Mitigation Implementation Plan for HHB White Paper

Priority 1: ISLAND-WIDE DISTRIBUTION/OCCUPANCY STUDIES

Primary Goals	Information on habitat types/areas bats occupy and do not occupy Information on seasonal distribution and movements
Secondary Goal	Population trend (stable, increasing, decreasing)
Priority locations	O'ahu and Maui
Secondary locations	Kaua'i and Hawai'i
Methods	Standardized acoustic monitoring grid
Duration	5- year study
Implementation	Within 1 year for priority locations

Informs the following Management Actions/Questions:

- The physical/geographic site factors that are important habitat determinants
- Type of habitat (forests/wetlands) that should be the focus of restoration efforts
- Seasonal fluctuations of occupancy
- Where additional studies should be focused
- Locations/habitats with the lowest and highest levels of occupancy
- Estimating the total state-wide population trends to help inform permit issuance criteria
- Optimal siting of projects and components such as wind turbines and ancillary structures
- Seasonal considerations for curtailment, tree trimming or removal, etc.

Priority 2: HABITAT SUITABILITY AND DEMOGRAPHIC RESEARCH

A. Research

Goals	Information on breeding behavior and habitat Information on roosting behavior and habitat Information on foraging behavior and habitat Information on basic demography
Priority location	All island habitat types and elevations (can be informed by Priority 1 results)
Methods	Intensive radio-telemetry monitoring, cameras
Duration	1+ year studies
Implementation	Within 1-4 years

Informs the following Management Actions/Questions:

- Identifies important characteristics of breeding, roosting, and foraging habitats for restoration projects
- Where and when breeding, roosting, and foraging occurs and when and where monitoring should be focused
- Type of habitats (forests/wetlands) that should be the focus of restoration efforts
- Provides essential demographic information about the species that will facilitate monitoring restoration progress and success, including lengths of breeding season and offspring dependence
- Home range size and overlap to determine size and type of management for a restoration project
- Where management for the species should occur
- Habitats to avoid for placement of wind turbines and ancillary structures

B. Experimental studies of restoration projects

Goals	Information on bat occupancy and behavior throughout restoration process (above and beyond any mitigation monitoring already required)
Priority location	Areas where restoration has progressed to a suitable time-scale or habitat change with enough baseline data to assess the impacts of restoration
Methods	Before-After-Control-Impact in restoration treatment plots using acoustic detectors, telemetry, cameras, diet studies/insect ID, and/or habitat monitoring
Duration	Long-term studies (dependent on restoration actions)
Implementation	Within 1-2 years if suitable sites are present

Informs the following Management Actions/Questions:

- Informs if mitigation actions were successful or unsuccessful and what actions could increase bat occupancy
- Optimal habitats and habitat characteristics such as size of sites for future restoration efforts

Priority 3: DIET STUDIES

Goals	Understand food habits and foraging ecology Understand relationship between food availability, survival, seasonality and home ranges
Priority location	All islands
Methods	Genetic analysis, monitoring, surveys and insect identification, BACI in restoration treatment plots

Duration	1+ year study
Implementation	Within 1-4 years

Informs the following Management Actions/Questions:

- Identification of preferred foods/species and if food availability is a limiting factor
- Spatial and temporal variability of prey species
- Where optimal habitat restoration should take place based on locations of prey species and identification of plant species that may increase prey availability
- The level of native versus non-native prey in the diet and the potential importance or detriment of non-native insects for the species

Priority 4: PREDATORY RELATIONSHIP STUDIES

Goals	Understand predation pressure of adult and bat pups
Priority location	All islands
Methods	Intensive monitoring, radio-telemetry, cameras
Timeline	1+ year study
Implementation	3-5 years

Informs the following Management Actions/Questions:

- Predators and predation levels on the bat, and whether this may be a limiting factor
- Identification of predators to help determine what predator control efforts could be implemented for mitigation and how this would be monitored.

Projects	Year 1	Year 2	Year 3	Year 4	Year 5	Year 5 +
Priority 1: ISLAND-WIDE DISTRIBUTION/OCCUPANCY STUDIES - Maui & Oahu						
Priority 1: ISLAND-WIDE DISTRIBUTION/OCCUPANCY STUDIES - Hawaii & Kauai						
Priority 2a: HABITAT SUITABILITY AND DEMOGRAPHIC RESEARCH						
Priority 2b: HABITAT RESTORATION RESEARCH						
Priority 3: DIETARY STUDIES						
Priority 4: PREDATORY RELATIONSHIP STUDIES						

Orange indicates contingent on previous results