Draft Environmental Assessment

for

Rat Eradication within the Hi‘i Predator-Proof Fence on Lāna‘i

July 26, 2023

Prepared for

The U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office
by Anden Consulting under subcontract to Pūlama Lāna‘i
Honolulu, HI

Estimated Lead Agency Total Costs Associated with Developing and Producing This Environmental Assessment: $20,000

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This Draft Environmental Assessment (EA) is being prepared to evaluate the effects associated with the Proposed Action and complies with the National Environmental Policy Act (NEPA) in accordance with Council on Environmental Quality regulations (40 CFR 1500-1509) and Department of the Interior (43 CFR 46; 516 DM 8) and U.S. Fish and Wildlife Service (Service) (550 FW 3) regulations and policies. The NEPA requires examination of the effects of proposed actions on the natural and human environment. Additional Federal statutes, regulations, and executive orders relevant to the discussion of alternatives and analysis in this EA are included where relevant, including the Endangered Species Act of 1973, as amended, 16 U.S.C. 1531-1544; 36 CFR Part 13; 50 CFR Parts 10, 17, 23, 81, 217, 222, 225, 402 (ESA), the Migratory Bird Treaty Act, as amended, 16 U.S.C. 703-712, 50 CFR Parts 10, 12, 20, and 21, and the National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470-470x-6; 36 CFR Parts 60, 63, 78, 79, 800, 801, and 810.

Proposed Action

The Service is proposing to eradicate rats (*Rattus* spp.) from the recently completed Hiʻi predator-proof fenced unit, built to protect ʻuaʻu (Hawaiian petrel, *Pterodroma sandwichensis*) habitat on Lānaʻi, through the use of a targeted aerial application of diphacinone.

Background

The Lānaʻi Hale summit fence (also called the Lanaʻihale Watershed Protection Fence) was proposed in 2001 to keep non-native ungulates (hooved mammals) out of approximately 4,767 acres of important watershed, while protecting remaining native habitat, including dry shrublands and forests, mesic forests, and cloud forest that supported the highest concentration of endangered species on the island (TMK 2-4-9:002:001). Rain and cloud drip that reaches the summit plays an important role in recharging the island's aquifer, so the ungulate-proof fencing protects a primary watershed area from the negative impacts of ungulates.

In 2006, seabird surveys identified an "unexpectedly large population" of ʻuaʻu (Hawaiian petrel or *Pterodroma sandwichensis*) on Lānaʻi (Associated Press 2007, Maui Nui Seabird Recovery Project 2023), and efforts began to inventory and monitor this population. Feral cat (*Felis catus*) and rat (*Rattus* spp.) predation on ʻuaʻu eggs and chicks were identified as a major cause of nest failure., and in April 2023, the Hiʻi Predator-proof Unit (Hiʻi fenced unit) was completed to

provide greater protection from these predators, enclosing 82 acres of the densest ʻuaʻu nesting habitat on Lānaʻi (Pūlama Lānaʻi 2019). A map illustrating the location of the Hiʻi fenced unit is included in Appendix A.

The predator-proof fenced unit replaced approximately 3,690 ft (1,125 m) of existing ungulate proof fencing (fence post and hogwire mesh) with 6.5 ft (2 m) high predator-proof fencing made of stainless steel mesh and a metal hood and adding approximately 4,528 ft (1,380 m) of additional predator-proof fence on the interior to create the 82 acre unit. The design of the predator-proof fencing prevents entry by rats and cats, as well as by ungulates. The apertures in the mesh prevent entry by rodents larger than 2-day old mice; the curved hood prevents cats or rats from climbing into the fenced unit. Once rats and cats are eradicated from within the fenced area, re-entry from outside the fenced area is not possible (except in case of natural disaster impacting the integrity of the fence). Additional photos and schematics of a predator-proof fence are included as Appendix B.

Because of the hood design, cats are able to climb out of the fenced unit and the few, if any, that remain within the fenced unit upon completion of the fence can be trapped. Three species of rats are found in the Hiʻi area: black rat or roof rat (*Rattus rattus*), Pacific or Polynesian rat (*Rattus exulans*), and the occasional Norway rat (*Rattus norvegicus*). Home ranges of *R. rattus* are approximately 9.4 acres and *R. exulans* are approximately 4.7 acres (Sheils 2010), consequently, many rats are expected to remain within the fenced unit upon completion of the fence.

The Proposed Action would apply rodenticide aerially inside the Hiʻi predator proof fence, with a helicopter, using a specialized suspended bucket, flying along predetermined Global Positioning System (GPS) plotted transects within the treatment area. The rodenticide bait would be broadcast by a rotary spreader bucket as the helicopter flies along the transects. The rodenticide bait to be used would be Diphacinone-50 Conservation: Pelleted Rodenticide Bait for Conservation Purposes (EPA Reg. No. 56228-35) (D-50 Conservation) containing the anticoagulant diphacinone (0.005% active ingredient). The current label is included as Appendix C. D-50 Conservation has been approved for aerial application by the U.S. Environmental Protection Agency (EPA) and the Hawaiʻi Department of Agriculture (HDOA).

While aerial application of rodenticide has been used in Hawaiʻi previously on off-shore islands for eradication and in an unfenced management unit on Oʻahu for rodent reduction, this project would be the largest attempt in Hawaiʻi to date to eradicate rodents from an enclosed predator-proof fence. As such, the project would help inform upcoming eradication efforts for endangered species protection in other proposed large-scale predator-proof fences on the islands of Kauaʻi and Hawaiʻi.

The NEPA requires Federal agencies to identify and disclose the anticipated effects of Federal actions to the human environment. The Federal action considered here consists of the Service's purchase and aerial application of diphacinone within a fenced unit on private land important for the continued survival of the endangered ʻuaʻu. Because the application of rodenticide is a Federal action, the Service must ensure that the action complies with the requirements of NEPA. Additional agencies and persons consulted during the development of this document are listed in a later section (starting on page 25).

Purpose and Need for the Action

The purpose of the Proposed Action is to improve the survival rate of endangered ʻuaʻu on Lānaʻi by eradicating rats from within the Hiʻi predator-proof fenced unit. The need for the project is demonstrated by monitoring of ʻuaʻu on Lānaʻi indicating that the Lānaʻi Hale supports one of the densest nesting concentrations in the Hawaiian Islands. The Proposed Action is further supported by the clear evidence that depredation by rats is the primary threat to ʻuaʻu on Lānaʻi (Pūlama Lānaʻi 2021).

ʻUaʻu were listed as endangered under the ESA in 1967. ʻUaʻu exhibit strong natal philopatry (tendency to return to birth site to breed) and high nest-site fidelity (USFWS 2015). These behavioral traits, along with a protracted nesting period and ground nesting habitat, result in great vulnerability to predation by introduced mammals at the breeding colonies (USFWS 2015, Croxall et al. 2012).

