United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawai‘i 96850

In Reply Refer To:
1-2-2006-F-069

Memorandum

To: Chief, Division of Consultation and Conservation Planning
Region 1, Portland, Oregon

From: Field Supervisor, Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii

Subject: Section 7 Consultation for the Kaheawa Pastures Wind Energy Generation Facility Habitat Conservation Plan and Incidental Take Permit Application, TE-118901-0

This biological opinion responds to your request for consultation pursuant to section 7 of the Endangered Species Act of 1973, as amended (Act), for the potential effects to the endangered Hawaiian goose, Nēnē (*Branta sandvicensis*); Hawaiian petrel, ‘Ua‘u (*Pterodroma sandwichensis*); and Hawaiian hoary bat, ‘Ōpe‘ape‘a (*Lasiurus cinereus semotus*)); and the threatened Newell’s shearwater, ‘A‘o (*Puffinus auricularis newelli*) hereafter, collectively called “covered species”, from the proposed construction and operation of a 20-turbine, 30 megawatt wind energy generation facility at Ukumehame, Maui, from the issuance of incidental take permit TE-118901-0 and implementation of the Habitat Conservation Plan (HCP) at the Kaheawa Pastures Wind Energy Generation Facility, Ukumehame, Maui, Hawaii.

Plant Critical Habitat

The area of the proposed action includes critical habitat of several listed plant species. The area around the four uppermost turbines (Turbine 1 through Turbine 4) in which regular searches will occur for bird and bat fatalities overlaps areas designated as critical habitat for *Cenchrus agrminioides*, *Diellia erecta*, and *Remya mauiensis*. Foot traffic during searches around each turbine (initially 180 m by 200 m) may potentially adversely affect listed plants and their designated critical habitats. Although a portion of the search areas around each turbine were previously surveyed to assess potential construction impacts to state- and federally-listed plants, and no listed or candidate species were documented, the entire area potentially affected by fatality searches was not surveyed. Several federally-listed plant species such as the endangered *Cenchrus agrminioides*, *Diellia erecta*, *Remya mauiensis*, *Santalum freycinetianum* var.

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lanaiensis, and candidate *Cyanea obtusa*, are known to occur within the upper reaches of Papalaua Gulch located to the west and the Manawainui Gulch plant sanctuary which is located to the east and immediately adjacent to the upper turbine string (Turbine 1 through Turbine 5).

In order to avoid and minimize construction and monitoring impacts to listed plants, the project applicant, Kaheawa Wind Power, LLC (KWP) will hire a qualified botanist to fully survey the 180 m by 200 m search area around all 20 turbines in advance of project operations. Any listed or candidate plant species discovered will be clearly marked, and an adaptive approach will be used to avoid direct or indirect impacts to listed plants, as described below.

Location(s) of listed plants, if any, will be documented (including GPS coordinates, photographs, rare plant monitoring data forms) and monitoring of vegetation plots established within and adjacent to the affected critical habitat areas as a baseline for determining whether adverse impacts to plants are attributable to the bird fatality search efforts or project activities occur over time. If critical habitat appears to be impacted by foot traffic, then the search methods may be modified and corrective action pursuant to the HCP will be developed and implemented at the request of the Hawaii Department of Land and Natural Resources (DLNR) and USFWS. Vegetation monitoring plots will be established prior to bird fatality searches and monitoring will be performed by a qualified botanist. Implementation of potential measures to offset impacts to critical habitat areas may include measures such as control of invasive species or propagation and planting of additional specimens.

Search methods in these areas will require an adaptive approach that documents covered bird species fatalities while avoiding adverse impacts to listed plants and designated plant critical habitat. Potential adaptive measures may include reduced frequency of bird fatality searches, scanning for fatalities from outside the area, and making corresponding adjustments to bird fatality numbers to account for the reduced search area or reduced level of search effort. Portions of the bird fatality search areas designated as critical habitat will be documented (as described above) as a baseline for assessing impacts to plants and prescribing any mitigation that may be appropriate. By implementing the measures described above, adverse effects to listed plant species and plant critical habitat will be insignificant. Thus, foot traffic impacts during fatality searches are not anticipated to adversely affect designated critical habitat for plant species in the search area and therefore are not analyzed further in this opinion.

This biological opinion is based upon: 1) Kaheawa Pastures Wind Energy Generation Facility Draft Habitat Conservation Plan (KWP 2005); 2) Kaheawa Pastures Wind Energy Generation Facility Draft Environmental Assessment (USFWS 2005a); 3) Draft Revised Recovery Plan for the Nēnē or Hawaiian goose (*Branta sandvicensis*)(USFWS 2004); 4) Hawaiian Dark-rumped Petrel and Newell's Manx Shearwater Recovery Plan (USFWS 1983); 5) Recovery Plan for the Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) (USFWS 1998); 6) other biological literature (see Literature Cited at the end of the document); and, 7) information contained in our files. Our log number for this consultation is 1-2-2006-F-069. Copies of pertinent materials and documentation are maintained in an administrative record in the U.S. Fish and Wildlife Service (USFWS) Pacific Islands Fish and Wildlife Office in Honolulu, Hawaii.

Consultation History

The USFWS Pacific Islands Fish and Wildlife Office received the permit application and associated fee from KWP on September 13, 2005, and September 21, 2005, respectively.

On December 7, 2005, the USFWS Portland Regional Office initiated the request for intra-Service consultation with the Pacific Islands Fish and Wildlife Office.

DESCRIPTION OF THE PROPOSED ACTION

The USFWS proposes to issue an incidental take permit (ITP) under section 10(a)(1)(B) of the Act, to KWP for covered activities associated with construction and operation of a new 30 megawatt (MW) wind energy generation facility and to accept a proposed HCP for incidental take of four federally listed species that are known or believed to occur in the project area: the endangered Nēnē, Hawaiian petrel, and the Hawaiian hoary bat, and the threatened Newell's (Townsend's) shearwater. As provided for under the Act, the applicant has developed and proposes to fund and implement the HCP to minimize and mitigate the effects of the incidental take.

Overview and Action Area

KWP proposes to develop and operate the island of Maui's first commercial wind energy generation facility in the Kaheawa Pastures area of Ukumehame ahupuaʻa, situated above Maʻalaea, West Maui, Hawaiʻi. The proposed wind energy generation facility is located on Conservation District Lands leased by the applicant from the State of Hawaiʻi. The subject property comprises 1,387.71 total acres and is located on portions of Tax Map Key Nos. 4-8-001: 001 and 3-6-001:014. The area leased by KWP for the proposed wind development project activities totals approximately 200 acres plus 5.8 km (3.61 mi) of access roadways (Figure 1 in the HCP). Implementation of the HCP will involve monitoring (seabird colony searches) and mitigation measures (*e.g.*, seabird colony management and construction and management of Nēnē release pens) that will occur at off-site locations to be determined.

The activities of the proposed development covered by the HCP consist of construction and operation of 20 General Electric (GE) 1.5 MW wind generation turbines and their foundations, improvement and realignment of the existing four-wheel drive road, construction of a new "spur" road, construction of an operations and maintenance facility, construction and use of wind monitoring equipment ("guyed" meteorological towers), an intra-turbine power collection system, and an electrical substation.

The proposed 20-turbine layout will be located in a single articulated row at an elevation extending from approximately 610 to 1,097 meters (m) (2,000 to 3,600 feet (ft)) in the vicinity of existing Maui Electric Company (MECO) transmission lines which cross the project site at an elevation of 609 m (2,000 ft). The height of each GE 1.5 turbine tower is 55 m (180 ft), and the diameter of the rotors is 70.5 m (231 ft), for a total structural height of approximately 90 m (296

ft). The rotor swept area ranges from 20 m to 90 m (65 to 296 ft) above ground level. Up to six of the 20 turbines will be equipped with medium intensity, simultaneously flashing (utilizing the minimum flash frequency), red lights at intervals of 762 to 914 m (2,500 to 3,000 ft) approved by the Federal Aviation Administration (FAA) to meet the requirements for aircraft navigational safety.

The proposed 20-turbine layout occupies an area approximately 2,591 to 2,743 m (8,500 to 9,000 ft) long and 304 to 335 m (1,000 to 1,100 ft) wide, approximately 81 ha (200 ac), as depicted in Figure 1 of the HCP. It is estimated that a minimum square area of 53 m (175 ft) on one side (0.3 hectares (0.7 ac) of land area) will be cleared and graded to plus or minus 5 percent slope around each turbine to accommodate lay-down area (*i.e.* area needed for the 70.5 m rotor, tower components) and crane (300-ton, 35-ft wide base, 350 feet at tallest height) staging areas. Therefore, the minimum total land area to be cleared and graded for turbine construction activities is 6 ha (14 ac).

Each turbine will be spaced approximately 152 m (500 ft) apart and situated on a concrete foundation that will be no larger than 149 sq m (1,600 sq ft) (40 ft by 40 ft). A minimum 15 m by 15 m (50 ft by 50 ft) area will be excavated to a depth of 3 m (9 ft) to construct each turbine foundation. Additionally, a 6 m (20 ft) width will be graded and graveled around each turbine foundation to serve as a buffer.

The action area also includes any area where monitoring and/or mitigation for any of the covered species may occur. At this time, these areas are not specifically defined, but could include West Maui, Molokaʻi, Lānaʻi, Hawaiʻi, and Kauaʻi. Any potential impacts to listed species or critical habitat for species not covered by this biological opinion will be addressed through the adaptive management plan and may require an amendment to the HCP as set forth in Section VI of the HCP and the Implementing Agreement.

Based on the above, the proposed action area encompasses 200 land acres plus 5.8 km (3.6 mi) of access roads (Figure 1 in the HCP), whereby project activities associated with wind turbine construction and operation and the vertical airspace in the vicinity of the 20-turbine layout and meteorological towers, and locations where potential monitoring and mitigation actions, may cause incidental take of the four listed species covered by the section 10(a)(1)(B) permit.

<u>Road Construction</u>

The project's roadway improvements will follow approximately 2.7 km (1.7 mi) of the existing four-wheel drive road alignment, from the Honoapiʻilani Highway entrance uphill, and include approximately 3.0 km (1.9 mi) of a new access roadway (to the west of the existing alignment) entering the midpoint of the project site and connecting to approximately 2.8 km (1.8 mi) of intra-site roadway serving the facility and wind turbines. The total width of the finished access roadway will be approximately 5 m (16 ft) along most of its length, with the addition of eleven 40-foot by 50-foot turn-outs to allow truck traffic and emergency vehicles to pass in both directions. The total width of the finished intra-site roadway will be approximately 11 m (36 ft),

consisting of a finished, improved surface of 5 m (16 ft) with a 3 m (10 ft) earthen shoulder on each side to accommodate crane travel between turbines.

The roadway work will be performed from the bottom to the top (makai to mauka), with any cut material being carefully reused as fill material, thus minimizing the removal of cut material and import of fill material to the site, with a goal of a net zero change in cut and fill material. The roadway will be topped with any available and salvageable screened material from site work cuts, supplemented with a coarse gravel that is locally produced on Maui, with appropriate swales, culverts and crowning to prevent erosion and concentrated runoff. Construction equipment needed for the roadway includes caterpillar bulldozers, dump trucks (to redistribute cut and fill material), and a crusher-screener to re-use as much cut material as possible.

Turbine Construction

The turbine components (tower segments, rotors, nacelles) will be shipped to Maui via containers that will be unloaded at Kahului Harbor. These materials will be transported to the staging area (just above the Honoapiʻilani Highway entrance) in the evening, to minimize any disruption of vehicular traffic. Otherwise, no construction work is expected to occur at night.

During daylight hours, the turbine components will be slowly transported on the access roadway to the project site using a combination of vehicles to carry, push and pull each load, including multi-axle lowboy trailers and specialized tractors. Once at the site, turbine components may be staged at the site and the turbines subsequently will be erected by a 300-ton crane, which itself must be transported unassembled to the site and assembled prior to its use. It is anticipated that erection of each turbine will require 1 to 3 days and total assembly time for 20 turbines may span 20-60 days.

Turbine Operations

Personnel will generally be present at the facility on a daily basis throughout project operation. They will monitor the condition of the roadway and ensure that any needed maintenance is performed promptly and all the turbines and supporting facilities are operating properly. Site maintenance will include weed and vegetation control (manual and chemical) around the turbine pads and cleared areas to eliminate any foraging attractions of new growth. Additional maintenance and site work may be conducted for fire prevention purposes at the direction of DLNR forestry officials, and will be verified with USFWS and DLNR wildlife officials to avoid adverse impacts towards any listed species in the area.

Project Lighting

Because of concerns for seabird attraction to lights at night, which may result in “fallout,” all project lighting will be kept to the absolute minimum necessary for safety and operations. Fallout occurs primarily for fledgling shearwaters on their first nocturnal flight from the burrow

to the sea (Ainley *et al.* 2001). The young birds are attracted to, and blinded by,light sources and frequently collide with power lines, buildings, cars, and other obstacles, or simply fall to the ground exhausted after fluttering around lights for long periods of time (Ainley *et al.* 1997). Project lighting will conform with the draft Maui County Lighting Standards (Altenberg 2005). Lighting of the towers will be limited to that which is required by the FAA for aircraft safety. In March 2005, KWP received FAA approval for lights at only six wind turbines (at intervals of 2,500 to 3,000 feet) with medium intensity, simultaneously flashing red lights, utilizing the minimum flash frequency. In January, 2006 KWP filed a request with FAA to reduce the total number of lighted turbines to five (pending FAA approval). Other lighting will be provided at the operations and maintenance facility and substation for the purpose of illuminating the ground area, solely if and when work would be performed beyond daylight hours. Such lighting would consist of halogen flood lights that are shielded and/or directed downward. Lights would be switched on infrequently, and strictly as necessary, on the rare occasions when personnel are working at the site at night. Lights within the maintenance and operations buildings will likewise be switched off at the end of each work day. None of the meteorological towers included for this project will be lighted.

Project Duration

The proposed project duration is 20 years. The continuance of the facility's operation would be subject to a renewal of KWP's lease with DLNR, as well as a renewal of this HCP, if amended. Should KWP discontinue the operation of the facility, during or after this 20-year period, the lease terms require that the turbines and other structures be removed and the site be returned, to the extent practicable, to its original condition.

Habitat Conservation Plan

The incidental take of four listed species may occur as a result of the construction and operation of the wind energy generation facility. Of the four, three are birds: the endangered Hawaiian petrel, the threatened Newell's (Townsend's) shearwater and the endangered Nēnē. The fourth species is a mammal, the endangered Hawaiian hoary bat. These species may potentially collide with the stationary towers, or be struck by the rotors, resulting in injury or mortality. These species also may collide with guy wires supporting the four temporary and two permanent meteorological towers. All of these species are endemic and nest only on the Hawaiian Islands (American Ornithologists' Union 1998).

An HCP has been prepared for the proposed wind energy facility in accordance with requirements of section 10(a)(1)(B) of the Act, as amended, and Hawai‘i Revised Statutes Chapter 195-D, for issuance of an Incidental Take Permit and Incidental Take License, respectively. The Federal Incidental Take Permit and State Incidental Take License have a concurrent duration of 20 years. Upon issuance of the permit and license, KWP will be authorized for the incidental take of the covered species associated with the construction and operation of the proposed wind energy generation facility.

