at $75,000 per year.

Table 6-1. Estimated Costs of Predator Control, Habitat Restoration, and Maintenance activities for the Lāna‘i Met Tower Project – Tier 1 and Tier 2

Activity	Tier 1 Year 1	Tier 2 Year 1	Tier 1 Year 2	Tier 2 Year 2	Total Cost per 3 Acres	Total Cost per 6 Acres
Initial Habitat Clearing						
MISC crew (estimate)	$22,128	$48,500	$0	$0	$22,128	$70,628
Herbicide and equipment	$8,500	$1,500	$0	$0	$8,500	$10,000
Chipper	C&C to provide	C&C to provide			NA	C&C to provide
Subtotal	**$30,628**	**$50,000**	**$0**	**$0**	**$30,628**	**$80,628**
Predator and Habitat Restoration Maintenance						
Personnel	$60,000	Provided in Tier 1 costs	$60,000	Provided in Tier 1 costs	$120,000	$120,000
Supervisor (0.3 FTE)	$15,000		$15,000		$30,000	$30,000
Fringe (30%)	$22,500		$22,500		$45,000	$45,000
PCSU/UH Costs (10%)	$10,725		$10,725		$21,450	$21,450
Vehicle (includes maintenance)	C&C to provide	C&C to provide	C&C to provide	C&C to provide	NA	NA
Traps and materials	$4,285	$3,214	$840	$0	$5,125	$8,339
Subtotal	**$112,510**	**$3,214**	**$109,065**		**$221,575**	**$224,789**
TOTAL	**$143,138**	**$53,214**	**$109,065**	**$0**	**$252,203**	**$305,417**

Notes: C&C - Castle & Cooke
FTE - full-time employee
NA - not applicable
PCSU/UH - Pacific Cooperative Studies Unit, University of Hawai‘i

Issuance of ITL pending satisfactory arrangement for vehicle.

Castle & Cooke will enter into an agreement with and provide monies to DOFAW to fund the predator control and habitat management program. A minimum non-refundable endowment of $252,203 for the Tier 1 mitigation will be disbursed by Castle & Cooke in two payments according to the MOA. The first payment ($143,138) was provided to DOFAW in February 2008 for Year 1 of Tier 1 and the remainder of Tier 1 costs ($109,065) will be paid within 10 working days of the permittee's receipt of the approved ITP/ITL. DOFAW will provide a letter to Castle & Cooke and the USFWS acknowledging the receipt of the funding and committing its use for seabird and bat habitat restoration and predator control. After receipt of these funds, DOFAW will provide follow-up letter reports to Castle & Cooke and the USFWS stating the progress made through the use of these funds and accounting for their expenditure. DOFAW will provide Castle & Cooke with an annual summary report by August 15 of each year of the project to be included in Castle & Cooke's annual report to DLNR and USFWS by August 31 of each year of the project.

If Tier 2 mitigation is deemed necessary based on monitoring results, additional funds, as outlined in **Table 6-1**, will be provided. Castle & Cooke will provide financial assurances for the Tier 2 funds and the estimated costs for post-construction monitoring at the towers over the 2-year period ($150,000). These funds will be assured through a financial instrument such as a bond, letter of credit or other similar mechanism as approved by DLNR and USFWS. This financial assurance for the mitigation and monitoring costs, not delegated to DOFAW via check, will be approximately $203,135 and will be in place prior to the effective date of the ITL/ITP. Tier 2 mitigation funds will be released 20 days after reaching the Tier 1 take limit for the Hawaiian petrel.

DOFAW has the option to restore the entire 6 acres in 2009 with the Tier 1 funds. Tier 2 funds would be provided to DOFAW only if the petrel Tier 1 take limit is reached. The 3- or 6-acre restoration area(s) will be maintained by the DOFAW employees hired under the Tier 1 mitigation plan. DOFAW may choose to reallocate the Tier 1 staffing funds to conduct and maintain the entire 6-acre restoration parcel for the project period if Tier 2 is not initiated. If DOFAW initiates restoration for the entire 6-acre parcel, this eliminates a delay in the initiation of Tier 2 habitat restoration work should Tier 1 take limits be reached at the end of the project period. However, additional predator control mitigation could be implemented immediately upon reaching Tier 1 take limits.

6.8 Revisions and Amendments

This section presents the procedures for amendments to the HCP.

Amendment Procedure

It is necessary to establish a procedure whereby the ITP/ITL can be amended. However, it is important that the cumulative effect of any amendments will not jeopardize any endangered species or other rare species. Amendments must be evaluated based on their effect on the habitat as a whole. The USFWS and DLNR must be consulted on all proposed amendments that may affect any federally listed species.

Amendments to Locally Approved Development Plans

It is acknowledged that the state and/or local agencies having land use regulatory jurisdiction are authorized in accordance with applicable law to approve, without consulting the USFWS, amendments to development plans for the subject project area which do not encroach on any

endangered species habitat which is not presently contemplated to be taken as a consequence of the project, and which do not alter the conditions set forth in the HCP.

Minor Amendments to the HCP

Minor amendments involve routine administrative revisions, changes to the operation and management program, or minor changes to the development area and that do not diminish the level or means of mitigation. Such minor amendments do not materially alter the terms of the ITP/ITL. Upon the written request of the Permittee, the USFWS and DLNR are authorized to approve minor amendments to the HCP.

All Other Amendments

All other amendments will be considered an amendment to the ITP/ITL, subject to any other procedural requirements of federal law or regulation that may be applicable to amendment of such a permit.

7 CONCLUSION

Castle & Cooke is working with USFWS and DLNR to obtain an ITP/ITL for potential incidental take of the Hawaiian petrel, Newell's shearwater, Hawaiian stilt, and Hawaiian hoary bat that may result from construction and operation of seven met towers. Castle & Cooke plans to implement the HCP in cooperation with these agencies to achieve a net benefit for these identified species as a result of the proposed project and to further the knowledge of these species' population biology on Lāna'i.

8 PERSONAL COMMUNICATIONS

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Duvall, Dr. Fern. 2007. Wildlife Biologist, Division of Forestry and Wildlife, Department of Land and Natural Resources, communication regarding Hawaiian stilt on Lānaʻi.

Holmes, Nick. 2008. Kauai's Endangered Seabird Recovery Program- DOFAW. Personal communication concerning current population estimates for Newell's shearwater.

Penniman, Jay. 2007. Maui Endangered Species Research Specialist, Department of Land and Natural Resources, Pacific Cooperative Studies Unit, University of Hawaiʻi. Personal communication regarding Hawaiian petrel, Newell's shearwater, and Hawaiian hoary bat on Lānaʻi.

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