Introduced rats are responsible for an estimated 40-60% of all bird and reptile extinctions worldwide and can have ecosystem-wide effects on the distribution and abundance of native species through direct and indirect effects (Hawaiʻi Department of Land and Natural Resources [DLNR] 2017, citing Island Conservation analysis of World Conservation Monitoring Centre data). The three species of rat currently present in the project area are omnivorous, can adapt to diverse ecological conditions, have high reproductive rates, and can survive in a variety of habitats (DLNR 2017, Atkinson 1985; Moors et al. 1992). *Rattus rattus*, are known to predate ʻuaʻu eggs and chicks, but *Rattus norvegicus* and *Rattus exulans* also have a documented impact on burrow-nesting seabirds (DLNR 2017, USFWS 2015, Pūlama Lānaʻi 2021). In 2014 alone, data from four nesting sites on Kauaʻi demonstrated that rats (species unidentified) visited 95% of the monitored ʻuaʻu burrows and caused 14 predation events (USFWS 2015). At a colony on Haleakalā, on Maui, predation by mongoose, cats, and rats caused breeding failures >70% for the ʻuaʻu (USFWS 2005).

The aerial application of D-50 Conservation is considered the most efficient and effective method to achieve the purpose of rat eradication in the project area. Aerial application would ensure even distribution of rodenticide to all rat home ranges throughout the fenced unit.

Alternatives

Discussion and consideration of alternatives has been ongoing for more than five years, beginning with a feasibility and benefits assessment regarding the construction of the Hiʻi predator-proof fence and consequent rat eradication. In addition to internal scoping, discussions with non-profit organizations familiar with predator-proof fencing and rat eradications, with USDA APHIS National Wildlife Research Center (USDA NWRC), Oʻahu Army Natural Resources Program staff, and other biologists familiar with previous targeted aerial applications of rodenticide, and with field staff experienced in predator control and eradication efforts have been ongoing to identify and evaluate the feasibility of alternatives.

No Action Alternative - Current Management Strategies

The No Action alternative consists of no aerial broadcast of rodenticide. Current management, consisting of rodent trapping using A24 automatic rat traps with non-toxic lure and bait boxes, would continue in accessible portions of the Hi‘i fenced unit. No rodent trapping or baiting would occur in areas of steep terrain or areas where access is unsafe to field staff.

The No Action alternative provides a basis for comparing the management direction and environmental consequences of the Proposed Action. In this instance, it means the Service will compare the environmental impacts of not conducting targeted aerial application of rodenticide with the impacts of applying diphacinone rodenticide from helicopter-borne buckets. Selection of the No Action alternative would mean the Service would not proceed with the Proposed Action and baseline predatory risk and rates of ‘ua‘u would continue to occur at the current levels or may be elevated if rat populations continue to increase.

Proposed Action Alternative 1: Aerial Application of Rodenticide

Under the Proposed Action Alternative 1, the Service proposes to conduct the targeted aerial application of rodenticide within the Hi‘i Predator-proof Fenced Unit to eradicate rodents within the fenced area. The Service will purchase and import the toxicant and conduct the application. The USDA NWRC and USDA APHIS-Wildlife Services Hawai‘i Branch will guide the monitoring design, conduct sample analysis for diphacinone residue, and provide technical expertise for aerial broadcast logistics.

EPA and the HDOA have approved D-50 Conservation containing the anticoagulant rodenticide diphacinone (0.005% active ingredient) for this type of conservation use. The Service would purchase and oversee storage and use of the D-50 Conservation bait product. The D-50 Conservation bait would be applied according to the EPA registered product label and HDOA permit to apply restricted use pesticide by aircraft. The broadscale application would consist of a helicopter dispersing D-50 Conservation within the treatment area, using a bucket suspended underneath, and flying along predetermined GPS transects as the bait is distributed in 70-meter swaths. The bait bucket system is comprised of a bait storage compartment, a remotely triggered adjustable gate to regulate bait flow, and a motor driven broadcast device that can be turned on (to broadcast bait) or off remotely and independently of the outflow gate. The rodenticide product would be broadcast by the rotary spreader bucket as the helicopter flies along the transects. For transects adjacent to the fenceline, the rotary spreader bucket may also be fitted with a deflector to spread the bait only to one side and prevent overspray outside the fencing.

For D-50 Conservation, a single treatment consists of two applications, typically spaced 5 to 7 days apart. For aerial distribution or broadcast, rodenticide bait is applied at 10 to 12 lbs/ac (11.1 to 13.8 kg/ha) for the first application and no more than 12.5 lbs/ac (13.8 kg/ha) for the second application, 5 to 7 days later (Appendix C). If heavy precipitation events are forecasted, the application would be postponed maximizing the effectiveness of the broadcast and to prevent runoff. If the forecast reduces the operational window, then a single higher dose may be applied (per the label instructions). In situations where weather or logistics only allow one bait

application, a single application may be made at a rate no higher than 20.0 lbs bait per acre (22.5 kg/ha).

The treatment area consists of approximately 82 acres completely contained within predator-proof fencing. The number and duration of flights is generally dependent on the size of the bucket available for applying bait and the size of the treatment area. Due to the small size of the fenced unit, it is anticipated that it would take 2 to 3 hours to complete a single application.

Although not required by label direction, additional measures would be implemented to avoid sensitive areas. The broadcast transects by the helicopter would stay within the fence footprint to ensure that the entire application is contained within the fenced management unit, and that no D-50 Conservation bait would be dropped outside the fenceline. Based on observations from previous aerial applications of rodenticide on Lehua Island and on windward Oʻahu, avoidance of operations in high winds, and the use of deflector, aerial delivery of D-50 Conservation bait is precise, and no bait is anticipated to land outside the fencing. In areas of high rodent activity along the exterior and immediate interior of the fence, bait boxes or traps will be used to reduce rodent populations and minimize potential for ingress in the case of as yet undiscovered gaps in the newly built predator-proof fencing.

The diphacinone treatment would take place between early August and mid-October. The primary weather related logistical constraints are wind and rain. Rodenticide application will not be conducted in winds higher than 35 mph. For each application day, a forecast of five days and nights without significant rainfall (>13mm) is preferred (Dunlevy 2007). The treatment would be scheduled for a period with little forecasted rain. If the weather window is too narrow, a single application may be necessary as per label direction.

After treatment, monitoring will be used to determine the effectiveness of the treatment. In the event that rodent activity persists within the fenced unit, hand baiting applications can occur in areas where rodents remain active. If the terrain does not permit use of hand baiting methods, additional aerial broadcast treatments may occur, limited to areas where active signs of rodents are seen, as along as rodent activity is evident in the area and rodents appear to be accepting bait (see Appendix C).

The Hiʻi fenced unit and the surrounding adjacent area is privately owned and managed by Pūlama Lānaʻi, and the proposed aerial application of rodenticide would occur in full partnership with the landowner. Unauthorized entry to the fenced unit during the targeted aerial application of rodenticide is extremely unlikely.

Diphacinone and D-50 Conservation

Selection of the most appropriate rodenticide for the specific conditions of a project is one of the main decisions for any rodent control project. Rodenticides must be used in the lowest quantity and toxicity which ensures that every rodent is exposed to a lethal dose while minimizing adverse environmental effects, especially impacts to nontarget species. Prudent use is also critical to ensure that regulators will allow effective rodenticides to continue to be made available for future use (Marsh 1985, Cromarty et al. 2002).