The purpose of the HCP is to assess the potential impacts posed by the wind energy generation facility upon each listed species; discuss alternatives to the proposed facility and its design that may minimize anticipated potential impacts; propose appropriate measures to minimize, mitigate, monitor, and report potential impacts to the maximum extent practicable; ensure adequate funding for implementation of the mitigation measures; and provide for adaptive management and adjustment of the mitigation measures as determined by the resource agencies during implementation of the HCP. The HCP also incorporates the recommendations of the USFWS Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines (USFWS 2003). These guidelines contain materials to assist in evaluating possible wind power sites, wind turbine design and location, and pre- and post-construction research to identify and/or assess potential impacts to wildlife.

Specific biological goals of the HCP are to:

- minimize and mitigate, to the maximum extent practicable, the effects of take caused by interaction of covered species with the wind energy generation facility;
- increase the knowledge and understanding of the four listed species' occurrence and behavior in the project vicinity;
- adhere to the goals of the USFWS Nēnē draft revised recovery plan and Division of Forestry and Wildlife (DOFAW) Nēnē Restoration Project;
- adhere to goals of the existing recovery plans for the other three species, considering the most recent updated information and goals; and
- provide a net conservation benefit to each of the four species.

By implementing the HCP and considering the project's other environmental benefits, KWP proposes to offset the risks of project-related impacts and provide a net conservation benefit to the four affected species.

Minimization and Avoidance of Impacts

KWP will minimize the risk of collisions as much as practicable by designing the turbines and aligning them in a manner making them more visible and less attractive to birds and bats. These measures include:

- employing relatively few turbines situated in a single row, rather than a large number of turbines in multiple rows;
- using "monopole" steel tubular towers rather than lattice towers, to virtually eliminate perching and nesting opportunities. The tubular towers may also reduce collision risk because they are considerably more visible;

- using a smaller tower (55 m) than is typically used with the GE 1.5 turbine (65 m or greater), to potentially reduce the risk of collision for birds and bats, even though such risk is not demonstrably related to the tower height;

- utilizing a rotor with a significantly slower rotational speed (11-20 revolutions per minute (rpm)), which makes the rotor much more visible during operation (previously proposed designs had 28.5 rpm and 34 rpm rotors);

- selecting a site in proximity to existing electrical transmission lines to eliminate the need for an overhead transmission line from the project to the interconnect location;

- placing all new power collection lines underground to eliminate the risk of collision with new wires;

- designing and installing the site substation and interconnecting to MECO's transmission lines using industry-standard measures to reduce the possibility of wildlife electrocutions;

- marking guy wires on meteorological towers with high-visibility bird diverters, such as reflectors, foam tubing, or other suitable marking devices designed to reduce bird strikes;

- restricting construction activity to daylight hours to avoid nighttime lighting attraction to seabirds;

- adopting a lighting plan endorsed by the FAA that reduces the likelihood of attracting or disorienting seabirds (in March 2005 the FAA approved a plan whereby only 6 of the 20 turbines will have lights); in January 2006 KWP filed a request to reduce the total number of lighted turbines to five and FAA approval is currently pending).

- using on-site lighting at the operations and maintenance building and substation only during the infrequent occasions when workers are at the site at night, and reducing upward light pollution by using fixtures that will be shielded and/or directed downward;

- limiting on-site vegetation to minimize new growth that would be a foraging attraction to Nēnē (by leaving existing surrounding vegetation "as-is" except for measures that may be needed for fire prevention, and by controlling new growth through manual or chemical means);

- conducting pre-construction surveys for Nēnē and Nēnē nests prior to roadway and site clearing and construction, to identify and avoid harming or harassing (as defined under the Act) any active nests, eggs, young, or adults, in accordance with the protocol in Appendix 7 of the HCP; conducting daily morning surveys of the area immediately ahead of construction and prior to construction; conducting approximately weekly surveys of the entire site to detect birds well ahead of construction; continuing to monitor the site throughout the

construction phase, and modifying construction activities and timing as necessary to avoid adverse impacts to Nēnē.

- implementing the agency approved survey and avoidance protocol should Nēnē and/or nests be discovered after construction begins.

Anticipated Impacts

The anticipated impacts for the covered species include both direct and indirect take. Indirect take includes individuals that may be harmed or killed indirectly as a result of the direct take of another (*e.g.*, the direct take of a breeding adult could result in the indirect take of a chick that therefore will not survive). It is anticipated that the project could result in the incidental direct and indirect take of up to two Hawaiian petrels, two Newells' shearwaters, three Nēnē and one Hawaiian hoary bat each year. These are the baseline take levels for the purposes of developing commensurate mitigation measures to offset anticipated take. To ensure that all possible scenarios are addressed, the HCP also considers lower, higher and notably higher take scenarios.

Impacts may include several components in addition to the direct take that is observed, including direct take that occurs but is not observed, indirect take, and loss of productivity. These other factors can be estimated to provide a basis for "adjusting" the direct take to serve as the basis for determining the appropriate mitigation to be provided. Thus:

Adjusted Take = Observed Direct Take + Unobserved Direct Take + Indirect Take + Loss of Productivity

Following is a summary of the components that go into estimating the adjusted take:

1. Observed Direct Take. The fundamental approach for observing direct take will be to conduct regular searches of the project area during operation to quantify the number of individual birds and bats that have been killed or injured. A detailed protocol for conducting regular searches is provided in HCP Section VI – Implementation.

2. Unobserved Direct Take. Downed wildlife may be overlooked by searchers, or scavenged by local predators such as mongoose, cats, etc. The monitoring protocol presented in HCP Section VI 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.

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 for each species is fully explained in HCP Section V.

4. Loss of Productivity. Direct take may result in the loss of productivity of the individual that is taken between the time the take occurs and the time that mitigation

is provided. Similarly, productivity may be lost if mitigation for the take of a breeding age adult is provided in the form of a juvenile. The potential for loss of productivity depends upon a variety of demographic factors such as the age and sex of the individuals taken, the time of year the take occurs, and the type of mitigation provided. Adjustments to take will be applied as appropriate to account for lost productivity, as described in HCP Section V.

The determination of incidental take will take into account observed direct take as adjusted for estimates of unobserved direct take, indirect take and loss of productivity.

Monitoring and Reporting

The HCP includes monitoring and reporting to ensure compliance and biological effectiveness of HCP implementation as described in HCP Section VI. KWP will conduct monitoring to document fatalities of covered species as well as non-listed species, and to assess site-specific carcass removal (*i.e.*, scavenging) rates to provide a basis for determining the appropriate search frequency, according to protocols described in Appendix 9 of the HCP. Annual reports and other deliverables described above will be provided to DLNR and USFWS, allowing them to independently verify that KWP has performed all of the required activities and tasks on schedule.

Mitigation and Adaptive Management for Anticipated Impacts

The proposed mitigation and adaptive management measures included in the HCP are incorporated herein. The summary of the mitigation program listed below includes the full range of measures that have been identified to provide mitigation for any of the potential take scenarios (*i.e.*, baseline, lower, higher and notably higher). The baseline (anticipated) level of mitigation will be implemented initially, however, adaptive management will allow for changes in the level of mitigation if warranted. A minimum level of mitigation, corresponding to the lower take scenario, will be implemented even if the actual take is zero. The proposed mitigation also includes the establishment of contingency funds for all four species to provide for additional mitigation up to the notably higher levels of take, if warranted.

For the Hawaiian petrel and Newell's shearwater, mitigation will include:

- Conducting surveys on-site, using radar and visual observations, during the nesting and fledging seasons of the first year of project operation. These surveys will enhance our understanding of these species' habits and population status on West Maui, as well as document the response to the turbines by any birds that fly near or through the project area.

- Conducting off-site surveys in an effort to (a) locate as-yet unknown or unconfirmed nesting colonies on West Maui, (b) estimate nest numbers and distribution, (c) identify management needs and (d) where possible, implement management measures. Colony searches and protection/management efforts will continue on West Maui until (a) it is determined that there are unlikely to be any (further) protection/management opportunities on West Maui that

are practicable, or (b) enough opportunities have been identified to implement all of the required mitigation.

- Conducting off-site searches for, and management/protection of, colonies on East Maui, Kaua‘i, Moloka‘i, Lāna‘i, and Hawai‘i Island if opportunities for colony protection/management on West Maui are insufficient.

- Implementing additional alternatives if opportunities for colony protection/management are insufficient. These include expansion of the Save our Shearwaters (SOS) program on Maui (*i.e.*, search for and rescue of downed birds in lighted urban/suburban areas); reducing lighting attractions elsewhere on Maui; and/or reducing the risk of bird strikes with artificial structures on Maui.

- Conducting at a minimum the first 2 years of site surveys, West Maui colony surveys, and West Maui colony protection/management, even if the actual take is zero.

Mitigation for Nēnē will include the following:

- Kaheawa Wind Power will make the following contributions to a Nene propagation and release, or translocation program: (a) the construction of a new Nēnē release facility within 1 year of permit issuance; (b) obtaining Nēnē chicks for release in the new facility; (c) operations and maintenance staffing of the new facility; (d) the purchase of a truck for staff use; and (e) funds to allow for helicopter release of fledged Nēnē.

- The construction and operation of a second new release facility (as described above) will be provided if warranted in subsequent years.

- At a minimum, funding will be provided to construct a new release facility, purchase 50 goslings, and operate the facility for 5 years, even if the actual take is zero.

The primary mitigation approach for the Hawaiian hoary bat will consist of funding the expansion of the ongoing research, as follows:

- An up-front contribution of $20,000 to an appropriate program in support of the current bat research effort, such as the Hawaiian Bat Research Cooperative (HBRC), the Hawai‘i Endangered Species Trust Fund, or a similar program as determined by DLNR and USFWS, even if the actual take is zero. This figure is roughly equivalent to the cost of $1,000 per year, to provide equipment and support for radio-tagging and monitoring an additional bat per year for 20 years under the existing HBRC research program (S. Fretz, DOFAW, pers. comm., 2005). Additional contributions may be made depending on actual take.

- Conducting monthly surveys for bat activity within the project area for 12 consecutive months (for 2 consecutive nights each month).

- Conducting at a minimum, the first year of site surveys.

Monitoring and Adaptive Management for Listed Plants and/or Critical Habitat

Several listed plant species and their critical habitats are known to occur within the upper reaches of Papalaua Gulch located to the west and Manawainui Gulch plant sanctuary located to the east of the upper turbine string. These areas overlap with the search plots around each turbine and meteorological tower to detect injured individuals or carcasses of covered species. In order to avoid and minimize impacts to individual plants and critical habitat, the following measures will be implemented:

- Prior to construction of turbines or project operations, the full 180 m by 200 m search area around all 20 turbines will be surveyed by a qualified botanist. Any listed or candidate plant species that are found will be clearly marked and documented (including GPS coordinates, photographs, rare plant monitoring data forms), and search activities will be modified as appropriate to avoid direct or indirect impacts.

- Prior to bird fatality searches, vegetation plots will be established within and adjacent to the affected plant critical habitat areas as a baseline for monitoring whether adverse impacts attributable to the fatality search efforts or project activities occur over time, and if so, whether mitigation needs to be implemented.

- Mitigation (if necessary) will be developed and implemented at the request of DLNR and USFWS. Potential mitigation measures would depend on the impacts that actually occur, but may include measures such as control of invasive species or propagation and planting of additional specimens.

- Methods for conducting bird fatality searches in these areas will need to proceed adaptively to best meet the objectives of documenting fatalities while avoiding adverse impacts to listed plants. Potential adaptive measures may include reduced frequency of searches, scanning for fatalities from outside the area, and making corresponding adjustments to fatality numbers to account for the reduced search area or reduced level of search effort, if necessary. Portions of the search areas designated as critical habitat will be documented (as described above) as a baseline for assessing plant impacts and prescribing any mitigation that may be appropriate.

Funding

An estimate of the costs of funding the proposed mitigation plan is provided in HCP Appendix 11. Assuming project operation begins in spring 2006, the cost of the supplemental studies for seabirds and bats, and intensive monitoring for downed wildlife during the first 12 months of operation, is estimated to be $367,500.00. This figure includes the initial $143,000.00 contribution to the Nēnē propagation effort. Assuming the take of all species remains at or below the estimate anticipated for the Baseline Take scenario, and contingency funds are not needed, the average annual cost for years 2 through 20 is estimated at $61,605.00 (in 2005

dollars). Total estimated cost over an assumed 20-year project life is $1,538,000.00 (not adjusted for inflation, assuming contingency funds are not needed).

KWP will pay the mitigation obligations described in Appendix 11 of the HCP out of (1) project operating revenues; (2) a bond posted in the amount of the contingency funds described in the HCP ("Contingency bond"); (3) a bond posted in the amount of $500,000 ("Mitigation bond"); and (4) a Guaranty Agreement provided by third-party equity holders in the project. The Mitigation Bond shall be renewed each year for at least $500,000 for the life of the project.

KWP will provide a rolling letter of credit (LC) or bond in the amount of $500,000, which will be available to fund mitigation in the unlikely event of a revenue shortfall or, in the worst case scenario, bankruptcy. KWP also will establish a bond or letter of credit for the value of the three contingency funds ($384,000). The amount of the Contingency Bond will increase at 2.5% annually over the term of the HCP.

FWS, DLNR and KWP shall review the amounts of the two bonds during the annual meetings held pursuant to HCP Section VI. If circumstances warrant, in accordance with the HCP, the amounts of the bonds may be decreased, increased or eliminated during the annual meetings. If unmitigated notably higher take is occurring, either during any given year or cumulatively, then KWP shall increase the amount of the $500,000 Mitigation Bond to $1 million. If unmitigated notably higher take continues to occur during Year 11 or thereafter, KWP, USFWS and DLNR agree to evaluate the adequacy of the Mitigation Bond during the annual meeting, based on the amount of mitigation funds already spent in relation to the total mitigation obligation of $3.76 million for the project. If FWS/DLNR believe an increase in the Mitigation Bond is warranted after the amount of the Mitigation Bond has been increased to $1 million, USFWS/DLNR may require an increase in the Mitigation Bond amount. USFWS/DLNR will consider the following factors in deciding whether such an increase is warranted: length of time the project has operated under the Notably Higher Take scenario; difference between the unspent portion of the total project mitigation obligation of $3.76 million and $1 million; financial condition of KWP; and KWP history of performance of mitigation obligations.

KWP recognizes that the cost of implementing mitigation measures (for example, construction of a release facility) in any one year may exceed that year's budget allocation, even if the overall expenditure for mitigation stays within the total amount budgeted over the life of the project. Accomplishing these measures may therefore require funds from future years to be expended, or likewise for unspent funds from previous years to be carried forward for later use.

The parent guaranty is described in Appendix 12 of the HCP. The guaranty amount would be for a maximum of $3.76 million, *i.e.*, equivalent to the estimated costs of all mitigation and monitoring measures, including contingency funds and interest accrued should the notably higher take scenario occur. The maximum guaranty amount would reduce over time by the actual amount expended by KWP toward these efforts.