Products containing diphacinone, an anticoagulant rodenticide, were first registered for rodent control in 1960 at active ingredient concentrations of 0.005% to 0.01% (50 to 100 ppm). It is described as a "first generation" rodenticide. Generally, "second generation" rodenticides, such as brodifacoum, are both more toxic and more persistent. D-50 Conservation, rat bait with diphacinone (0.005% active ingredient), is registered for use for conservation purposes. D-50 Conservation has been trialed or used with favorable results in a number of landscape-scale rodent control efforts (Shiels et al. 2020, DLNR 2017, Dunlevy et al. 2000, Spurr et al. 2003a, Spurr et al. 2003b). At least 32 successful island rodent eradications have been reported using diphacinone as the primary toxicant (DLNR 2017, Howald et al. 2007, Island Conservation unpubl. data, cited in USFWS 2015).

Diphacinone is often a preferred rodenticide because of the reduced environmental risk in comparison to other rodenticides (Fisher et al. 2003, Eason and Ogilvie 2009). The primary advantage of diphacinone as a rodenticide for conservation purposes is the low risk it poses to non-target organisms. Diphacinone has comparatively low persistence in animal tissues; the chemical does not stay very long in the body. This makes toxicity to non-target species through secondary exposure less likely than for brodifacoum (Fisher 2009).

Another characteristic is diphacinone has extremely low solubility in water and binds tightly to organic matter in soil, where the rodenticide is degraded by soil micro-organisms and exposure to oxygen and sunlight (DLNR 2017).

The half-life of diphacinone is soil is ~30 to 60 days, depending on the soil type and aerobic vs. anaerobic soil conditions (DLNR 2017). Microbial degradation is dependent on climatic factors such as temperature and the presence of microbes enabling degradation. Therefore, degradation times will be longer in colder climates and shorter in warmer places like Hawai‘i (Eason and Wickstrom 2001, Eisemann and Swift 2006). Hawai‘i forest environments are generally warm and moist, and these conditions promote rapid degradation of the chemical. Soil samples collected one week after diphacinone aerial bait application on Lehua Island in Hawai‘i resulted in little to no detectable concentrations of diphacinone (Orazio et al. 2009). On Palmyra Atoll in 2010 two out of 48 samples tested had concentrations of the diphacinone high enough to be quantified (soil collected directly under a pellet); all other samples yielded a zero (undetectable) or ‘trace‘ value (Island Conservation 2010a, US Army Garrison 2017).

D-50 Conservation is a cereal bait product, available in 1 to 2 g pellets, with an added fish flavor. D-50 Conservation pellets are dyed green, which has been shown to make pellets less attractive to some birds and reptiles (Pank 1976, Tershy et al. 1992, Tershy and Breese 1994). D-50 Conservation bait product is similar to commercially available Ramik®Green bait products, however, D-50 Conservation is licensed by the State of Hawai‘i and labeled to allow aerial broadcast for "control of invasive rodents for conservation purposes on islands" (Appendix C).

The physiological action of diphacinone is the same as for other anticoagulants such as brodifacoum; diphacinone interferes with the blood's clotting ability and causes profuse bleeding. Although diphacinone can be lethal to some rats when administered in a single, large dose, it is relatively more potent in small doses administered over several days (Buckle and Smith 1994, Timm 1994). Several properties indicate that diphacinone generally takes longer

than other anticoagulants to accumulate in a rodent and achieve a lethal dose. A single dose that is lethal to 50% of the test subjects (LD_{50}) in a population or study group, is a measure of acute oral toxicity. Single lethal doses of 1.93 to 43.3 mg/kg have been reported for laboratory rats, but doses of < 1 mg/kg over five successive days are more effective (Hone and Mulligan 1982, Jackson and Ashton 1992). Jackson and Ashton (1992) reported LD_{50} values over a five-day period of 0.21 and 0.35 mg/kg/day in domestic and wild Norway rats respectively. Tobin (1992) demonstrated that for mortality to occur, black and Polynesian rats required a mean of 8.6 mg/kg (11.8 to 28.4 g of pellet), and Norway rats required a mean of 10 mg/kg (34.6 g of pellet) ingested over an average of six to seven days, with a range of between four and 12 days.

From an operational perspective, D-50 Conservation bait should be available to all rats for 10 to 12 days. This requires (a) the bait be highly attractive to rats to ensure preference over their natural food items, (b) sufficient bait is available daily to ensure rats frequently encounter bait within their environment, and (c) bait ingestion by rats and other animals, and degradation by invertebrate, microbial, and other environmental conditions does not diminish the amount of bait available below sufficient daily ingestion levels for rats (USFWS 2015).

From the perspective of nontarget risk, diphacinone is the optimal choice of registered rodenticides for natural areas in Hawai‘i. Laboratory trials have indicated that diphacinone has low toxicity to birds when compared with brodifacoum (Erickson and Urban 2004, Eisemann and Swift 2006). Recent research suggests that the toxicity of diphacinone to some birds may be considerably higher than previously thought (Rattner et al. 2010), yet overall, the toxicity of diphacinone still remains low compared with brodifacoum. The LD_{50} for diphacinone in mallard ducks is 3,158 mg/kg, and in bobwhite quail is 1,630 mg/kg (Extension Toxicology Network 1996). Aerial application of diphacinone on O‘ahu did not result in detectable negative impacts to non-target species (Shiels et al. 2020).

Bait palatability is another critical aspect important for successful rat control and eradication. In field trials, the products Brodifacoum-25D and Ramik®Green (comparable to D-50 Conservation) have both been shown to be preferred by most rats over locally available natural food sources (Pitt et al. 2011). While bait product choice is an important component of control efficacy, the most important component is the methodology used for bait delivery. Success is most often a function of how many rats within the target area are exposed to a lethal dose. Aerial application of rodenticide allows for greater probability of bait and rat interaction than bait boxes or mechanical traps (Recht 1988). Aerial broadcast of D-50 Conservation would achieve the goal of consistent exposure of rats within the entire Hi‘i fenced unit, including areas of steep terrain, to bait.

Under the Proposed Action Alternative, eradication of rats will be conducted using diphacinone applied aerially throughout the Hi‘i fenced unit. Aerial application of diphacinone increases the probability of eradication. This would increase protection of the densest ‘ua‘u colony and reduce the overall time, cost and danger of continued rat control.

Alternative(s) Considered, But Dismissed From Further Consideration

A number of alternatives were identified during internal scoping and were deemed infeasible and were not carried forward for further analysis in this EA. Other than aerial broadcast of

rodenticide, there are no other known effective methods of rat eradication that meet the project purpose and need of ʻuaʻu protection from rat depredation. Therefore, this EA compares only Alternative 1 (the proposed action) with the "No Action" alternative in this EA.

Hand Broadcast of Rodenticide

An alternative to applying rodenticide by helicopter would be to apply rodenticide solely by hand, which would involve field technicians walking a grid of trails while evenly distributing rodenticide bait. To achieve the goal of continuous baiting, bait would need to be spread 32.8 ft (10 m) in all directions from locations spaced every 65.6 ft (20 m) along a grid of trails, using pre-measured bait containers to broadcast product uniformly throughout the area.

Due to area logistics, including the steep terrain and human safety concerns, establishing a grid of trails covering the entire 82 acres would not be feasible. The result would be an uneven patchwork of narrow treated corridors surrounded by untreated territory due to physical inaccessibility. This method might temporarily reduce rat populations in some areas but would not be expected to eradicate rats from within the fenced unit. This method would require a re-broadcast interval every few months, requiring ongoing staff effort, to prevent rat populations from increasing within the fenced unit to a level higher than outside the fencing. Finally, the foot traffic and trails involved with a hand distribution effort would damage sensitive native habitat, potentially trample and destroy seabird burrows, or harm small endangered plants or tree snails located under thick native vegetation.

For the reasons described above, eradication of rats is unlikely to be achieved and therefore does not meet the purpose and need.

Use of Bait Boxes

Use of bait boxes throughout the fenced unit were initially proposed, which involves field technicians walking a grid of trails to place (and later re-bait) bait boxes. To achieve the goal of continuous baiting, bait boxes would need to be spread uniformly throughout the area.

The use of bait boxes would eliminate the risk of D-50 Conservation bait exposure to non-target species. Bait boxes may provide an extended period of D-50 Conservation lifespan, by protecting the bait from some types of environmental and microbial degradation.

Due to area logistics, establishing an effective system of bait boxes covering every 16-82 ft (5-10m) throughout the entire 82 acres per the label would not be feasible. Again, establishing a grid of trails covering the entire 82 acres would not be feasible. The steep and irregular terrain would make it challenging, and likely impossible, to place the bait boxes to the density recommended by the label. As a result, use of bait boxes would not be sufficient to eradicate rats within the fenced unit. The result would be an uneven patchwork of treated areas surrounded by untreated territory. Required re-baiting of bait boxes every few weeks, to prevent rat populations from increasing within the fenced unit to a level higher than outside the fencing, would involve ongoing staff effort and risk. Finally, the foot traffic and trails involved with setting and re-baiting bait boxes would damage sensitive native habitat, potentially trample and destroy seabird burrows, or harm small endangered plants or tree snails located under thick native vegetation.

Because of the proximity of potential trails to the burrows, the bait boxes would have to be limited to deployment when seabirds are absent to reduce disturbance to the nesting seabirds.

Though bait boxes provide some advantages such as reduced risk of D-50 Conservation exposure to non-target animals that cannot access the bait inside the boxes and extended bait product life, the inaccessibility of parts of the fenced unit due to terrain restraints, potential damage to seabird burrows, endangered plants, tree snails, and native habitat from repeated pedestrian activity during deployment and rebaiting, and evidence that eradication of rats in the unit would not be achieved and thus, would not meet the purpose and need, the alternative was dismissed from further consideration.

Use of Snap Traps and A24 Automatic Traps

Snap traps and automatic traps are another tool for rodent control. These are generally installed in a grid system to ensure even exposure of rats to the traps. Snap traps are one-time use traps, while automatic traps are self-resetting traps that can fire 24 times with 1 CO2 cartridge. Traps are typically baited every four to six weeks.

Again, due to area logistics, establishing an effective grid system of snap traps and automatic traps covering the entire 33 ha is not feasible. Over the past three years, a system of A24 rat traps have been established throughout the very steep terrain of the project area for control but are not adequate for eradication. The steep and irregular terrain have made it challenging to place the traps sufficient to ensure even exposure to the traps, and the A24 traps differentially attract different rat species (more likely to capture *R. rattus* as opposed to *R. exulans;* T. Bogardus, R. Sprague, pers. comm.). Moreover, field experience on O‘ahu demonstrated that targeted levels of rat suppression were not always met with rat trapping grids (Shiels et al. 2019). For these reasons, use of traps would not be sufficient to eradicate rats within the fenced unit. The result would be an uneven patchwork of treated areas surrounded by untreated territory. Required re-baiting of traps every few weeks, to prevent rat populations from increasing within the fenced unit to a level higher than outside the fencing, would involve ongoing staff effort and risk. The foot traffic and trails involved with setting and re-baiting traps would damage sensitive native habitat, potentially trample and destroy seabird burrows, or harm small endangered plants or tree snails located under thick native vegetation.

Though traps provide some advantages such as no risk of diphacinone exposure to non-target animals, the inaccessibility of parts of the fenced unit due to terrain restraints, potential damage to seabird burrows, endangered plants, tree snails, and native habitat from repeated pedestrian activity during deployment and rebaiting traps, and evidence that eradication of rats in the unit would not be achieved and thus, would not meet the purpose and need, the alternative was dismissed from further consideration.

Use of a Combination of Traps and Bait Boxes

A combination of bait boxes, snap traps, and automatic traps was evaluated to determine if, in combination, these rodent control methods could be anticipated to eradicate rats within the fenced unit. A combination of bait boxes and trapping has been used successfully in other

predator-proof fenced units (Nihokū, Kaʻena Point) and offshore islets (Mokuʻauia) to eradicate rodents (Young et al. 2012a, Young et al. 2018, L. Young, pers. comm.).

The Nihokū (7 acres) and Kaʻena (59 acres) fenced units were relatively small and level, with walkable access to the entire area within the predator-proof fencing. Placing bait stations at 25 m intervals and establishing a grid-system of snap traps was easily achieved in both area. However, within the Hiʻi fenced unit, as previously noted, establishing a uniform grid system covering the entire 33 ha would not be feasible due to the steep and irregular terrain. It is not possible, even using a combination of traps and bait stations, to ensure even coverage throughout the fenced unit.

As a result, use of a combination of traps would not be sufficient to eradicate rats within the fenced unit. The result would be an uneven patchwork of treated areas surrounded by untreated territory. Furthermore, required re-baiting of traps and bait stations every few weeks, to prevent rat populations from increasing within the fenced unit to a level higher than outside the fencing, would involve ongoing staff effort and risk. The foot traffic and trails involved with setting and re-baiting traps would damage sensitive native habitat, potentially trample and destroy seabird burrows, or harm small endangered plants or tree snails located under thick native vegetation. Based on the above, and evidence that eradication of rats in the unit would not be achieved and thus, would not meet the purpose and need, the alternative was dismissed from further consideration

Affected Environment and Environmental Consequences

This section describes both the affected environment (the existing environmental and socioeconomic baseline in the action area for each resource, including trends and ongoing and planned actions) and environmental consequences (effects and impacts) of the proposed action on each resource." The effects and impacts of the proposed action considered here are changes to the human environment, whether adverse or beneficial, that are direct, indirect, or cumulative. This EA includes the written analyses of the environmental consequences on a resource only when the impacts on that resource could be more than negligible and therefore considered an "affected resource." Any resources that will not be more than negligibly impacted by the action have been dismissed from further analysis.