Progress to Date

Under the terms of the State of Hawaii's Conservation District Use Permit as amended June 24, 2005, KWP initiated the baseline level of mitigation in August 2005, in advance of issuance of the state license and federal permit for incidental take. As of November 30, 2005, the following mitigation and monitoring measures have been implemented:

- Hired on-site staff, including a full-time Senior Wildlife Biologist and a temporary Wildlife Technician, to implement mitigation and monitoring measures prescribed under the HCP; purchased two vehicles and field equipment; and established local base of operations;

- Retained contractor beginning in August 2005 to implement the Nēnē Survey Protocol in association with the start of construction, and to support other wildlife efforts as needed;

- Instituted on-going training of on-site construction personnel as prescribed under the Wildlife Education and Observation Program (WEOP);

- Implemented a pre-operational Carcass Removal Trial from November 2 – 30, 2005, as prescribed under the Wildlife Casualty Monitoring Protocol;

- Compiled reports of the two seabird species on West Maui, including review of published literature, field notes and files, interviews and e-mail surveys from Division of Forestry and Wildlife (DOFAW) biologists, major landowners, and conservation organizations, and created a GIS data layer;

- Compiled DOFAW reports of downed seabirds around West Maui, created GPS of all known downed seabird locations as reported and a GIS data layer;

- Compiled and created a GIS layer of reported sightings of Barn owls (*Tyto alba*), a known predator of seabirds, around West Maui;

- Conducted field visits, including overnight observations, to investigate locations where seabirds were previously reported by others (no birds detected);

- Conducted night-time and early morning searches of lighted areas for downed seabirds (no birds found);

- Conducted searches of the immediate vicinity of the project site for appropriate seabird nesting habitat or indications of seabird nesting (none found);

- Developed a GIS database in support of the seabird colony search effort;

- Coordinated with DOFAW to determine the timing and form of funding for construction and operation of the Nēnē release facility;

- Coordinated with DOFAW to determine the timing and form of funding for the contribution for Hawaiian hoary bat mitigation.

STATUS OF THE SPECIES

Newell's Shearwater

Taxonomy and Species Description

The Newell's shearwater is a bird of the open tropical seas and offshore waters near breeding grounds. A medium-sized shearwater, the Newell's is approximately 12-14 inches long, with a wingspan of 30-35 inches. It has a glossy black top, a white bottom, and a black bill that is sharply hooked at the tip. Its claws are well adapted for burrow excavation and climbing.

Historic and Current Distribution

The Newell's shearwater was once abundant on all main Hawaiian islands. The total population of the Newell's shearwater is estimated at roughly 84,000 birds (Ainley *et al.* 1997), with approximately 75 percent occurring on the island of Kaua'i.

Newell's shearwater breeds on several of the main Hawaiian islands, with the largest numbers clearly occurring on Kaua'i, where they nest in mountainous terrain between elevations of 500 and 2,300 feet. These birds also nest on Hawai'i, almost certainly nest on Moloka'i, and may still nest on Oahu. The occurrence on Maui of injured, dead, or grounded adults in summer, low numbers of radar targets exhibiting Newell's-like timing of movement, and of juveniles in autumn suggest that the species also may nest on Maui; however, the exact status of this species on Maui is unclear at this time. The strictly nocturnal behavior of this species makes determination of its status and distribution more difficult than that of the more crepuscular Hawaiian petrel.

Population models incorporating best estimates of breeding effort and success yielded a population decreasing at a rate of 3.2 percent annually (Ainley *et al.* 2001). When variables describing the anthropogenic mortality suffered by Newell's shearwater (predation, light attraction and collision) were included, these models predicted a population decline of 30 to 60 percent over 10 years (Ainley *et al.* 2001). As noted by DOFAW (2005), 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.

Life History

Most of the life history information for this species is based on studies of the Kaua‘i population; life histories of birds in a West Maui population, if one exists, may differ slightly. During their nine-month breeding season from April through November, Newell's shearwaters live colonially in burrows under ferns on forested mountain slopes. These burrows are used year after year and usually by the same pair of birds. A single egg is laid probably in June. Incubation by both sexes lasts 45 days, and young fledge in October-November. The Newell's shearwater needs an open downhill flight path through which it can become airborne.

Daily flight to and from colonies occurs only at night. On, Kaua‘i, Newell's shearwaters begin to arrive at colonies well after sunset and just before the sky becomes completely dark (*i.e.,* light meter reads 0 lux) (Cooper and Day 1995). After 30 minutes past sunset, markedly fewer birds arrive, although some continue to arrive throughout the night. In the morning, departure is even more synchronous and centered about 15 minutes on either side of a completely dark sky. Flight speed over land in Hawai‘i, without correction for wind direction and speed, has been estimated at 16.8 m/s ± 1.9 (38 miles per hour ± 4 SD; Reynolds *et al.* 1997, measured by radar).

Three age classes of Newell's shearwaters were developed based on the following demographic factors and assumptions (from Ainley *et al*. 1997 and as otherwise noted): (1) young-of-year (YoY), (2) pre-breeding immature/adult (if recognizable), or (3) breeding adults. For Newell's shearwater on Kaua‘i, on basis of estimates made by Telfer (1986), incidence of non-breeding is high: only 46 percent of pairs that actively use a burrow actually breed in a given year (range 30–62 percent, $n = 5$ yr, 36–47 burrows monitored/yr). First breeding occurs at approximately six years of age (Ainley *et al*. 1997).

Study of reproductive success in one Newell's shearwater colony on Kaua‘i documented an average annual production of 0.66 young per pair (Ainley *et al.* 2001). This fledging rate is similar to that of stable Manx shearwater populations (Brooke 1990). Based an allometric equation relating survivorship to body mass in procellariiforms, annual adult survivorship of Newell's shearwater was estimated to be 0.904 ± 0.017 SE. This figure is close to that estimated for Manx shearwater by more conventional means (Brooke 1990). No specific data exist on the longevity for this species, but other shearwaters may reach 30 years of age or more (Bradley *et al.* 1989, del Hoyo *et al.* 1992).

Habitat Description

On Kaua‘i, Newell's shearwater breeds between 160 and 1,200 m (528 to 3,960 ft) and at elevations between 189 to 330 m (623 to 1089 ft) near Puna, Hawai‘i (Ainley *et al.* 1997). Newell's shearwater usually nests where terrain is vegetated by open canopy of trees and understory of densely matted uluhe ferns (*Dicranopteris linearis*). Some exceptions to these conditions exist, as on walls of Waimea Canyon, Kaua‘i, where forest canopy is absent.

Burrows are most commonly placed at the base of trees, where the substrate may be easier for the birds to excavate.

Threats, Recovery Strategy, and Ongoing Conservation Measures

The Newell's shearwater was listed as a threatened species by the USFWS in 1975. The Hawaiian Dark-rumped petrel and Newell's shearwater Recovery Plan was published in 1983. During the last 150 years, 75 percent of the forests on the main islands of the Hawaiian archipelago have been converted to agricultural, military, commercial or residential land uses, leading to a depletion of available nesting habitat for this species. The introductions of the mongoose (*Herpestes auropunctatus*), black rat (*Rattus rattus*), and Norway rat (*Rattus norvegicus*) have also played a primary role in the reduction of ground-nesting seabirds. Predation by feral cats (*Felis domesticus*) and barn owls (*Tyto alba*) has been observed. In addition, feral pigs (*Sus scrofa) are* known to collapse burrows as well as predate shearwaters. Another major threat is the species' attraction to light. Increasing urbanization and the accompanying manmade lighting have resulted in substantial problems for fledgling shearwaters during their first flight to the ocean from their nesting grounds. When attracted to manmade lights, fledglings become confused and may suffer temporary night blindness. They often fly into utility wires, poles, trees, and buildings and fall to the ground. Between 1978 and 1981, more than 5,000 Newell's shearwaters fell on Kaua'i's highways, athletic fields, and hotel grounds (USFWS 2005b).

The USFWS' "Hawaiian Dark-rumped Petrel and Newell's Manx Shearwater Recovery Plan" includes 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 (USFWS 1983). In order to meet these goals, DOFAW (2005) recommends 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 Oahu, Lana'i, Moloka'i, and Maui.
5. Monitor results of restoration/conservation activities at specific sites.

Predator control in key habitat areas, the establishment of Bird Salvage-Aid Stations, nest translocation, and light attraction studies have been initiated to help save the Newell's shearwater. Outreach to Kaua'i's local community has resulted in people picking up and bringing downed birds to aid stations for care and release, and enhanced seabird survivorship (USFWS 2005).

Hawaiian Petrel

Taxonomy and Species Description

The Hawaiian petrel is a large petrel, approximately 16 inches long with a wing span of three feet. Previously known as the Dark-rumped petrel, the Hawaiian petrel, has a dark gray head, wings, and tail, and a white forehead and belly. It has a stout grayish-black bill that is hooked at the tip, and pink and black feet. It has a distinctive call during the breeding season that sounds like "oo ah oo." They also have calls that sound like the yapping of a small dog.

Historic and Current Distribution

The species was once abundant on all main Hawaiian islands except Niʻihau. Today, Hawaiian petrels breed in high-elevation colonies, primarily on East Maui and, to a lesser extent, on Hawaiʻi and Kauaʻi, and probably Molokaʻi, Lānaʻi, Lehua, and sea stacks off Kahoʻolawe.

Based on pelagic observations, the total population including juveniles and subadults was estimated at 20,000 with a breeding population of 4,500 to 5,000 pairs (Spear *et al.* 1995, Ainley *et al.* 1997). Approximately, 1,000 pairs nest in Haleakalā National Park, Maui. There is also a small colony on Mauna Loa, Hawaii. Kauaʻi populations are difficult to assess, but potentially a large portion of the population nest on that island. Numbers breeding on Maui appear to be stable (Simons and Hodges 1998) and have increased in areas of Haleakalā National Park with active predator management (Hodges and Nagata 2001).

Life History

The Hawaiian petrel is strictly nocturnal over land, and active in their nest colony for about nine months each year (activity at the nesting colony is diurnal and nocturnal). The long-lived adults (ca. 30 years) return to the same nesting burrows each year between March and April. Females lay only one egg, which is incubated alternately by both parents for approximately 55 days. Eggs hatch in July or August, after which both adults spend their time flying to sea to feed and bring food home for the nestling. The fledged young depart in October and November at Haleakalā, although unpublished information from Hawaiʻi Island suggests that birds may be found as late as December (Cathleen Bailey, Haleakalā National Park, pers. comm., 2004). Adult birds do not breed until age 6 and may not breed every year. However, pre-breeding and non-breeding birds return to the colony each year to socialize. It is estimated that 89 percent of the adult population breed each year (Simons 1984). An analysis of life history by Simons (1984) estimated that a stable population would show the following distribution:

Age Class (years old)	% of population
< 6 (pre-breeders)	52.2
6 -11	19
12-17	12.3

Age Class (years old)	% of population
18-23	7.9
24-29	5.2
30-35	3.4

In this analysis, juvenile survival was assumed at 80 percent and adult survival at 93 percent.

Habitat Description

On Hawai‘i and Maui, Hawaiian petrel have been pushed to the limits of their habitat, nesting in the cold, xeric environment above 2,500 m primarily in national parks. On Kaua‘i, there is evidence that Hawaiian petrel nest at lower elevations in densely vegetated rainy environments (Ainley *et al*. 1997). Hawaiian petrel are colonial and nest in burrows, crevices in lava, or under ferns. The burrows are generally 1 to 2 m (3 to 6 ft) long (from entrance to nest chamber), although some may be as long as 9 m (30 ft) (Simons and Hodges 1998).

Threats, Recovery Strategies, and Ongoing Conservation Measures

The most serious threat to the species, based on studies at Haleakalā, is depredation of eggs and young in the breeding colonies by introduced mammalian predators such as feral cats (*Felis silvestris*) and mongoose. According to population modeling, this species could face extinction in a few decades if predation is not controlled (Simons 1984). Removal and exclusion of feral ungulates together with intensive control of non-native predators have improved survival of the species (Hodges and Nagata 2001). Other threats include avian malaria, which was found in blood samples of Hawaiian petrels in the 1960s and may have killed off low-elevation breeders, and occasional mortality from collisions with powerlines and fences near breeding sites. For example, 31 adult birds were killed at Haleakalā National Park from 1976 to 1993 as a result of collisions with a fence erected to exclude predators from the nesting colony (Hodges 1994). In addition, fledgling birds are sometimes grounded when they become disoriented by lights on their nocturnal first flight from inland breeding sites to the ocean. A few, mostly juvenile, Hawaiian petrels land in brightly lit areas at scattered locations on Maui in most years. The problem is much smaller than the one involving Newell’s shearwaters (see previous section), and currently is not anticipated to pose a threat to remaining populations (Simons and Hodges 1998). Predator control in key habitat areas, the establishment of Bird Salvage-Aid Stations, and light attraction studies have been initiated to help conserve the Hawaiian petrel. The USFWS, DOFAW and the National Park Service work cooperatively to protect their breeding habitats and control predators within Haleakalā National Park.

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, (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).

The Pacific Region Seabird Conservation Plan (USFWS 2005b) also recommends the USFWS: (1) Work with the National Park Service, the state of Hawai‘i and other land managers to control introduced predators in the area of important colonies; (2) Work with utilities to develop solutions to reduce mortality caused by powerlines (*e.g.,* different spatial array, strategic tree planting, visual deterrents); (3) Survey Lāna‘i and Kahoolawe to determine if the Hawaiian Petrel are nesting, locate and determine the size of Kaua‘i colonies, and outline and implement a population monitoring program; (4) Maintain a program to shield lights to reduce their effects on petrels and continue recovery efforts for grounded fledglings; (5) Determine status ? of offshore islands such as Lehua, that could be made predator-free.

Nēnē

Taxonomy and Species Description

The Nēnē is a medium-sized goose, with an overall length of approximately cm (25 to 27 in). This species is adapted to a terrestrial and largely non-migratory lifestyle in the Hawaiian islands with limited freshwater habitat. Compared to the related Canada goose, Nēnē wings are reduced by about 16 percent in size and their flight is weak. Nonetheless, Nēnē are capable of both inter-island and high altitude flight (Banko *et al*. 1999).

Historic and Current Distribution

Fossil records show that Nēnē used to live on all the main Hawaiian islands. It is believed that they were abundant (about 25,000 birds) on the Big Island before the arrival of Captain James Cook in 1778 (USFWS 2004). Currently, there are wild populations of Nēnē on Hawai‘i, Maui and Kaua‘i composed of an estimated 349, 251, and 620 individuals, respectively (USFWS 2004). After nearly becoming extinct in the 1940s and 1950s, this species' population slowly has been rebuilt through captive-breeding programs. As a result of such programs, the Nēnē has been re-introduced onto four of the main Hawaiian islands (Kaua‘i, Maui, Moloka‘i, and Hawai‘i). The primary release site on Maui is located at Haleakalā National Park on East Maui where, as of 2003, 511 Nēnē have been released since 1962. Releases on Maui have ranged from a high of 72 birds in 1969, to a low of zero in several years including from 1979 through 1991. Annual releases were typically on the order of 20 to 50 birds at Haleakalā in the 1960s and 1970s.