The Hiʻi project area is on Lānaʻi, the sixth largest and the smallest publicly accessible inhabited island of the main Hawaiian Islands. In 1922, James Dole purchased Lānaʻi, and the tiny island became one of the largest pineapple plantations in the world. Immigrants came from the Philippines, Japan, China, Portugal, Korea and Puerto Rico to work in the fields and Lānaʻi City was established as a small plantation settlement. The island changed hands from Dole Food Company to Castle & Cooke, which began developing resort opportunities in the 1980s. Lānaʻi's pineapple history came to an end soon after with the last harvest held in 1992. In 2012, Lānaʻi was purchased by Larry Ellison. Nearly the entire island (98%) is privately owned by Lānaʻi Resorts LLC, dba Pūlama Lānaʻi (County of Maui 2016).

Lānaʻi was created by a single shield volcano that erupted over 1 million years ago. The entire island is approximately 89,950 acres. There are no perennial streams or lakes (DLNR 2015),

though Maunalei stream historically flowed year-round (Maly 2020). Located in the rain shadow of Maui, Lānaʻi is generally dry with an average rainfall of 30 to 40 inches over Lānaʻi Hale, the highest point at 3,370 ft (1,027 m), and less than 10 inches on the southwestern side of the island.

Because of the history of overgrazing by cattle, goats, and axis deer, much of the island has suffered from extensive soil erosion and few native-dominated natural communities remain (DLNR 2015). Lānaʻi Hale is the center of the conservation area to protect the cloud forest (mesic/wet forest) and fern understory essential to Lānaʻi's limited water supply (DLNR 2015; County of Maui 2016). Fog drip, moisture pulled from clouds by trees and ferns in upper elevations, contributes substantially (approximately 50%) to the aquifer (County of Maui 2016, DLNR 2015, County of Maui 2011, Lānaʻi Company 2001). Efforts to protect, restore, and enhance this watershed have been ongoing for over 20 years, continuing through changes in land ownership. These efforts include the construction of a perimeter fence around the primary forest and water recharge area, the removal of deer from the core conservation area, invasive species removal, and native forest restoration. The Hiʻi project area is located within the Lānaʻi Hale conservation area (see Appendix A).

The Hiʻi project area is a fenced 82-acre area located within the larger Lānaʻi Hale Summit Fencing (TMK 2-4-9:002:001). The fencing alignment was selected specifically to enhance protection for the endangered ʻuaʻu (Pūlama Lānaʻi 2019). The fencing is approximately 150 ft from the Munro Trail and is not generally visible to travelers on the trail. No roads or trails intersect the Hiʻi fencing, and the fenced unit is not within a public hunting or other recreation area.

The following resources either (1) do not exist within the project area or (2) would either not be affected or only negligibly affected by the proposed action and will not be evaluated further in this document:

- Air quality;
- Soils;
- Flood plain;
- Noise;
- Economic impact;
- Environmental justice; and
- Visitor use and experience/Public recreation.

Natural Resources

Terrestrial Wildlife Species (non-listed)

Affected Environment

Description of Affected Environment for the Affected Resource

The Hiʻi fenced unit is located within the Lānaʻi Hale conservation area and supports both native and non-native wildlife species:

- Historically, Lānaʻi was home to eight species of Hawaiian forest birds. Most are now extinct, and only the ʻapapane (*Himatione sanguinea*) still persists in low numbers on Lānaʻi Hale. The ʻapapane was observed in only 7 locations during 2021 Forest Bird Surveys (DLNR 2015, MFBRP 2021), no closer than 600 m from the Hiʻi fenced unit, and mostly over 1.5 km away. ʻApapane have not been observed within the Hiʻi fenced unit at any point during weekly field work for the past 7+ years (Pūlama Lānaʻi 2023).
- Pueo (Hawaiian short-eared owl, *Asio flammeus sandwichensis*) have been observed in the Hiʻi area; they seem to mostly use the area for roosting rather than hunting.
- Non-native birds observed in the Hiʻi area include Japanese bush warbler (*Horornis diphone*), Japanese white-eye (*Zosterops japonicus*), Northern cardinal (*Cardinalis cardinalis*) and occasionally white-rumped shama (*Copsychus malabaricus*).
- Non-native game birds present on Lānaʻi and potentially within the Hiʻi fenced unit include ring-neck pheasant (*Phasianus colchicus),* green pheasant (*Phasianus versicolor*), Gambelʻs quail (*Callipepla gambelii*), California Valley quail (*Callipepla californica*), Japanese quail (*Coturnix japonica*), Chukar partridge (*Alectoris chukar*), gray francolin (*Francolinus pondicerianus*), Erckelʻs francolin (*Francolinus erckelli*), spotted dove (*Streptopella chinensis*), barred dove (*Geopelia maugeus*), and wild turkey (*Meleagris gallopavo*).
- Non-native mammals include three species of rats, feral cats (*Felis catus*), axis deer (*Axis axis*), and wild mouflon (*Ovis gmelini*).
    - One cat was detected inside the predator-proof fence footprint shortly before fence closure. It was captured in March 2023, and no other cats have been detected inside the fence on trail monitoring, trap monitoring, or seabird monitoring cameras since then (Pūlama Lānaʻi, pers. comm.); therefore, the area is presumed to be cat-free.
    - Fewer than three individual axis deer may still persist within the fenced unit, but efforts to remove them all before aerial application of rodenticide are underway.
    - Mouflon sheep prefer steep, windward slopes and have not been seen in the Hiʻi fenced unit or immediately adjacent to the project area (on the leeward side of Lānaʻi Hale) over seven years of camera monitoring for a variety of projects.

Description of Cumulative Impacts, Environmental Trends, and Planned Actions

Climate change refers to the increasing changes in the measures of climate over a long period of time – including precipitation, temperature, and wind patterns (USGS 2019). Global climate change is anticipated to have multiple and disastrous effects on Hawaiian wildlife (DLNR 2015). For example, sea level rise (SLR) will inundate the Northwestern Hawaiian Islands (NWHI), reducing habitat for nesting seabirds, native passerines, monk seals, and sea turtles, and altering coastal habitats throughout Hawaiʻi (DLNR 2015). Temperature increases will allow avian disease pathogens and vectors to expand their ranges to higher elevations, areas that currently

support the last remaining populations of many native forest bird species (DLNR 2015). Climate change impacts are expected to interact with non-native species invasions, which will likely intensify impacts on island ecosystems and amplify the challenges of management and control of invasive species (DLNR 2015, Harter et al. 2015). Hawai‘i could experience increased frequency of El Nino/Southern Oscillation (ENSO) events, resulting in amplified drought that could impact both wildlife and habitat (DLNR 2015). Though none of the management alternatives would have an impact on climate change, the activities associated the proposed action would provide enhanced protection for vulnerable native species by establishing a rat-free mid-elevation refugia.

Impacts on Affected Resource

The evaluation of impacts on terrestrial wildlife species was based on identifying the species within or close to the project area and determining the direct and indirect impacts that may affect these species. The proposed action would involve the aerial application of a toxicant that is lethal to rats. The impact of the toxicant to non-listed species other than rats is evaluated below.

No Action Alternative – Current Management Strategies

The No Action alternative would maintain existing management. Trapping to reduce rat populations in accessible areas would continue. Under this scenario, rats would remain within the Hi‘i fenced unit and could continue to move inside the predator-proof fenced area. Rats would remain and continue to be a predation threat to the terrestrial wildlife within the fenced unit. There would be no impacts to other non-listed species associated with the No Action Alternative.

Proposed Action Alternative 1 – Aerial Application of Rodenticide

Under the Proposed Action, rats would be eradicated from the Hi‘i Predator-proof Fenced Unit through the aerial application of D-50 Conservation bait. Both primary (direct consumption) and secondary impacts (consuming a poisoned rodent) on native species can result from rodenticide use and are discussed more fully below. However, overall, the impacts are expected to be beneficial.

Many birds are known to be physiologically sensitive to anticoagulant rodenticides (Erickson and Urban 2004). In a hand-broadcast diphacinone study conducted in the Wai‘anae Range at Kahanahāiki, several common bird species survived and appeared healthy after some diphacinone ingestion (Shiels 2017). Overall, bird survival would benefit from reduced rodent predation. Risk of rodenticide poisoning for an animal is based on both the toxicity of the chemical and its exposure to the chemical. Exposure can arise from directly ingesting the rodenticide (i.e., primary exposure) or eating an animal that has ingested the rodenticide (i.e., secondary exposure).

Toxicity is taxa specific and is determined by the quantity of active ingredient (a.i.) for a given body weight (bwt) to achieve a certain effect, usually measured as milligrams active ingredient (mg a.i.) / kilogram (kg) bwt. Toxicity is most frequently represented as the LD50 and LC50. LD50 is the chemical dose where 50% of the test animals died and is usually administered as a

single dose. LC50 is the concentration of the chemical in feed where 50% of the test animals died and the test is usually administered over a multi-day period (e.g., five to 10 days). A third measure of toxicity is the LLD, the lowest lethal dose of a chemical at which a test animal died. The lower the LD50, LC50, or LLD value, the more toxic the chemical, or more sensitive the species. LD50, LC50, and LLD measure the lethality of a chemical to the subject species.

Toxicants are also evaluated by their sublethal effects on animals. These are represented by metrics, such as NOEL (no observable effect level) and LOEL (lowest observable effect level). NOEL is the highest dose or exposure level of a toxicant that produces no measurable toxic effect on the test group of animals and LOEL is the lowest dose or exposure level of a toxicant that produces a measurable toxic effect on the test group of animals. Sublethal effects observed in the anticoagulant acute oral studies included lethargy, subcutaneous, intramuscular, and internal hemorrhaging, piloerection, diarrhea, bloody diarrhea, and anorexia (Anderson et al. 2011).

Individual species of birds and mammals vary in their relative sensitivity (i.e., the toxicity) to different rodenticides. For mammals, diphacinone is considered "very highly toxic" as measured by acute oral toxicity (LD50) and dietary toxicity (LC50) (Anderson et al. 2011). For birds, the acute oral and dietary toxicity of diphacinone is considered "slightly toxic" and "moderately toxic," respectively. The Shiels (2017) hand-broadcast diphacinone study observed that some birds gained exposure, but there appears to be very little chance of mortality at these application rates.

The ʻapapane, a native forest bird, has not been observed inside the Hiʻi fenced area. If there are any birds present, they would be unlikely to accidentally ingest diphacinone because they feed on nectar, foliar insects and spiders, and forage primarily in the mid- to upper strata of the forest canopy (US Army Garrison 2017).

Pueo (Hawaiian short-eared owl, *Asio flammeus sandwichensis*) are occasionally observed in the Hiʻi area. Pueo capture live prey and therefore are extremely unlikely to ingest diphacinone directly. It is possible that they could be exposed to diphacinone indirectly by eating rats that have ingested D-50 Conservation bait but have not yet died. The most conservative (worst case) analyses of these situations has been examined using data from the literature. To assess secondary non-target hazards for pueo, the analysis used data from barn owls and whole body values with the maximum residue levels documented in rodents (Erickson and Urban 2004). The LD50 for an average sized 0.7 lb (315 g) owl is 126 mg of diphacinone. To ingest these amounts of rodenticides secondarily via rats contaminated to the highest level documented, an owl would need to consume 81.6 lbs (37 kg) of contaminated rats. As consuming this quantity of contaminated rats is extremely unlikely, the risk of mortality to pueo due to using the proposed diphacinone formulation is discountable (negligible).

Non-native passerines occasionally found in the Hiʻi fenced unit could be at risk. Birds that are most at risk from feeding directly on rodenticides are those that are naturally inquisitive, terrestrial ground-feeders, and that have a diet that includes grains and seeds. In order to consume sufficient diphacinone bait to reach a dose equivalent to the LD50 for the northern

bobwhite (or a single dose that is lethal to 50% of test subjects), a passerine bird would have to eat 0.53 lbs of bait, or 5,027 lbs of invertebrates in one day. Neither of these amounts is even physically possible (USFWS and DOFAW 2008). However, hazard calculations for sublethal exposure show that a 50g bird, such as a small passerine, would only need to eat 0.07 g (1/100 of a bait pellet, or 0.2% its body weight) or 0.65 g of invertebrates per day for multiple days to ingest a dose that resulted in measurable blood clotting effects in golden eagles. Therefore, small passerine birds could be vulnerable to sublethal or possibly lethal effects through primary and secondary exposure if they forage on diphacinone bait or contaminated invertebrates over time (Eisemann and Swift 2006). If there are any dead or dying non-native passerines observed after treatment, they will be euthanized and disposed of. It is unlikely that affecting a small number of these non-native birds from the project area would cause population level effects.

The project area is on private land and is not within or adjacent to public hunting areas. Game birds found in the area would be at some risk of being affected by the Proposed Action and that risk will vary with their relative abundance and distribution, in combination with their diet and body size. The diet of these birds is comprised primarily of vegetation (e.g., seeds and fruits) and animal matter (e.g., insects and snails), which puts them at risk of both primary and secondary poisoning. However, bait pellets are dyed green which has been shown to make pellets less attractive to some birds and reptiles (Pank 1976, Tershy et al. 1992, Tershy and Breese 1994). It is unlikely that individual game birds would ingest lethal amounts of diphacinone, although there could be some exposure to non-lethal levels. Aerial application of rodenticide would not occur within the game bird hunting season, which runs from November to January. If there are any dead or dying game birds observed after treatment, they will be euthanized and disposed of (i.e., not consumed). It is unlikely that affecting a small number of these non-native game birds from the project area would cause population level effects.

There are no ungulates within the Hiʻi fenced unit. However, if there are any remaining undetected ungulates within the fenced area after the rodenticide application, these will be trapped, euthanized, and properly disposed (i.e., not consumed). Cats are no longer present within the fenced area.

Threatened and Endangered Wildlife Species, and Other Special Status Species

Affected Environment

Description of Affected Environment for the Affected Resource

The upland area surrounding Lānaʻi Hale, including the Hiʻi fenced unit, supports a breeding colony of ʻuaʻu, endangered native land snails (*Partulina variabilis* and *Partulina semicarinata*), and the ʻōpeʻapeʻa (Hawaiian hoary bat, *Lasiurus cinereus semotus*). These species were listed and are afforded protection under the ESA. Additionally, the ʻuaʻu is protected under the Migratory Bird Treaty Act, as amended, 16 U.S.C. 703-712; 50 CFR Parts 10, 12, 20, and 21. Discussion of impacts on endangered plants in the project area will be covered in the next section.