Life History

The Nēnē has an extended breeding season with eggs reported from all months except May, June, and July, although the majority of birds in the wild nest during the rainy (winter) season between October and March (Banko *et al*. 1999, Kear and Berger 1980). Nesting peaks in December and most goslings hatch from December to January (Banko *et al*. 1999).

Nēnē nest on the ground, in a shallow scrape in the dense shade of a shrub or other vegetation. A clutch typically contains three to five eggs, and incubation lasts for 29 to 31 days. While the female incubates the eggs, the male stands guard nearby, often from an elevated location. Once hatched, the young remain in the nest for one to two days (Banko *et al*. 1999). Fledging of captive birds occurs at 10 to 12 weeks, but may occur later in wild birds. During molt, adults are flightless for a period of 4 to 6 weeks, generally attaining their flight feathers at about the same time as their offspring. When flightless, goslings and adults are extremely vulnerable to predators such as dogs, cats, and mongooses. From June to September, family groups join others in post-breeding aggregations (flocks), often far from nesting areas.

Habitat Description

The current distribution of Nēnē has been highly influenced by the location of release sites for captive-bred Nēnē. Nēnē are known to occupy various habitat and vegetation community types ranging from coastal dune vegetation and non-native grasslands (such as golf courses, pastures, and rural areas) to sparsely vegetated low- and high-elevation lava flows, mid-elevation native and non-native shrubland, cinder deserts, native alpine grasslands and shrublands, open and non-native alpine shrubland-woodland community interfaces (Banko 1988; Banko *et al*. 1999). Nēnē are browsing grazers. The composition of their diet depends largely on the vegetative composition of their surrounding habitats and they appear to be opportunistic in their choice of food plant as long as they meet nutritional demands (Banko *et al*. 1999; Woog and Black 2001). Nēnē may exhibit seasonal movements to grasslands in periods of low berry production and wet conditions that produce grass with a high water content and resulting higher protein content.

The distribution of Nēnē nests generally has also been associated with the location of release sites of captive-bred Nēnē since 1960. The sites used by Nēnē for nesting range from coastal lowland to subalpine zones and demonstrate considerable variability in physiognomic features (Banko *et al.* 1999). Nest sites studied at Haleakalā National Park were located in well vegetated habitat (Black *et al.* 1994). During the breeding season, Nēnē were observed feeding mainly on berries and other plant items found near their nest sites. Although some birds supplemented their diets by feeding in grasslands due to declining berry density, during the pre- and non-breeding season their principal foods are cultivated grasses.

Threats, Recovery Strategy, and Ongoing Conservation Measures

The Nēnē was listed as endangered in 1967 (USFWS 2004). The Nēnē Recovery Plan was first written in 1983. A Draft Revised Recovery Plan for the Nēnē or Hawaiian Goose was recently published and incorporated a considerable amount of new information in the fields of genetics, paleontology, nutrition, behavior, effects of predation, and predator control. The plan also recommended a shift in recovery efforts to include more intensive habitat management and releases of captive-reared birds at lower elevations (USFWS 2004).

The main limiting factors currently affecting Nēnē recovery are predation by introduced mammals, insufficient nutritional resources for both breeding females and goslings, limited availability of suitable habitat, and human-caused disturbance and mortality (USFWS 2004). In order for Nēnē populations to survive, they must be provided with generally predator-free breeding areas and sufficient food resources, human-caused disturbance and mortality must be minimized, and genetic and behavioral diversity maximized. At the same time, it is recognized that Nēnē are highly adaptable, successfully utilizing a gradient of habitats, ranging from highly altered to completely natural, which bodes well for the recovery of the species.

The goal of the recently revised USFWS' "Draft Revised Recovery Plan for the Nēnē or Hawaiian Goose *(Branta sandvicensis)*" is to enable its conservation by utilizing a mix of natural and human-altered habitats in such a way that meets the life history needs of the species and promotes self-sustaining populations at or above recovery target levels (USFWS 2004). On Maui, captive releases are considered an important strategy for Nēnē recovery for establishing new populations and supplementing current unstable populations. However, releases must occur in conjunction with predator control and habitat manipulation (USFWS 2004).

Hawaiian Hoary Bat

Taxonomy and Species Description

The Hawaiian hoary bat is the only existing native terrestrial mammal from the Hawaiian archipelago (USFWS 1998). The Hawaiian hoary bat is a medium-sized (14 to 22 grams; 0.5 to 0.8 ounces), nocturnal, insectivorous bat with short, thick, rounded ears, a wingspan measuring 26.9 to 34.6 centimeters (10.5 to 13.5 inches), and a furry tail. "Hoary" refers to the white-tinged, frosty appearance of the bat's grayish brown or reddish brown fur. Although females are slightly larger than males, forearm lengths are similar in both genders. These bats are not colonial, and roost solitarily in tree foliage.

The Hawaiian hoary bat is classified under the Family Vespertilionidae of the Suborder Microchiroptera, and is one of three recognized hoary bat subspecies. The other two subspecies are *Lasiurus cinereus cinereus*, one of the most common and widespread bats in North America, and *Lasiurus cinereus vilosissimus*, which occurs in South America and the Galapagos.

Morphologically, the Hawaiian hoary bat may have diverged significantly from the North American form, as Hawaiian hoary bats are about 45 percent smaller. Nonetheless, preliminary genetic analysis indicates the Hawaiian hoary bat may be derived from the North American hoary bat. The low degree of genetic divergence, however, suggests subspecies classification may be appropriate (USFWS 1998).

Historic and Current Distribution

The Hawaiian hoary bat is endemic to the state of Hawai‘i and has been documented historically on the islands of Hawai‘i, Maui, Moloka‘i, Oahu, Kaua‘i, and possibly Kaho‘olawe. This bat is now resident only on Hawai‘i, Maui, and Kaua‘i, with the largest populations probably on Hawai‘i and Kauai; no evidence of a breeding population (*e.g.*, pregnant or lactating females) has been documented on Maui (USFWS 1998). Occasional observations of bats on Oahu and Moloka‘i are considered to be migrant or vagrant individuals from other islands. There are no population estimates for the Hawaiian hoary bat and few historical or current records. Unsubstantiated population estimates across the state have ranged from hundreds to a few thousand (USFWS 1998). Data are limited because no feasible method currently exists for surveying the abundance and distribution of solitary, tree-roosting bats. The Hawaiian hoary bat's distribution may be broader than indicated by the current limited information resulting from localized search efforts (USFWS 1998).

The Hawaiian hoary bat occurs primarily below 1,219 m (4,000 ft) elevation, although it commonly is seen at 2,133 to 2,438 m (7,000 to 8,000 ft) on Hawai‘i and at 3,048 m (10,000 ft) on Haleakalā, Maui. The highest altitude record of this species is of one bat at 3,354 m (11,004 ft) on Mauna Loa, Hawai‘i. This species was recorded between 0 and approximately 2,758 m (9,050 ft) in elevation on Maui, with most records occurring at approximately 630 m (2,060 ft).

Hawaiian hoary bats are thought to be present in low numbers on Maui and most numerous on the island of Hawai‘i, where they are uncommon but fairly widespread (Jacobs 1994). Bats have been observed year-round in a wide variety of habitats and elevations below 2,286 m (7,500 ft), and a few sightings from limited surveys have been reported as high as 4,023 m (13,199 ft). Bats have been detected in both wet and dry areas of Hawai‘i but seem to be more abundant on the drier leeward side (Jacobs 1994) and generally less abundant in wet areas (Kepler and Scott 1990). Only three researchers have examined spatial/temporal variation in occurrence patterns of bats on Hawai‘i, and there are conflicting conclusions about possible altitudinal or regional migration (Tomich 1986; Jacobs 1994).

Life History

Hawaiian hoary bats are generally considered to be tree-roosting bats of primarily forested areas, similar to the North American hoary bat (*Lasiurus cinereus cinereus*). Hawaiian hoary bats roost in a variety of tree species during the day and forage in a wide range of habitat types during the night. There is no information on the Hawaiian hoary bat's average life span, age at first reproduction, survivorship, how age and reproductive condition affect its food habits, habitat selection, home range size, and movement patterns.

Breeding has been documented on Hawai‘i and Kaua‘i, but is not known on the other islands (Baldwin 1950, Kepler and Scott 1990). Breeding probably occurs most frequently between September and December, with birth of two young occurring in May or June. Hawaiian hoary

bat activity apparently varies seasonally, but the nature and timing of this variation is unclear. Although seasonal inter-island and elevational migration has been suggested, migration on the scale of the mainland North American Hoary Bat is unknown in the Hawaiian hoary bat (Kepler and Scott 1990, Kramer 1971, Tomich 1986).

Hawaiian hoary bats have been observed foraging in a variety of both open and more vegetatively cluttered habitats, including open fields near native or non-native vegetation, over the open ocean (in bays near shore), over lava flows, and at streams and ponds, and have been documented foraging from 1 m to over 150 m (3 ft to over 483 ft) above the ground or water (Baldwin 1950, Fujioka and Gon 1988, Kepler and Scott 1990, Jacobs 1993 and 1994, and Reynolds *et al.* 1997). It is unknown whether they prefer to roost in native or non-native vegetation cover. Population estimates for all islands have ranged from hundreds to a few thousand. However, these estimates are based on limited and incomplete data and the magnitude of any population decline is unknown (USFWS 2005b). Observation and specimen records do suggest, however, that these bats are now absent from historically occupied ranges.

Habitat Description

The Hawaiian hoary bat is a solitary bat that roosts among foliage in trees. Jacobs (1993) found that hoary bats typically depart roost sites shortly before sunset and return before midnight. Although its North American counterpart forages almost exclusively in open habitats away from vegetation (Barclay 1985), the Hawaiian hoary bat has been observed foraging in a variety of both open and more vegetatively cluttered habitats, including open fields near native or non-native vegetation, over open ocean (in bays or near shore), over lava flows, and at streams and ponds.

On Maui, the Hawaiian hoary bat is believed to primarily occur in moist, forested areas, although little is known about its exact distribution and habitat use on the island, especially in the West Maui mountains. In spite of the species' probable preference for moist forested areas, it has been seen on West Maui in Lahaina and near Mopua, both of which are dry, and on the dry, treeless crest of Haleakalā in East Maui. It also is recorded regularly on the drier side of Kaua‘i and Hawai‘i, especially near the coast, indicating that such habitat does not exclude this species. These bats were found to be more common on the drier side of Hawai‘i, probably because the number of flying insects is higher and feeding is less disrupted by rain. During the day, these solitary bats roost in a variety of tree species and occasionally in rock crevices and buildings. Bats have rarely been recorded hanging from wire fences on Kaua‘i and have once been seen leaving and entering caves and lava tubes on Hawai‘i. Hawaiian hoary bats are generally considered to be tree-roosting bats of primarily forested areas, similar to the North American hoary bat.

Threats, Recovery Strategy, and Ongoing Conservation Measures

The Hawaiian hoary bat was listed as endangered on October 13, 1970, under the Endangered Species Conservation Act of 1969, and a recovery plan was prepared in 1998 (USFWS 1998). Species listed under the Act of 1973 are automatically listed under the state of Hawaii's endangered species law (Hawai‘i Revised Statutes 195D-4a). Critical habitat has not been designated for the Hawaiian hoary bat.

The major threats to Hawaiian hoary bats are assumed to be the same as those that threaten many bat species in general (Harvey *et al.* 1999; USFWS 1998). Bats have the slowest reproductive rate and the longest life-span of all mammals of their size (Neuweiler 2000). Thus, any mortality of breeding-age adults, particularly females, would constrain the recovery of the subspecies. The primary factor limiting recovery may be habitat loss, primarily the availability of roosting sites. Suitable roosting habitat is particularly important to pregnant and lactating females and non-volant young. Other possible threats identified in the recovery plan that have not been investigated may include pesticides (directly or by impacts to prey), predation (by native hawks and non-native feral cats), alteration of prey availability due to introduction of nonnative insects, and roost disturbance. Occasional instances are documented of Hawaiian hoary bats killed by collisions with vehicles and structures (Belwood and Fullard 1984; Tomich 1986; Kepler and Scott 1990; Menard 2001), and North American hoary bats seem quite susceptible to such collisions (Erickson *et al.* 2002).

The overall recovery strategy for the Hawaiian hoary bat is for research that can provide information on the subspecies' abundance and distribution, life history, and habitat associations. The currently available information is so limited that even the most basic management actions cannot be undertaken with any certainty of benefit (USFWS 1998). Therefore, the primary recovery goal is to conduct research essential to the conservation of the Hawaiian hoary bat. Research should focus on developing standardized survey and monitoring protocols for determining abundance and distribution, roosting habitat associations, basic life history biology, and food habits. Other recovery goals are to protect and manage current populations by identifying and managing threats, including protection of key roosting and foraging areas; conduct a public education program; evaluate progress towards recovery; and revise recovery criteria as necessary (USFWS 1998).

The USFWS, the Hawai‘i Department of Land and Natural Resources - DOFAW, and Bat Conservation International (BCI, a nonprofit conservation and education organization) jointly sponsor a public-private Hawaiian Hoary Bat Research Cooperative to collaboratively prioritize and fund management-oriented research on the Hawaiian hoary bat's abundance, distribution, and habitat requirements.

Major stakeholders include private landowners, agricultural and commercial forestry interests, environmental groups, local governments, and Federal and state agencies. Most of the cooperative's current funding is provided by two USFWS Cooperative Endangered Species

Conservation Fund Section 6 (of the Act) grants to the state. These cost-shared section 6 grants are for state development (including baseline surveys) of a programmatic Safe Harbor Agreement and a programmatic Habitat Conservation Plan under sections 10(a)(1)(A) and 10(a)(1)(B), of the Act respectively. The cooperative recently awarded funding to the U.S. Geological Survey's Biological Resources Discipline for telemetry research in years 2004 to 2006 on Hawaiian hoary bat movements within state-owned timber management areas on the island of Hawaii.

ENVIRONMENTAL BASELINE

The environmental baseline describes the status of the species and factors affecting the environment of the species or critical habitat in the proposed action area contemporaneous with the consultation in process. The baseline includes State, local, and private actions that affect a species within the action area at the time the consultation begins. Unrelated Federal actions that have already undergone formal or informal consultation are also a part of the environmental baseline. Federal actions within the action area that may benefit listed species or critical habitat are also included in the environmental baseline.

Status of the Species within the Action Area

Habitat

Vegetation at the project site consists of grasslands at lower elevations and a mixture of grasslands and scattered shrubs at moderate to higher elevations. Non-native and native shrubs and scattered trees line the two nearby gulches. In the vicinity of turbines 1-3, and directly above the site, shrubs dominate, with native ʻohia trees (*Metrosideros polymorpha*) and indigenous uluhe ferns becoming more common. These two plant species form the preferred nesting habitat for Newell's Shearwaters (Sincock and Swedberg 1969, Ainley *et al.* 1997). Although the proposed wind energy generation facility itself consists of a dry Mediterranean habitat, vegetation becomes much wetter upland, above the project area and toward the summit of the West Maui Mountains. It is presumed that vegetation communities are dominated by native species in higher, wetter areas that appear to be a suitable nesting habitat for Newell's Shearwaters, based upon comparable research of this species on Kauaʻi. In addition to the vegetation, the steepness of higher elevations also suggests suitable nesting habitat for Hawaiian Petrels, as it does on Haleakala Volcano on East Maui (Brandt *et al.* 1995), Kauaʻi (T. Telfer, DOFAW, pers. comm., 2004), and Lānaʻi (Hirai 1978).

Newell's Shearwater and Hawaiian Petrel

Ornithological radar and night-visual surveys were performed at the site during the peak nesting period (28 through 31 May 1999 and 1 through 4 June 1999) of both species and fledging period of both the Newell's shearwater (1 October through 10 November) and Hawaiian petrel (15 October through 20 November) in the fall of 2004 (Cooper and Day 2004a). In summer 1999, a

total of 40 radar targets fit the criteria for petrel/shearwater targets and an estimated mean nightly movement of 1.2 targets/hour was calculated from the data. In fall 2004, 37 petrel/shearwater targets were recorded and an estimated movement rate of 1.0 targets/hour (Cooper and Day 2004a) was derived. From these data, and incorporating estimated passage rates during non-survey hours (Day and Cooper 1995), a 180-day breeding period per year, Cooper and Day (2004b) estimated that 267 petrels or shearwaters will pass over each km of the proposed turbine string.

The movement rate of birds within the turbine zone was estimated using the area (sq m) of side and frontal turbine profile and an estimate of the number of birds (38 percent) that flew at or below turbine height of 91 m (based on data from Kauai where reasonable sample sizes, n=1,825 birds were observed, Day and Cooper 1995). In addition, timing of inland flights at the nearby Ukumehame site (Cooper and Day 2003) suggested that 60 percent of the seabirds in the area are Hawaiian petrels and 40 percent are Newell's shearwaters. Applying those proportions to Day and Cooper (1999) and Cooper and Day (2004a), 8 to 54 Hawaiian petrels and 5 to 36 Newell's shearwater will fly through the space occupied by the proposed Kaheawa turbines.

The number of radar and night-visual observations of petrel/shearwater targets by Day and Cooper 1999) and Cooper and Day (2004a) indicate that both species still nest somewhere on the West Maui mountains, and that these birds regularly fly over or near the proposed Kaheawa Pastures site at night, to or from nesting colonies either on the West Maui mountains or (occasionally) on Haleakalā. Furthermore, the occurrence on Maui of injured, dead, or grounded adults in summer, of low numbers of radar targets exhibiting Newell's-like timing of movement, and of juveniles in autumn also suggest that both species may nest on Maui.

Based on the data, it is not possible to estimate the size of the West Maui nesting population at this time. In comparison with other locations on Maui and 18 sites on Kauai, the mean movement rates are low – less than most other locations on Maui and less than 15 percent of the lowest mean movement rates that were recorded at 18 sites on Kaua'i for shearwaters during 1993 through 2001 (Cooper and Day 2003, Day and Cooper 1995).

The number of Hawaiian petrels on Maui has been estimated at 1,800 birds, all of which are believed to be associated with colonies on Haleakalā. However, radar counts of petrels on the perimeter of Maui suggest that the number is much higher (Cooper and Day 2003). It is not known with certainty whether they also nest in the western part of the island (*i.e.*, the West Maui mountains) and, if they do, their nesting distribution or habitat use there. However, on June 16, 1999, a Hawaiian petrel was heard calling from a bed of uluhe ferns (*Dicranopteris linearis*) at 3,300 ft elevation in the Kapunakea Preserve, which lies on the northwestern slope of the West Maui Natural Area Reserve, suggesting breeding in West Maui (A. Lyons, *fide* C. Bailey *in* Cooper and Day 2004a). This location is approximately 8 miles from the upper end of the proposed project site. Further, Cooper and Day (2004a) observed Hawaiian Petrels flying inland over the northern coast toward the West Maui mountains.

Based on the data, it is not possible to estimate the size of a West Maui nesting population at this time. However, the detection of radar targets characteristic of Hawaiian petrels and visual observation at all six locations surveyed in West Maui (Cooper and Day 2003) provides evidence of the existence of petrel colonies in West Maui, albeit smaller than the 1,800 birds known from East Maui.

Nēnē

Since 1995, the majority of Maui Nēnē releases have been from a new release pen in Hanaula, in the West Maui mountains, in an effort to establish a second population on this part of the island (F. Duvall, Maui DOFAW, pers. comm., 2004). This pen is located near the upper end of the proposed Kaheawa Pastures project site, approximately 1,800 ft from the nearest proposed wind turbine (Turbine 1) and meteorological tower. Since 1994, 100 Nēnē have been released at Hanaula, compared with 18 at Haleakalā (USFWS 2004). DOFAW estimates that 91 of the 100 birds released between 1994 and 2004 have survived, a survival rate of 91 percent over the 10-year period. At this time, there are no additional releases of Nēnē planned at Hanaula release (J. Medeiros, Maui DOFAW, pers. comm., 2005). The 91 Nēnē at the Hanaula site represent approximately 35 percent of the 256 Nēnē known on Maui, and 7 percent of the 1,300 Nēnē known statewide.

Nēnē are regularly observed within and near the site. During the summer 1999 and fall 2004 surveys, Nēnē were commonly observed (*i.e.,* 7 of 8 flocks) flying at altitudes (10, 20, 30, 50, 60, 70, and 75 m above ground level) within the height [90 m (296 ft)] of turbine tower and rotor swept area. Three of the eight flocks had flight paths that crossed the proposed turbine string. Three of the eight flocks exhibited circling behavior at altitudes (50, 60, 70 m) within the height of the turbine tower and rotor swept area. During the fall 2004 survey effort, two of the flocks were observed landing in the area: one landed approximately 600 m (ft) west of the proposed turbine string, and one landed approximately 100 m (ft) east of the proposed turbine string. In addition, during visual sampling, 1 to 2 pairs were frequently observed above the upper end of the turbine string (Cooper and Day 2004a).

A number of the Nēnē from the Hanaula release site remain as residents within or near the proposed windfarm; in 1998, four goslings were successfully fledged from the first nest reported in the area (J. Medeiros, Maui DOFAW, pers. comm., 2005). Although no active nesting has been found, evidence of one old nest (previous year) was discovered approximately 500 ft outside of the construction area at Turbine 17 in August 2005. Pre-construction monitoring of the site has identified two seasonal "hotspots" where Nēnē have been observed: (1) flocking and pairing in the area of Turbines 17-20, 609m to 670 m (2,000 to 2,200 ft) characterized by non-native grasses with pockets of native vegetation (a‘ali‘i, pukiawe, ‘ulei, akia, and a few ‘ohi‘a and ‘iliahi, (2) pairing in significant numbers in grasslands at the 457 m (1,500 ft) contour (Nishibayashi 2005). Nēnē also have been observed near Honoapi‘ilani Highway near sea level, suggesting Nēnē may utilize the entire project site (J. Medeiros, DOFAW, pers. comm., 2005).

Monitoring will continue throughout the construction phase, and construction activities and timing will be modified as necessary to avoid impacts to Nēnē.

Little is known about any migration pattern or movements of the birds released at Hanaula, although they have been recorded as far west as Lahaina and as far east as Haleakalā National Park, indicating that at least some birds from this release site move extensively around the island.

Nēnē within the project area are presently at risk from mammalian predators, including rats, mongoose, feral cats and feral dogs. In an effort to reduce this risk, DOFAW maintains an active program to trap mammalian predators in the vicinity of the release site. Nēnē may also be at risk of colliding with the existing MECO power lines, though no surveys have been done and few observers are present to report any collisions that may occur. Nēnē may also be at risk of being involved in collisions with vehicles that are operated within the project area.

Hawaiian Hoary Bat

No Hawaiian hoary bats were recorded in the area of the proposed wind turbines during studies conducted in summer 1999 (Day and Cooper 1999) or fall 2004 (Cooper and Day 2004a). However, this species may occur in the proposed project area at any time of year, either foraging or in transit, although it probably occurs infrequently and in very low numbers (Cooper and Day 2004a).

On Maui, this bat is believed to primarily occur in moist, forested areas, although little is known about its exact distribution and habitat use on the island, especially in the West Maui Mountains. In spite of the species' probable preference for moist forested areas, it has been seen on West Maui in Lahaina and near Mopua, both of which are dry, and on the dry, treeless crest of Haleakalā in East Maui. In a summary of hoary bat sightings on Maui during a four-year period (1987-1990), bats were reported from habitats ranging from native (wet-ohia) and non-native (*Eucalyptus* sp., pine, conifers) forested areas, agricultural areas (e.g., pineapple), alpine shrubland, and pastures. Although the results may reflect the tendency of observers to frequent areas containing these habitats, nevertheless, it does show that the hoary bat can be found throughout a broad range of habitat (vegetation type, climate) and elevation (sea level to summit of Haleakala) on Maui that overlap with the wind farm project site (Duvall 1991). Based on the limited data, it is not possible to estimate the population size in West Maui.

EFFECTS OF THE ACTION

Effects of the Action on the Hawaiian petrel and Newell's shearwater

Activities that may affect the Hawaiian petrel and Newell's shearwater in the project area include construction and operation of turbines and meteorological towers, lighting, and implementation of HCP mitigation, monitoring, and adaptive management measures. No road construction

impacts to seabirds are anticipated as the existing road alignment is devoid of seabird habitat and occurs outside flight corridors.

Loss of Potential Nesting Habitat from Intra-Turbine Road Construction, Turbine Construction, and Fatality Plot Searches Surrounding Turbines 1, 2, and 3

Botanical surveys indicate the presence of the vegetation type (‘*ohia – uluhe*) which is known to support nesting of shearwaters in the vicinity of Turbines 1, 2 and 3. Development of a wind power site can require as much as 0.4 to 1.2 ha (1 to 3 ac) of land area to be cleared for each turbine, numerous lay-down and crane staging areas, and intra-turbine road construction and power connections over the period of site development (USDOI-BLM 2005). Site plans for the KWP project indicate the impacts will be less than this (HCP Figure 1), but removal of vegetation could nonetheless result in the loss of potential nesting habitat for shearwaters.

Wildlife casualty monitoring for incidental take of listed species will be conducted within a 180 m by 180 m plot (plus an additional 20 m on the prevailing downwind side) centered on each turbine that extends beyond the areas in which vegetation will be cleared for lay-down and turbine construction. This creates a maximum search area of approximately 3.6 ha (8.9 ac) per turbine or total of 72 ha (178 ac). Monitoring in these areas at the proposed frequency and intensity could result in degradation of potential nesting habitat from trampling of vegetation and collapsing burrows, and indirect effects of reduced survival and productivity as a result of increased predation following habitat disturbance.

However, since previous surveys have not detected the presence of nesting shearwaters in the area, and there is a greater likelihood that seabirds will nest at higher elevations with less disturbance, the removal of vegetation and potential degradation of surrounding areas in the vicinity of Turbines 1, 2, and 3 is not expected to have an effect on petrels or shearwaters.

Injury or Mortality from Collisions with Construction Cranes, Turbines, and Meteorological Towers

Collisions with construction cranes, turbines, or meteorological towers may result in injury or mortality to petrels and shearwaters that regularly fly over the project site and cross the proposed turbine string. Potential collisions with the crane are anticipated during construction and are less likely to occur should turbine construction be completed prior to the start of the breeding season. However, seabird collisions during operation of all turbines and meteorological towers may occur throughout the 20-year life of the project.

Injury or Mortality from Collisions and Fallout as a Result of Project Lighting

Navigational lights on turbines, lights at the operations and maintenance facility and substation, and any additional lights during night time operations may potentially increase collision risk, and fallout for petrel and shearwater fledglings. Fallout occurs primarily for fledglings on their first

nocturnal flight from the burrow to the sea (Ainley *et al*. 2001). The young birds are attracted to, and blinded by, light sources and frequently collide with power lines, buildings, cars, and other obstacles, or simply fall to the ground exhausted after fluttering around lights for long periods of time (Ainley *et al*. 1997). When coupled with low visibility conditions due to fog, non-FAA lighting (sodium vapor lights) associated with an electrical substation at the Mountaineer Wind Energy Center, West Virginia, were determined to be the primary cause of a bird fatality incident, where 27 songbirds were found killed due to collision with nearby turbines and the substation itself (Kerns and Kerlinger 2004).

KWP received FAA approval for lighting six of the 20 turbines (at intervals of 2,500 to 3,000 feet) with medium intensity, simultaneously flashing red lights, utilizing the minimum flash (maximum recommended time interval) frequency. Although these light specifications contrast with the USFWS Interim Voluntary Guidelines for Wind Projects (USFWS 2003), which recommend use of white strobe lights at night, differences between red and white lights have not been well studied. While there is some literature that suggests solid red or pulsating red lights should not be used, as they appear to attract night-migrating birds at a much higher rate than white strobe lights (Gauthreaux and Belser 1999), the HCP states that white strobe lighting would not conform to either the existing or pending FAA guidance and flashing red lights provide the best available technology to minimize the risk of collision. Thus, the project lights may pose no greater risks than using white lights. In January 2006, KWP requested approval from FAA to eliminate lighting on one of the six turbines, thus reducing the total number of lighted turbines to five (approval from FAA is pending).

Other lighting associated with the operations and maintenance facility and substation for the purpose of illuminating the ground area will be provided only if work must be performed beyond daylight hours. Such lighting would consist of halogen flood lights that are shielded and/or directed downward. Any night time lighting will be used on an infrequent basis, strictly when necessary, and on extremely rare occasions. Interior lights in the maintenance and operations buildings likewise will be turned off at the end of each work day. Meteorological towers will not be lighted. For the Kaheawa project site,based on the limited amount, type, and use of night time lighting at support facilities, we do not anticipate an increased risk of collision and/or fallout of petrels and shearwaters due to lighting.

The lighting plan is not expected to increase the risk of collision due to lights placed at turbines because lights will be placed on a reduced number of turbines and will use medium intensity, flashing red lights. As noted above, other on-site lighting will be minimal, shielded and used infrequently, to minimize bird attraction. As bird fatality monitoring will be implemented during project operation, adaptive measures to address any negative impacts caused by project lighting will be implemented as necessary.

Mortality of Eggs or Nestlings from Injury or Collision of Adults with Turbines or Meteorological Towers

The collision of an adult petrel or shearwater may involve an adult with young, an adult without young, or a newly fledged bird on its first flight to the sea. In the case of an adult with young (or possibly a paired adult about to have young), potential indirect loss of an egg or a chick is likely. The potential for successful rearing of a chick to a fledging is expected to decrease upon loss of a parent, and would probably be zero during the period from egg-laying through the first several weeks after hatching (Ainley *et al*. 1997). Later in the chick-rearing period parental feeding and care may drop off dramatically, and the loss of an adult may or may not affect survival of the chick. For example, Simon and Hodges (1998) report that nestlings were fed almost 70 percent of their total food during the first half of the nestling period, and about 95 percent of their total by the time they were 90 days old. Further, some individuals are deserted by their parents up to six weeks before they fledge, whereas others are attended up to the day they take their first flight. Eggs and chicks also die from natural causes, including predation, so loss of an adult during the nesting period may not always be associated with the loss of that year's young. Estimates of annual reproductive success at Haleakala (chicks fledged/eggs laid) from 1979–1981 (Simons 1985) and 1993 (Hodges 1994) averaged 63.4 percent ± 16.0 SD (range 38–82, $n = 128$) at Haleakala, *i.e.*, slightly less than two-thirds of eggs laid were successfully raised to fledglings. Adults present may also include a large number of non-breeders, especially early in the nesting season.