Description of Cumulative Impacts, Environmental Trends, and Planned Actions

Climate change refers to the increasing changes in the measures of climate over a long period of time – including precipitation, temperature, and wind patterns (USGS 2019). Global climate change is anticipated to have multiple and cumulative negative effects on threatened and endangered species and their habitat (DLNR 2015). As noted previously, changes in temperature can facilitate spread of disease, encourage proliferation of invasive species, and amplify effects of drought, including increased fire risk (DLNR 2015).

Efforts to protect ʻuaʻu habitat through the creation of predator-free fenced units has occurred or is planned in other locations across the main Hawaiian islands (Kauaʻi, Hawaiʻi, Maui) as a result of declines in the overall ʻuaʻu population. Supporting colonies in several locations across several islands may contribute to their survival in the event of natural disaster or disease.

Impacts on Affected Resource

The evaluation of impacts on threatened and endangered wildlife species was based on identifying the species within or close to the project area and determining the direct and indirect impacts that may affect these species. The Proposed Action would involve the aerial application of a toxicant that is lethal to rats. The impacts of the toxicant to federally listed species and other special status species are evaluated below.

No Action Alternative – Current Management Strategies

The No Action alternative would maintain existing management. Trapping to reduce rat populations in accessible areas would continue. Under this scenario, rats would remain within the Hiʻi fenced unit and could continue to move inside the predator-proof fenced area. Rats would remain and continue to be a predation threat to the threatened and endangered terrestrial wildlife within the fenced unit.

Proposed Action Alternative 1 – Aerial Application of Rodenticide

The impacts to ʻuaʻu population abundance would be greatly improved from reducing predatory pressure by reducing and eliminating the rat population within the fenced area. Over 140 ʻuaʻu burrows have been identified within the Hiʻi fence footprint (out of over 650 known burrows on the island) as of early 2023. Given the density of burrows already found and the area as yet un-searched within the fenced unit, there could be in excess of 500 to 600 burrows currently within the predator-proof fenced area. Eradicating introduced rats from the Hiʻi fenced unit will eliminate their predatory pressure on the ʻuaʻu colony, protecting existing birds and promoting an increase in colony size. Anticipated secondary effects of rat eradication include re-establishment of healthy native plant communities and protection for rare native plants, improved habitat for endangered tree snails (*Partulina* spp.), and possible recolonization by other seabird species.

ʻUaʻu are marine seabirds who do not feed terrestrially and would be extremely unlikely to accidentally ingest diphacinone or contaminated invertebrates. ʻUaʻu and burrow-nesting *Procellarids* are not known to exhibit pica (i.e., pecking at or eating objects found on the ground such as rocks, sticks, and foreign objects), and their nest locations in burrows minimize the

likelihood chicks would access bait pellets. During the 2017 rodent eradication on Lehua Islet, there were more than 2,000 wedge-tailed shearwater (*Ardenna pacifica*) nests (another burrow-nesting seabird related to ʻuaʻu). Residue analysis was performed by the USDA NWRC after the rodenticide applications on Lehua, including on five shearwater carcasses, and detected no diphacinone in their livers or tissue (Siers et al. 2018). Given the lack of behaviors that would expose ʻuaʻu to rodenticide, and the lack of impact to burrow-nesting *Procellarids* during other aerial rodenticide applications, the Proposed Action Alternative 1 would not result in adverse impacts to the ʻuaʻu. Eradicating rats and thus removing the threat of predation would have a positive impact on both individual birds and the overall population.

Primary or secondary poisoning from diphacinone is not likely to occur for the Lānaʻi tree snails (*Partulina* spp.) since they primarily forage on the microbes that grows on the surface of their plant hosts, and many spend their entire life on one tree. Tree snails primarily forage in trees and it is not likely they will come into contact with rodenticide on the ground. Eradicating rats could have a beneficial impact by removing the threat of predation; research on Molokaʻi demonstrated the devastating impacts rats can have on tree snails through predation (Milius 2009).

Primary poisoning from diphacinone is not likely to occur for ʻōpeʻapeʻa as they consume a wide variety of insects, primarily moths and beetles (USFWS 2018). Secondary poisoning is possible through biomagnification (concentration of toxins from food sources) via the prey base. Trace amounts of rodenticide residues have been detected in tissues from 2 out of 21 ʻōpeʻapeʻa carcasses examined statewide but there is currently no data to evaluate the impact of rodenticide on the bat or the specific sources of the trace amounts (USFWS 2018). While bats of other species are impacted by predation, there is no data to indication if this is also a problem for ʻōpeʻapeʻa (DLNR 2015). Given the assumption of presence, but no direct observations of bats in the project area, limited documentation of interaction between flying insects and diphacinone bait, and the fact that diphacinone is not persistent in the environment but is degraded within 30 – 60 days by soil micro-organisms and exposure to oxygen and sunlight, the risk of mortality to ʻōpeʻapeʻa is considered to be very low. Anticipated benefits are speculative.

Habitat and Vegetation (including vegetation of special management concern)

Affected Environment

Description of Affected Environment for the Affected Resource

Predominant plant taxa within the Hiʻi fenced unit are ʻōhiʻa lehua (*Metrosideros polymorpha*), ʻuluhe (*Dicranopteris* spp.), pūkiawe (*Styphelia tameiameiae*), kāwaʻu (*Ilex anomala*), kōpiko (*Psychotria* spp.), kanawao (*Broussaisia arguta*), and mountain naupaka (*Scaevola gaudichaudiana*). Common native species also present in lesser density in the upper Lānaʻi Hale area include ʻaʻaliʻi (*Dodonea viscosa*), kukui (*Aleurites moluccana*), wiliwili (*Erythrina sandwicensis*), ʻahakea (*Bobea elatior*), oha-wai (*Clermontia* spp.), kolea (*Myrsine lessertiana*), ʻōhelo (*Vaccinium reticulatum*), ʻūlei (*Osteomeles anthyllidifolia*), and ʻōhe mauka (*Tetraplasandra* spp.) (Lānaʻi Company 2001). The endangered ʻiliahi (*Santalum haleakalae* var. *lanaiensis*) and hala pepe (*Pleomele fernaldii*) are known to be within the project area and in

2003, the Service proposed, but did not designate critical habitat on Lānaʻi for *Bidens micrantha kalealaha* (USFWS 2003). These listed plant species are afforded protection under the ESA.

Description of Cumulative Impacts, Environmental Trends, and Planned Actions

Climate change refers to the increasing changes in the measures of climate over a long period of time – including precipitation, temperature, and wind patterns (USGS 2019). Global climate change is anticipated to have multiple and cumulative negative effects on threatened and endangered species and their habitat (DLNR 2015). As noted previously, changes in temperature can facilitate spread of disease, encourage proliferation of invasive species, and amplify effects of drought, including increased fire risk (DLNR 2015).