Adjustments to Take and Mitigation – Unobserved Direct Take and Loss of Productivity

The amount of take will be adjusted based on the results of searcher efficiency and carcass removal trials (Section VI and Appendix 9 of the HCP) to account for unobserved take during fatality searches. Based on a review of demographic factors (percent breeding adults, age at first breeding, adults breeding per year, reproductive success, survival, number of broods, clutch size, pair productivity, sex ratio) for petrels in Simons and Hodges (1998) and for shearwaters in Ainley *et al*. (1997), a level of annual productivity was estimated for each species in Section V of the HCP. The amount of take for petrels will be increased by 15 percent each year mitigation (replacement) lags behind take, compounded annually to account for lost productivity of offspring. The analysis for shearwaters also resulted in a 15 percent increase each year mitigation (replacement) lags behind take, compounded annually to account for lost productivity of offspring.

Adjustments to take based on searcher efficiency and carcass removal trials, and estimates of loss productivity provide an accurate estimate of take and mitigation required. Assuming the ability to locate colonies and implement protection and management measures that are expected to increase survival and productivity, the loss in productivity will be offset by corresponding adjustments to take that will provide commensurate mitigation.

Mitigation, Monitoring, and Adaptive Management

The proposed mitigation for the potential take of these species will consist of conducting additional studies of bird movement over and through the project area during the first year of operation; research to identify and, where practicable, protect and/or manage as-yet unknown colonies in West Maui; and alternate mitigation measures to be implemented elsewhere in the event that the required mitigation cannot be provided by protection and/or management of West Maui colonies.

Radar and visual surveys will contribute to a better understanding of these species' habits and population status on West Maui, as well as document the response to the turbines of any birds that fly near or through the project area. Data for this aspect of turbine/bird interactions are generally lacking in the industry, and are non-existent for these species.

KWP also will conduct surveys to (a) locate as-yet unknown or unconfirmed nesting colonies of petrels and shearwaters in West Maui, (b) estimate nest numbers and distribution, and (c) identify management needs, and where possible, and if required to offset incidental take, implement management measures to offset the anticipated or actual take.

Management and protection opportunities are likely to include predator/ungulate trapping/removal, fencing to exclude predators/ungulates, or other measures to improve productivity and survival. KWP will implement management and protection measures during the first two years of project operation as they are identified, and/or as they are required to offset the anticipated adjusted take (see Project Description of this opinion or Section V of the HCP for definition) for both species throughout the life of the project. Fencing to exclude ungulates and trapping/toxicants to reduce predators in and around nesting habitat of petrels on East Maui have been shown to increase survival and productivity (Hodges and Nagata 2001). Therefore, colony protection and management is expected to provide an increase in productivity and survival at seabird colonies where disturbance by ungulates and mammalian predation is a major limiting factor.

Overly intrusive surveys can be disruptive to the colony, and can result in unintended adverse impacts. Collection of colony-specific information will be limited to data that can be gathered with minimal risk of disruption and adverse impact. As an alternative, data on improved survival and productivity rates from previously studied colonies may be used where colony-specific surveys are impracticable. Attempts to access and "manage" colony sites that are remote may actually lead to habitat degradation, increased predation, possible harm from collisions with fencing installed to reduce habitat degradation from ungulates, and other unintended adverse effects from human disturbance, introduction of invasive plant species, and establishment of trails that increase the likelihood of predators. Some actions may require additional environmental review and require permission and agreement of landowners to implement monitoring and management.

Colony searches and protection/management efforts will continue on West Maui until (a) it is determined that there are unlikely to be any (further) protection/management opportunities on West Maui that are practicable, or (b) enough opportunities have been identified to more than cover the anticipated adjusted take. If it is determined that there are unlikely to be sufficient protection/management opportunities on West Maui that are practicable to provide mitigation for the adjusted take, then searches for and management/protection of colonies on East Maui, Molokaʻi, Lānaʻi, and Hawaiʻi Island will be implemented.

If after 10 years of effort no practicable opportunities for colony protection and management have been identified on West Maui or elsewhere, or if opportunities have been exhausted and there is still a need for further mitigation, then KWP will work with DLNR and USFWS biologists to identify and implement alternate mitigation measures that may include, but not be limited (1) expansion of Save Our Shearwaters (SOS) efforts on Maui, (2) measures to reduce lighting attraction on Maui; and/or (3) measures to reduce the risk of bird strikes with artificial structures on Maui. These additional mitigation measures, if necessary, are expected to increase survival and reproduction of each species.

To further ensure the success of the mitigation effort, KWP will establish a $100,000 Seabird Contingency Fund that will be made available prior to construction of the proposed turbines. The value of the fund will be adjusted for inflation at 2.5 percent over the 20-year project term. This results in an increase of 2.5 percent annually for 20 years for a total maximum of $163,861.64 (if left unused through year 20). If drawn upon at any time, the 2.5 percent would continue to accrue on the remaining balance. The fund will be available to implement adaptive management strategies to ensure mitigation is commensurate with take. If at the end of the 20-year period, mitigation implemented is not commensurate with take, any remaining funds will be used to continue to implement mitigation measures.

Two Models to Estimate Incidental Take

The HCP concludes a low number of individuals of each species are likely to be taken based on an estimate provided by two independent modelers solicited by KWP. Cooper and Day (2004b) developed a model that combines the results of on-site observations with their own observations of these species elsewhere in Hawaiʻi, and applies assumed ranges of collision probability to predict ranges of annual fatality rates for both species. Podolsky (2005) uses the passage rates derived by Cooper and Day (2004b), but uses his own Avian Risk of Collision (ARC) model to independently estimate potential take ranges. Because there is very little empirical data available on which to base predictions and many variables affecting the potential for take, we recognize the difficulty in arriving at an accurate estimate for the number of individuals likely to be taken. However, the two models present viable alternatives for estimating the level of take anticipated.

The results of modeling by Cooper and Day (2004b) suggest that the direct take of Hawaiian Petrels due to collision with the turbines is between 0.03 and approximately 11 birds per year, and the direct take for Newell's Shearwater would be between 0.02 and approximately 7 birds

per year. In comparison, modeling by Podolsky suggests that the direct take of Hawaiian petrels would be between 4.4 (worst case) and 0.001 (best case) birds per year, with an "average" case of 0.6 birds per year. For Newell's shearwater, the take would be between 2.5 (worst case) and 0.0006 (best case) per year, with an "average" case of 0.4 birds per year. These two models were used to estimate the range of take anticipated for the purpose of identifying a reasonable level of take and corresponding mitigation. However, it should be noted that the models are based on an extremely limited data set, 8 nights during the 1999 breeding season, and 8 nights during the 2004 fledging season. The additional year of radar and visual surveys will provide much needed information on the species in the project area.

Summary of Species Response to the Effects of the Action on Hawaiian Petrels and Newell's Shearwaters

The potential for take of these two seabird species is considered low, although the ability of their local populations to sustain even a low level of take is unknown at this time. Both species are believed to nest in West Maui, and a relatively small number have been documented passing over or through the area proposed for wind turbines. Therefore, take, if any, will be monitored during the life of the project and implementation of mitigation measures will be based on the level of adjusted take that is calculated. Studies have been limited, however, and a better understanding of these species in the area would have future benefits for protection and management, and for understanding the implications of any take that may occur. Accordingly, the proposed mitigation for the potential take of these species will consist of conducting additional studies of bird movement over and through the project area during the first year of operation; research to identify and, where practicable, protect and/or manage as-yet unknown colonies in West Maui; and alternate mitigation measures to be implemented elsewhere in the event that the required mitigation cannot be provided by protection and/or management of West Maui colonies.

Based on the above analyses, the HCP estimates take of up to one adult or recently fledged bird of each species to be taken per year of project operation. In addition to the direct take, the potential for indirect take due to the loss of eggs or nestlings is estimated at 0.5 individual per year, *i.e.*, approximately half of the direct take will also result in an indirect take. Thus the HCP likely anticipates take for each of these two species will be, on average, no more than 1.5 (rounded up to 2) birds per year of project operation. This take applies to the entire project, including all 20 turbines, meteorological towers, and electrical substation combined over an entire year of operation. Accordingly, take of up to 40 individuals is estimated over the 20-year project duration.

To ensure that all possible scenarios are addressed, the HCP also considers lower (less than 1.5 per year), higher (3 to 5 per year) and notably higher (5 to 10 or more per year) take scenarios. The amount of take can be increased up to the notably higher take level provided that mitigation has been implemented such that benefits to the species outweigh the losses as detailed in the HCP. If the take of either species exceeds a running average of two per fiscal year, or greater

than five in any one fiscal year, the HCP requires development and implementation of adaptive management strategies approved by DLNR and USFWS and reviewed by the Endangered Species Recovery Committee in accordance with the HCP.

There is a low risk of adverse population or cumulative impacts for the Lower and Baseline levels of adjusted take for the two seabird species (*i.e.*, ranging from no take up to 1.5 individuals per year for 20 years), in part because the take is very small relative to their estimated populations and the likelihood of achieving a net benefit to either species through implementation of the appropriate mitigation measures as described in the HCP is high. For example, total population estimates for the Hawaiian petrel, based on observations of birds at sea and birds flying inland on Kaua‘i, range from several thousand to 34,000 birds. For the Newell's shearwater, population estimates range between 57,000 and 115,000, with roughly 80 percent of the world's population nesting on Kaua‘i (Ainley *et al*. 1997). As previously noted, West Maui breeding populations are suspected for both species but have not been confirmed; hence there are no published estimates of numbers or population trends for this location. Although petrels have been documented flying over the project area, shearwaters have not (Cooper and Day 2004a).

Higher and notably higher levels of adjusted take (*e.g.*, on the order of 5 to 10 or more individuals per year), may present a greater risk for local West Maui populations (if they exist), although the take would still be small compared to the two species' overall populations. In order to avoid adverse or cumulative impacts to the population, adaptive management measures have been included in the mitigation plan to address the effects of the higher and notably take scenarios. Take due to monitoring and protection/management actions is anticipated to fall within the level of notably higher take estimates with adequate mitigation provided. In the unlikely event that higher or notably higher adjusted take does occur, the adaptive management provisions include, (i) increased management and protection of colonies on West Maui, (ii) efforts to protect colonies on East Maui and other islands if opportunities to protect West Maui colonies are insufficient to offset take, and (iii) implementation of alternative measures on West Maui and elsewhere (*e.g.*, shielding of urban lighting, expansion of SOS programs, etc.) if warranted. Based on the range of mitigation options, we conclude that even if take should reach higher or notably higher take scenarios, the HCP requires mitigation such that the benefits to the species will outweigh the losses (*e.g.*, net increase in productivity and survival as compared to the number of seabirds determined to be taken by the proposed action), thereby producing a net conservation benefit to the species

While the higher levels of take are possible, one modeler noted that such potential levels only occur under highly improbable scenarios, for example when birds transiting the site follow a flight path that takes them through all 20 turbines in succession (Podolsky 2005). Another modeler noted that higher take would only occur if it is assumed that only 50 percent of all birds passing through the site detect and avoid the turbines (Cooper and Day 2004b). Actual avoidance rates are likely to be much higher, and in fact are much higher at existing wind turbine installations. It is also important that far higher numbers of individuals transit to and from interior West Maui from the north; passage rates at the project site are among the lowest reported

for West Maui (Day and Cooper 2001). Thus, the probability of the higher take scenarios, and of significant adverse effects for West Maui populations, is relatively low.

Predation by alien mammals and downing due to urban lighting are considered the primary threats to both species' recovery. The proposed mitigation measures, which are focused specifically on these threats, are expected to more than offset the anticipated take and contribute to the species' recovery by providing a net conservation benefit, as required by State law. For these reasons, there are no adverse impacts to the species' overall populations or significant cumulative impacts anticipated.

Effects of the Action on Nēnē

Activities that may affect Nēnē in the proposed project area include construction and improvement of access roads; construction and operation of turbines; construction and operation of meteorological towers, an electrical substation, and maintenance facilities; and implementation of mitigation and monitoring measures.

Habitat Loss Resulting from Road Construction, Turbine Construction, Substation Construction, Operation and Maintenance Facility Construction, and Fatality Plot Searches

The construction of a new access ("spur") road from the existing four-wheel drive road to the intra-site turbine string road will result in the direct loss of a minimum of approximately 1.5 ha (3.6 ac) (3 mi of road with 10 ft minimum road width) of habitat that may be currently used by Nēnē for breeding, foraging, and sheltering. Typically, access roads would be a minimum of 3 m (10 ft) wide, but they may need to be as much as 9 m (30 ft) wide to accommodate excessively long loads, such as rotor blades or tower components (USDOI-BLM 2005). Final site plans also proposed construction of at least 11 turnouts (40 ft by 50 ft) along the approximately 6.4 km (4 mi) of the existing four-wheel drive to be improved and widened. The intra-site turbine string road spans approximately 3.2 km (2 mi) at 10 ft in width, will also remove a minimum of 1.2 ha (2.9 ac) of habitat. Indirect effects of road construction may result in degradation of nesting and foraging habitat due to habitat fragmentation and establishment of non-native invasive plant species from increased human and vehicular traffic.

Construction of turbines will result in the direct loss of a minimum total of approximately 6 to 8 ha (14 to 20 ac) of habitat that may currently be used by Nēnē for breeding, foraging, and sheltering. However, pre-construction surveys have so far not discovered any nests within the footprint of the project (Nishibayashi 2005). Construction of each turbine will require site clearing and grading to prepare the site for lay-down areas for turbine components (tower, rotor blade, nacelle), and staging areas for the crane, heavy equipment, and transport vehicles. Wind power projects can require as much as 0.4 to 1.2 ha (1 to 3 ac) of land area to be cleared for each turbine, and additional clearing may be needed for lay-down and crane staging areas (USDOI-BLM 2005). Construction of turbine foundations will require excavation, pouring of concrete, creation of graveled buffers, and placement of electrical transformers adjacent to each turbine. It is assumed that all vegetation in

these areas will be removed to facilitate turbine construction and maintenance thereby removing the value of these areas to function as breeding, foraging, or sheltering habitat for Nēnē.

Although potential nesting opportunities may be lost, excessive clearing or frequent mowing of vegetation may create a foraging attraction for adults and juveniles, despite the turbines' operation and site activity. The proposed minimization measures will limit on-site vegetation to that which is already established and existing in order to limit new growth that would be a foraging attraction to Nēnē. In addition, vegetation management will consist of leaving existing vegetation "as-is" except for measures that may be needed for fire prevention, and by controlling new growth through other manual or chemical means. Therefore, we anticipate the areas surrounding each turbine will not be an attractive nuisance and therefore will not increase the risk of injury or mortality due to collisions.

Wildlife casualty monitoring for incidental take of listed species will be conducted within a 180 m by 180 m plot (plus an additional 20 m on the prevailing downwind side) centered on each turbine that extends beyond the areas in which vegetation will be cleared for lay-down and turbine construction. This creates a maximum search area of approximately 3.6 ha (8.9 ac) per turbine or total of 72 ha (178 ac). Monitoring will be intensive for the first two years occurring twice per week during the seabird fledging season (8 weeks, October to November) and Nēnē fledging season (8 weeks, May to June), and along parallel transects spaced 6 to 8 m apart throughout the entire plot. Monitoring at this frequency and intensity is expected to result in degradation of breeding and foraging habitat from trampling of vegetation, soil compaction, and increased potential for introduction and establishment of invasive plant species.

<u>Injury or Mortality from Collisions with Construction Cranes, Turbines, Meteorological Towers, and Vehicular Traffic</u>

Nēnē are susceptible to injury or mortality from collisions with construction cranes, turbines, and meteorological towers during the day and night.

Nēnē may also suffer injury or mortality from collisions with vehicular traffic. Vehicular traffic is expected to be high during initial construction to support transportation of heavy equipment, turbine components, gravel, material for turbine foundations, personnel, and possible removal of excavated material. A number of Nēnē have site fidelity to the Hanaula release sites and remain as residents within or near project area. These birds may encounter collisions with project structures and/or vehicular traffic.

<u>Loss of Eggs, Chicks from Injury or Mortality of Adults Colliding with Turbines or Vehicles</u>

Injury or mortality of an adult Nēnē may result in the potential indirect effect of mortality of Nēnē eggs or goslings. The loss of an adult female during the early nesting and brood-rearing stages would likely result in the loss of her own eggs or young, if she were nesting at the time. According to Banko *et al*. (1999), females first breed at 2 to 3 years of age, and wild clutches

average 3.1 eggs. However, productivity of Nēnē is generally very low because pairs do not attempt to nest each year, many nests fail because of predation, and many goslings die because of poor foraging opportunities and predation (Banko *et al*. 1999). For example, in populations on Hawai‘i and Maui each year during 1978 to 1981, fewer than 10 percent of all females (n = 258; n = 15 to 61/yr) raised fledglings. Also, because males may also provide care and protection, loss of a male may reduce survivorship of young, but the degree to which this may occur is unknown.

Adjustments to Take and Mitigation – Unobserved Direct Take and Loss of Productivity

The amount of take will be adjusted based on the results of searcher efficiency and carcass removal trials (Section VI and Appendix 9 of the HCP) to account for unobserved take during fatality searches. Based on a review of demographic factors (percent breeding adults, age at first breeding, adults breeding per year, reproductive success, survival, number of broods, clutch size, pair productivity, sex ratio) for Nēnē in Banko *et al*. (1999), a level of annual productivity was estimated in Section V of the HCP. The amount of take of Nēnē will be increased by 10 percent each year mitigation (replacement) lags behind take, compounded annually to account for lost productivity of offspring.

Adjustments to take based on searcher efficiency and carcass removal trials, and estimates of loss productivity provide an accurate estimate of take and mitigation required. Assuming the ability to contribute funds that will result in the construction of release pens, obtaining and releasing goslings, and the management of release sites, the loss in productivity will be offset by corresponding adjustments to take that will provide commensurate mitigation.

Minimization Measures

Pre-construction surveys (described in HCP Appendix 7) for Nēnē and Nēnē nests prior to roadway and site clearing and construction will be conducted. Daily, early morning surveys of the area immediately ahead of construction and approximately weekly surveys of the entire site to detect birds well ahead of construction are expected to identify and avoid potential adverse effects to Nēnē. Monitoring for Nēnē and Nēnē nests will continue throughout the construction phase, and construction activities and timing will be modified as necessary to avoid adverse impacts to Nēnē. As stated in the HCP, no downed birds have been found during searches conducted in the vicinity of the existing guyed met towers on the site. However, bird diverters will be installed on the guy wires of all existing and proposed met towers as a precautionary measure, with the intention of deterring birds and thereby reducing the potential for harm to Nēnē. Such devices have proved effective elsewhere at reducing avian interactions with powerlines (APLIC 1994).

Mitigation, Monitoring, and Adaptive Management

Upon permit issuance, KWP will fund a propagation and release, or translocation program that will provide for construction of a new Nēnē release pen, release of 50 goslings, predator control,

and site operations and maintenance for the first five years regardless of take. In subsequent years KWP will provide funding for obtaining goslings (in minimum lots of either four or ten), operations and maintenance, and helicopter releases as necessary for the mitigation level to remain ahead of the adjusted take level, as determined through fatality monitoring and coordination with USFWS and DLNR. The above measures allow KWP to support the release of up to 10 birds per year. In this way, KWP intends to provide mitigation up front prior to potential take associated with operation of the windfarm should any take occur.

KWP will fund the construction and operation of a second new release pen, provide funding for a truck, staffing, helicopter releases, and the purchase of goslings as outlined above, if any of the following occur: (1) If the cumulative take over a five year period exceeds the capacity of the new release facility to provide mitigation for the adjusted take; (2) If the Nēnē population at Hanaula (*i.e.*, the existing release facility near the proposed wind power project), which is currently on the increase and is believed to be self-sustaining, goes into decline as a result of the take that is occurring at the project, when measured over a five-year period; (3) If the population of birds at the new release site does not increase or is unstable, when measured over a 5-year period, indicating that the reintroduction of Nēnē at the site is failing. Some actions may require additional environmental review and require permission and agreement of landowners to implement monitoring and management.

During the first year of project operation, a wildlife biologist will make systematic visual observations of Nēnē activity to document the use of the area by Nēnē (if any) and record observations of Nēnē behavior and activity in the vicinity of turbines, including in-flight response (*e.g.*, changing flight direction to avoid the turbines), activity during daylight and crepuscular periods, effects of noise or any hazardous substances.

If monitoring determines that the level of take is consistently lower than expected, then KWP, with the concurrence of USFWS and DLNR, may decrease the level of annual contributions to be commensurate with the actual level of take, provided that the ratio of birds released to the adjusted take remains greater than 1 throughout the life of the project. Should no take occur, KWP nonetheless will provide the first five years of mitigation (construction of the new release facility, funding for its maintenance and predator control, propagation and release of ten goslings each year, etc.). To ensure that all possible scenarios are addressed, the HCP also considers Lower (less than 3 per year), Higher (4 to 5 per year) and Notably Higher (5 to 10 or more per year) take scenarios. The incidental take authorized can be increased provided that mitigation has been implemented that will continue to provide a net conservation benefit to each species as detailed in the HCP. Incidental take exceeding a running average of three per fiscal year, or greater than eight in any one fiscal year, requires the development and implementation of adaptive management strategies approved by DLNR and USFWS and reviewed by the Endangered Species Recovery Committee in accordance with the HCP.

Funding at the Higher and Notably Higher Take levels will be made available if take occurs at a lower annual level, but cumulatively reaches these levels before mitigation has been provided.

In addition, past, current or future funds allocated to other Covered Species may be expended where necessary to provide for the cost of implementing HCP mitigation measures for a particular species as long as the overall expenditure for mitigation does not exceed a total of $3.76 million.

To further ensure the success of the mitigation effort, KWP will establish a $264,000 Nēnē Contingency Fund prior to construction of the proposed turbines. If at the end of the 20-year period, the Hanaula Nēnē population is smaller than the population existing at the time the permit is issued as a direct result of project operations, the Nēnē Contingency Fund will be available to construct an additional new release pen, to operate this new pen for up to 5 years beyond the life of the project, and to supply the new pen with up to 50 Nēnē.

Summary of Species Response to the Effects of the Action on Nēnē

Nēnē may be displaced from potential nesting, foraging, and sheltering habitat within and adjacent to the proposed project area. While the risk of displacement exists, the anticipated risk of an actual take of individual Nēnē is low.

Habitat loss of the magnitude of up to 200 acres plus 3.6 miles of roads represents a sizable amount of potential habitat in close proximity to the Hanaula site where 91 of the 100 captive-reared Nēnē survive and are now managed. The establishment of a minimum of one and up to three new release sites (depending on the take scenario observed) with 50 goslings per site will offset take determined to occur and will result in a more viable West Maui Nēnē population than exists currently.

Because of limited survey data and the lack of knowledge on behavioral response of Nēnē to wind turbines, it is difficult to determine an anticipated level of injury and mortality of Nēnē due to collisions. In a review of interaction and behavior of various waterfowl at wind turbines, waterfowl in general appear to have low susceptibility to collision, although there appear to be very species-specific reactions to wind turbines, as even closely related species can have very different reactions (Mossop 1998, Larsen and Madsen 2000, Percival 2001). Such differences among species may be especially pronounced for the Nēnē, which have a very distinct behavior and ecology compared to most of the waterfowl species studied at existing wind energy facilities. It remains to be seen, however, whether Nēnē will avoid the area of the turbines, and to what degree.

KWP estimates that the anticipated direct take will be two individuals per year of project operation. Take of one additional Nēnē will be added to account for potential indirect impacts, resulting in a total annual estimated take of three at the baseline take scenario, and up to 60 individuals over the 20- year project term.

The lower (less than 3 per year), higher (4 to 5 per year) and notably higher (5 to 10 or more per year) take scenarios for Nēnē are not expected to cause a decline in number, distribution, or

reproduction of the species due to the upfront mitigation proposed. The level of mitigation will be determined through adaptive management (monitoring and calculation of adjusted take and with the concurrence of Service and DLNR), such that the ratio of birds released to the adjusted take remains greater than 1 throughout the life of the project. Even if no take should occur during the first five years, KWP will provide upfront mitigation (construction of the new release facility, funding for its maintenance and predator control, propagation and release of ten goslings each year, etc.). If take results in a decline of the existing population that has been established in the vicinity of the Hanaula release pen, the adaptive management program requires construction and management of an additional Nēnē release pen, and release of a number of Nēnē such that the decline is offset by a net increase in the Hanuala/West Maui population. If take should reach the higher or notably higher scenarios (via cumulative unmitigated take, annually, or by failure of initial release sites) a third release site may be required. Finally, a contingency fund would provide for construction, management, and the required number of goslings should any unmitigated take remain at the end of the project period. Therefore, even if take should reach higher or notably higher take scenarios, the HCP requires mitigation such that the benefits to the species outweigh the losses, thereby producing a net conservation benefit to the species.

Cumulative Effects on Nēnē

The State of Hawaii will continue management of the Hanaula Nēnē release site. This involves weekly visits to the release pen during the Nēnē breeding season to conduct monitoring and predator control. At this time, the State does not plan any additional Nēnē releases at the site in the future (J. Medeiros, DOFAW, pers. comm., 2005). Nēnē may be subject to human disturbance associated with the Lahaina Pali trail on the lower portion of the access road. Although the land is publicly owned, access is expected to be controlled and thus vehicular traffic is expected to be limited. Because Nēnē pairs and families typically remain within 10 km of nesting and rearing sites (Banko *et al.* 1999), it is likely that birds released at Hanaula may pair and attempt to nest within the project area. However, the low level of nesting documented, and the ability of Nēnē to find other suitable nesting habitat throughout West Maui (J. Medeiros, DOFAW, pers. comm. 2005), suggest that any potential disturbance of additional nesting attempts will not significantly impact the ability of the Hanaula Nēnē population to find suitable breeding habitat.

Effects of the Action on Hawaiian Hoary Bat

Activities that may affect the Hawaiian hoary bat in the proposed project area include construction and operation of turbines and meteorological towers, and implementation of HCP mitigation, monitoring, and adaptive management measures.

Hawaiian hoary bats are susceptible to injury or mortality from collisions with construction cranes, turbines, and meteorological towers during the construction, and operation over the proposed 20-year project duration. It is probable Hawaiian hoary bats may occur in the proposed project area at any time of year and the species' foraging behavior places them within the height

of the crane and turbine, rotor swept area, and guyed meteorological towers. Project lighting is not anticipated to increase the risk of collision with turbines (Kerns and Kerlinger 2004).

Although hoary bats are known to be susceptible (due to seasonal dispersal or migration) to collision with wind turbines in their North American range, bat echolocation and collision mortality studies indicate that only a small fraction of detected bat passes near turbines result in collisions (Johnson *et al.* 2003).

Hawaiian hoary bats are thought to forage near their roost sites, but they sometimes commute long distances between roost sites and foraging areas. They have been tracked flying up to 15 kilometers (nine miles) in one night (Jacobs 1993). Further, differences in susceptibility between hoary bats and the Hawaiian subspecies, if any, are unknown. Based on this, KWP has determined that, despite their apparent scarcity in the area, the anticipated take for this species is one individual per year of project operation. This level of take will provide a benchmark for implementing a modest mitigation effort, intended to enhance our understanding of this species' occurrence and current status in the region. Accordingly, take of up to 20 individuals over the 20-year project term is anticipated, subject to provisions for adaptive management.

Monitoring, Mitigation, Adaptive Management

Because there is limited general information for this species, the recovery plan for the Hawaiian hoary bat identifies research, including development of standardized survey and monitoring techniques, as an appropriate interim recovery strategy. Accordingly, the applicant's primary mitigation consists of funding additional ongoing research to contribute a net conservation benefit to the recovery of the Hawaiian hoary bat.

KWP will contribute $20,000 to an appropriate program in support of bat research such as the Hawaiian Bat Research Cooperative (HBRC), the Hawaiʻi Endangered Species Trust Fund, or a similar program as determined by DLNR and USFWS. This figure is roughly equivalent to the cost of providing equipment and support for radio-tagging and monitoring an additional bat per year for 20 years under the existing HBRC research program (S. Fretz, DOFAW, pers. comm., 2005).

KWP will conduct monthly surveys for bat activity within the project area for 12 consecutive months, using thermal imaging (as available) or night vision technology and an acoustic bat detector, and document bats observed during radar and thermal imaging/night vision surveys for seabirds, and during crepuscular observations of Nēnē activity during the first year of project operation. Bat observations will also be incidentally documented during the seabird colony searches and monitoring efforts described above, which will enhance the knowledge base of bat distribution and occurrence in West Maui.

If monitoring indicates a higher level of take (*i.e.*, a total of 2 to 5 bats per year), then KWP will provide additional funding at the rate of $1,000.00 per bat taken, for the expansion of research efforts as described above.

If monitoring indicates a notably higher level of take (*i.e.*, 5 to 10 or more bats per year), then KWP will: (1) continue to contribute $1,000.00 per bat annually toward research efforts described above, and (2) conduct thorough on-site investigations to determine the cause(s) of the unexpectedly high level of take, and to identify and implement measures to reduce and minimize further take. On-site investigations may include, but not be limited to, additional surveys using thermal imaging (as available) or night vision equipment, or newer state-of-the-art technologies, as appropriate, to document bat behavior and movements during periods when collisions are believed to be occurring, and particularly to determine whether certain turbines or site-specific conditions account for most of the take. Investigations may also include experimental changes in project operations, structures and lighting, and experimental measures to divert or otherwise repel bats from the area. Measures to reduce and minimize further take may include, but not be limited to, implementing permanent changes in project operation, structures or lighting, or measures to divert or repel bats, known to be effective and otherwise not harmful.

To further ensure the success of the mitigation effort, KWP will establish a $20,000.00 Bat Contingency Fund that will be made available prior to construction of the proposed turbines. The value of the fund will be adjusted at 2.5 percent over the term of the project. This results in a total maximum value of $32,772.40. If drawn upon at any time, the 2.5 percent would continue to accrue on the remaining balance. The funds will be available in the event that adjusted take exceeds the estimated 20 bats or as required to implement adaptive management strategies to ensure mitigation is commensurate with take. The fund will be used for on-the-ground measures such as, but not limited to, implementation of technologies to reduce the likelihood of collisions with the wind turbines and protection of roost sites as agreed to by USFWS and DLNR. If at the end of the 20-year period, the mitigation implemented is not commensurate with take, any remaining funds will be used to continue to implement additional mitigation measures.

<u>Summary of Species Response to the Effects of the Action on the Hawaiian Hoary Bat</u>

The potential for take of the Hawaiian hoary bat is expected to be very low based on on-site surveys, and the lack of other available information regarding the species occurrence on West Maui. Take of one bat per year or less is unlikely to have a significant impact on the population of the Hawaiian hoary bat. Although overall numbers of Hawaiian hoary bats are believed to be low, they are believed to occur in the greatest numbers on other islands, especially on Kaua‘i and Hawai‘i (also the only locations where breeding has been documented)(Cooper and Day 1998).

The applicant’s primary mitigation consists of funding additional ongoing research that will enhance our understanding of the species’ occurrence, habitat preference, migration patterns, etc., thereby guiding future management and recovery efforts. Higher levels of take under the notably higher take scenario (*i.e.*, 5 to 10 individuals per year) could impact the West Maui

population (if it exists), but would not likely impact the overall status of the species statewide. If determined to be necessary through adaptive management, at higher or notably higher take levels, additional contributions will be made to support research, or contribute to activities that result in a net increase in the quality or amount of breeding habitat. Therefore, even if take should reach higher or notably higher take scenarios, the HCP requires mitigation such that the benefits to the species outweigh the losses, thereby producing a net conservation benefit to the species.

Cumulative Effects on the Hawaiian Hoary Bat

Current threats to Hawaiian hoary bats are believed to be habitat loss, pesticides, predation, and roost disturbance. Though research is still being conducted, the reduction and disturbance of tree cover (*e.g.,* roost sites) as well as use of pesticides may be causes for the decline of bat populations (USFWS 1998). Development of the KWP project will not increase bat losses due to these other causes. However, loss of tree cover and pesticide use may increase due to continued real estate development on Maui, and likely will continue to increase in the future. These impacts, in addition to the anticipated take at the KWP project, are likely to occur. However, the proposed mitigation is expected to offset the anticipated take and result in a net increase in the knowledge of the species, thereby benefiting survival and recovery of the species. Therefore, no adverse or significant cumulative impacts to the species' overall population are anticipated.

No Growth Inducing Indirect Effects

The power generated from renewable sources such as wind power are considered "non-firm" and "as available" and are not consistent sources of energy available all the time. This is in contrast to "baseload" or "firm" power sources which increase total generating capacity in response to increased demand (MECO 2006). Therefore, the power generated by the windfarm is not considered to be growth-inducing.

Additional Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The project area lies within the jurisdiction of the West Maui Mountains Watershed Partnership (WMMWP), a body consisting of the major landowners and land managers of the West Maui Mountains: Hawai'i State Department of Land and Natural Resources (DLNR), Maui County Department of Water Supply, Amfac/JMB Hawai‘i, L.L.C., Kamehameha Schools Bishop Estate, Maui Land & Pineapple Company, Inc., C. Brewer and Company, Limited, the County of Maui, and The Nature Conservancy of Hawai‘i (TNCH). The WMMWP Plan (WMMWP 1999) identifies current watershed management goals and activities occurring in the West Maui Mountains, and

projects future programs that may be implemented in the vicinity of the project area: 1) feral animal control, 2), weed control, 3) human activities management, 4) public education & awareness, and 5) water and watershed monitoring, and 6) management coordination improvements. The Hanaula area and Manawainui Plant Sanctuary are areas of interest and concern for the WMMWP based on the threats of establishment and spread of invasive plant species, continued habitat degradation by feral ungulates, and need to protect rare native shrubland communities (C. Brosius, WMMWP, pers. comm., 2006). The activities of the WMMWP are expected to conserve and protect native species and their habitats by implementing monitoring and management actions to remove threats and will likely result in a beneficial effect for the covered species.

CONCLUSION

After reviewing the current status of the Newell's shearwater, Hawaiian petrel, Nēnē, and Hawaiian hoary bat, the environmental baseline of the species in the action area, the effects of the proposed HCP, and the cumulative effects, it is the USFWS's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Newell's shearwater, Hawaiian petrel, Nēnē, or Hawaiian hoary bat. Implementation of the HCP's conservation strategy is expected to adequately offset impacts and result in a net conservation benefit for each species. No critical habitat has been designated for the covered species, therefore, none will be affected.

Newell's Shearwater

Newell's shearwater have not been visually confirmed at the proposed project site,, however they are believed to have been among the targets detected during radar surveys. Although some targets were observed flying across the proposed turbine string within heights of the rotor swept area, crane, and tower, the numbers observed were relatively low compared to other sites where studies were conducted on Maui. It is also likely that breeding populations/colonies exist in the West Maui Mountains, however they have not been confirmed; hence, there are no published estimates of numbers or population trends for the species in this location.

Based on the low numbers observed in initial surveys and two models presented in the HCP, an estimate level of take of up to two individuals per year or a total of 40 shearwaters during the 20-year project is anticipated. This level of take represents a small percentage of the overall number of individuals for the species, which is estimated to range between 57,000 and 115,000, with roughly 80 percent of the world's population nesting on Kaua'i (Ainley *et al*. 1997). However, this low level of take could have an effect on a West Maui breeding population, although small and perhaps insignificant over the species range, given the low number petrel/shearwater targets observed in initial surveys. Because there is limited data for this species on Maui, it is difficult to determine the status of population trends and breeding populations/colonies.

The strategies identified in the species' recovery plan include colony protection and management to increase productivity and survival by addressing the primary threats of predation and habitat disturbance by feral ungulates. Mitigation proposed in the HCP includes searches to identify colonies in West Maui where protection and management will be implemented to increase

productivity and survival. Adaptive management will allow for continued colony searches and colony protection/management on the islands of Maui Nui and Hawaii, or additional measures to increase survival, if necessary. In addition, any temporary loss to the species (*e.g.,* loss in productivity caused by a lag in replacement, or replacement of an adult with a juvenile) is added to the level of take, with mitigation implemented to adequately mitigate and offset the temporary loss.

Based on the proposed minimization, mitigation, and adaptive measures to offset take, and anticipated overall net conservation benefit to the Newell's shearwater, it is the USFWS' biological opinion that permit issuance for the proposed windfarm project is not likely to jeopardize the continued existence of the species.

Hawaiian Petrel

Hawaiian petrel have been documented at the proposed windfarm project site by initial radar and visual surveys. Although the species was observed flying across the proposed turbine string within heights of the rotor swept area, crane, and tower, the numbers observed were relatively low compared to other sites where studies were conducted on Maui. It is also likely that breeding populations/colonies (although unconfirmed) exist in the West Maui Mountains; hence there are no published estimates of numbers or population trends for the species in this location.

Based on the low numbers observed in initial surveys and two models presented in the HCP, an estimate level of take of up to two individuals per year or a total of 40 petrels during the 20-year project is anticipated. This level of take represents a small percentage of the species' total population (including juveniles and subadults), estimated at 20,000 with a breeding population of 4,500 to 5,000. In comparison with an East Maui breeding population estimated between 500 to 1,000 birds, we can make two assumptions: (1) the remainder and majority of the species breeds on Kauai; (2) based on the targets during initial radar surveys on Maui, the breeding population is one or two degrees of magnitude less on West Maui compared with East Maui. Therefore, this low level of take could have effects on a West Maui breeding population, although small and perhaps insignificant when considered across the species range, given the low number petrel/shearwater targets observed in initial surveys. Because there is limited data for this species on Maui, it is difficult to determine the status of population trends and breeding populations/colonies.

The strategies identified in the recovery plan include colony protection and management to increase productivity and survival by addressing the primary threats of predation and habitat disturbance by feral ungulates. Mitigation proposed in the HCP includes searches to identify colonies where protection and management could be implemented to increase productivity and survival. In addition, any temporary loss to the species (*e.g.,* loss in productivity caused by a lag in replacement, or replacement of an adult with a juvenile) is added to the level of take, with mitigation implemented to adequately mitigate and offset the temporary loss.

Based on the proposed minimization, mitigation, and adaptive measures to offset take, and anticipated overall net conservation benefit to the Hawaiian petrel, it is the USFWS' biological opinion that permit issuance for the proposed windfarm project is not likely to jeopardize the continued existence of the species.

Nēnē

Nēnē are known to occur in close proximity to the proposed windfarm and may utilize the project area as breeding, feeding, and sheltering habitat. Direct, indirect, and cumulative effects are anticipated to result in take of 3 Nēnē per year and up to 60 Nēnē over the 20-year project duration. Current strategies identified as priority recovery actions for the species include increasing population numbers and distribution by captive propagation and release programs. Accordingly, the proposed mitigation provides for upfront construction of a release pen, propagation and release of up to 50 Nēnē goslings, and management in the first 5 years even if injury or mortality of Nēnē does not occur, and an additional release pen, 50 goslings, and management if required to offset any additional loss of Nēnē adults, juveniles, eggs, or goslings. In addition, any temporary loss to the species (*e.g.,* loss in productivity caused by a lag in replacement, or replacement of an adult with a gosling) is added to the level of take, with mitigation implemented to adequately mitigate and offset the temporary loss. Loss of habitat and disturbance of foraging and breeding due to project construction and operations is not considered significant, as Nēnē are known to utilize a wide range of habitat which still remain available throughout West Maui, and will be offset by creation of at least one additional release site.

Based on the proposed minimization, mitigation, and adaptive measures to offset take, and anticipated overall net conservation benefit to the Nēnē, it is the USFWS' biological opinion that permit issuance for the proposed windfarm project is not likely to jeopardize the continued existence of the species.

Hawaiian Hoary Bat

The Hawaiian hoary bat has not been recorded in the project area, however, its occurrence on Maui, wide distribution, and history of interaction of related species of bats with existing windfarm facilities on the mainland, create the potential for it to be affected by the proposed windfarm project. Based on its absence in the project area during initial surveys and solitary nature, low numbers of the hoary bat are anticipated in the project area. Impacts to one hoary bat per year or up to 20 bats over the 20-year project duration is anticipated.

The HCP proposes mitigation to fund current interim recovery actions such as research and the development of standardized survey and monitoring techniques. The HCP also provides flexibility to direct funding to implement additional recovery actions should recovery priorities for the hoary bat change or additional mitigation be required to offset impacts.

Based on the proposed mitigation and adaptive measures to offset take, and anticipated overall net conservation benefit to the Hawaiian hoary bat, it is the USFWS' biological opinion that permit issuance for the proposed windfarm project will not create a net adverse affect to the species, nor is it likely to jeopardize the continued existence of the species. No critical habitat has been designated for this species, therefore, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations promulgated pursuant to section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Harm is further defined by the USFWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Harass is defined by the USFWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2) of the Act, taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

AMOUNT OR EXTENT OF TAKE

Based on the proposed HCP and the analysis of the effects of the proposed action provided above, the USFWS anticipates the following take may occur as a result of the proposed action:

1. Up to two (2) Hawaiian petrels (adults, subadults, fledglings, nestlings, eggs) annually or a total of forty (40) over the 20-year permit term, may be incidentally taken in the form of harm (injury or mortality) as a result of collision with cranes, meteorological towers, construction cranes, or wind turbines (tower, nacelle, rotor blades).

2. Up to two (2) Newell's shearwater (adults, subadults, fledglings, nestlings, eggs) annually or a total of forty (40) over the 20-year permit term, may be incidentally taken in the form of harm (injury or mortality) as a result of collision with cranes, meteorological towers, construction cranes, or wind turbines (tower, nacelle, rotor blades).

3. Up to three (3) Nēnē (adults, subadults, fledglings, goslings, eggs) annually or a total of sixty (60) over the 20-year permit term, may be incidentally taken in the form of harm (injury or mortality) as a result of collision with vehicles, cranes, meteorological towers, construction cranes, or wind turbines (tower, nacelle, rotor blades).

4. Up to one (1) Hawaiian hoary bat adult or juvenile annually or twenty (20) over the 20-year permit term, may be incidentally taken in the form of harm (injury or mortality) as a result of collision with cranes, meteorological towers, construction cranes, or wind turbines (tower, nacelle, rotor blades).

The incidental take authorized can be increased up to the Notably Higher Take scenario for any covered species as specified in HCP, provided that the Service and the State of Hawaii Department of Land and Natural Resources (DLNR) determine that mitigation has been implemented such that benefits to the species outweigh the losses. Notwithstanding provisions of the HCP and Special Condition #3 of the DLNR Incidental Take License, the incidental take authorized by this permit cannot be increased beyond the Notably Higher Take scenario for any covered species except as provided by section 12 of the Implementing Agreement and applicable law.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) of 1918, as amended (16 USC 703-712), prohibits the take of migratory birds. The MBTA provides no process for authorizing incidental take of MBTA-protected birds. Newell's shearwater, Hawaiian petrel, and Nene are protected under the MBTA. The Service will not refer the incidental take of either the Newell's shearwater, Hawaiian petrel, or Nene for prosecution under the MBTA, if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

EFFECT OF TAKE

In the accompanying biological opinion, the USFWS determined that the maximum level of incidental take authorized under the proposed HCP and permit is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

No reasonable and prudent measures beyond the conservation measures described in the HCP have been identified to further minimize incidental take.

TERMS AND CONDITIONS

No additional terms and conditions are necessary as no additional Reasonable and Prudent Measures have been identified.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a) (1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are USFWS suggestions regarding discretionary agency activities to promote the recovery of listed species. However, the process of developing an HCP essentially necessitates the incorporation of this approach into the planning process.

1. The USFWS will work with KWP to ensure all personnel are instructed not to feed Nēnē or leave open trash receptacles in the project area in order to prevent attraction of Nēnē to the project area.

2. The USFWS will coordinate with KWP to maximize potentially mutually beneficial conservation actions with actions being undertaken by the West Maui Mountains Watershed Partnership within and around the project area.

RE-INITIATION NOTICE

This concludes formal consultation on the proposed issuance of the section 10(a)(1)(B) incidental take permit to Kaheawa Wind Power, LLC. As required in 50 CFR §402.16, reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may affect listed species in a manner or to an extent not considered in this opinion; 3) the agency action is subsequently modified in a manner that causes an adverse affect to the listed species that was not considered in this opinion; or 4) a new species is listed or critical habitat designated that may be affected by this action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation.

If you have any questions regarding any of the information contained in this biological opinion, please contact James Kwon of my staff (phone: 808/792-9400; fax: 808/792-9581).

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Personal Communications

Cathleen Bailey, Biologist, Haleakala National Park, 2004.

Chris Brosius, Coordinator, West Maui Mountains Watershed Partnership, 2006.

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