Efforts to protect native vegetation through the creation of both ungulate-free areas and predator-free fenced units has occurred or is planned across the main Hawaiian islands. Protecting remaining native habitat and restoring degraded habitat through ungulate-proof fencing, invasive species management, and re-planting of native species in several locations across several islands may contribute to continued existence of a wide range of native species, including listed species, in the event of natural disaster, disease, introduction of new invasive species, human alteration, drought, wildfire, and more.

Impacts on Affected Resource

The evaluation of impacts on habitat and vegetation was based on identifying the species within or close to the project area and determining the direct and indirect impacts that may affect these species. The Proposed Action Alternative 1 would involve the aerial application of a toxicant that is lethal to rats. The impact of the toxicant to plant species is evaluated below.

No Action Alternative – Current Management Strategies

The No Action alternative would maintain existing management. Trapping to reduce rat populations in accessible areas would continue. Under this scenario, rats would remain within the Hiʻi fenced unit and could continue to move inside the predator-proof fenced area. As omnivorous feeders, rats would remain and continue to be a predation threat to the native plants within the fenced unit.

Proposed Action – Aerial Application of Rodenticide

Plants are not known to be susceptible to toxic effects from diphacinone (USFWS 2015, US Army Garrison 2017, DLNR 2017). Control of invasive rodents would benefit endangered and other native plants found in the area. Rats are known to eat the seeds, fruits, leaves, and shoots of Hawaiian plants, such as chewing the apical and lateral buds of naupaka (*Scaevola sericea*), stripping the bark of koa (*Acacia koa*) saplings, and eating loulu (*Pritchardia* sp.) seeds (DLNR 2008). These actions either kill the plant outright, make it more susceptible to disease, or prevent natural reproduction. Rats also facilitate the spread of invasive plants they have eaten. Eradicating invasive rodents would improve conditions and be beneficial for both individual native plants and native plant populations (USFWS 2003). Anecdotally, rats are known to eat the seeds of both ʻiliahi and hala pepe, and eradication of rats within the Hiʻi fenced unit would be expected to benefit any endangered native plants located within the fencing.

Water Quality

Affected Environment

Description of Affected Environment for the Affected Resource

There are no perennial streams or lakes on Lānaʻi (DLNR 2015), though Maunalei stream historically flowed year-round (Maly 2020). Located in the rain shadow of Maui, Lānaʻi is generally dry with an average rainfall of 30 to 40 inches over Lānaʻi Hale, the highest point at 3,370 ft (1,027 m), and less than 10 inches on the southwestern side of the island. Lānaʻi Hale is the center of the conservation area to protect the cloud forest (mesic/wet forest) and fern understory essential to Lānaʻi's limited water supply (DLNR 2015; County of Maui 2016). Fog drip, moisture pulled from clouds by trees and ferns in upper elevations, contributes substantially (approximately 50%) to the aquifer (County of Maui 2016, DLNR 2015, County of Maui 2011, Lānaʻi Company 2001). Efforts to protect, restore, and enhance this watershed have been ongoing for over 20 years, continuing through changes in land ownership. These efforts include the construction of an ungulate-proof perimeter fence around the primary forest and water recharge area, the removal of deer from the core conservation area, invasive species removal, and native forest restoration. The Hiʻi fenced unit is located on private land distant from the ocean, with limited intermittent water flow. Dry streambeds usually only run following consistent or heavy rains, and do not flow through or out of the Hiʻi fenced unit.

Description of Cumulative Impacts, Environmental Trends, and Planned Actions

Climate change refers to the increasing changes in the measures of climate over a long period of time – including precipitation, temperature, and wind patterns (USGS 2019). The specific impact of climate change on Lānaʻi's water resources is unknown.

Impacts on Affected Resource

The evaluation of potential impacts on water resources is based on potential to contribute to lower water quality. The Proposed Action Alternative 1 and the No Action alternatives were considered to have a significant negative impact on the resource if they were to result in the following: (1) cause a substantial increase in sedimentation; or (2) degrade water quality in a manner that would reduce the existing or potential beneficial uses of the water.

No Action Alternative – Current Management Strategies

The No Action alternative would maintain existing management and result in no changes to water resources from the existing condition.

Proposed Action – Aerial Application of Rodenticide

The Proposed Action involves the aerial application of diphacinone within the Hiʻi fenced unit. D-50 Conservation bait has been registered by EPA and licensed by the State of Hawaiʻi for conservation purposes using aerial and ground broadcast application techniques. Before the EPA may register a pesticide under FIFRA, the applicant must show, among other things, that using the pesticide according to specifications "will not generally cause unreasonable adverse effects on the environment" (EPA 2017).

There are no surface waters within the target area that could be impacted. The potential to negatively impact ground water is considered minimal for the following reasons. Diphacinone has extremely low solubility in water and binds tightly to organic matter in soil, where the rodenticide is degraded by soil micro-organisms and exposure to oxygen and sunlight. Upon breakdown of any uneaten bait, most of the chemical is expected to remain in the topsoil layers, and its potential to reach ground water is very low.

Marine waters off Lānaʻi are not likely to be negatively affected. Seawater sampling conducted both one day and one week after aerial application of diphacinone pellets to Lehua Island in January 2009 found no diphacinone residues in seawater surrounding Lehua Island (Orazio et al. 2009). Similarly, water sampling conducted after aerial application of diphacinone pellets to Mokapu Island in February 2008 found no diphacinone residues in the seawater samples (Gale et al. 2008). The Hiʻi fenced unit is located miles from marine resources, whereas both the Lehua Island and Mokapu Island applications treated each entire island including shoreline areas (US Army Garrison 2017).

Cultural and Archaeological Resources

Affected Environment

Description of Affected Environment for the Affected Resource

Hawaiians began settling on Lānaʻi in the 1200s, and although the island was not as abundant in resources as Maui or Molokaʻi, by the late 1700s, an estimated 6,000 residents sustained themselves with the island's natural resources and cultivated loʻi kalo (taro fields) (Van Tilburg et al. 2017). In the 1820s and 30s, missionaries arrived and built schools; pineapples, sheep and goats were introduced to the island. In 1848, Kamehameha III divided the lands among the chiefs, government and himself. By 1850, the population of Lānaʻi had dropped to approximately 600 people (Van Tilburg et al. 2017). In the late 1800s, a Mormon named Walter Murray Gibson began purchasing and leasing land from the government until only a fraction of land on the island was left to the remaining few residents. Efforts to plant sugar cane, alfalfa and cotton were made in the late 1890s; all failed. Large-scale pineapple production began in the early 1920s, importing laborers. Pineapple production ended in 1992 after ownership of Castle and Cooke transferred to David Murdock, who shifted focus to the tourism industry (Van Tilburg et al. 2017). Today, 98% of the land is controlled by Pūlama Lānaʻi, while 2% of the island remains under the ownership of private citizens, the state, or the county of Maui.

Lānaʻi has a wide variety of archaeological and traditional sites across the island, including heiau, villages, ahupuaʻa, beaches, and fishponds. Prior consultation with the State Historic Preservation Division for the construction of the proposed Lānaʻi Hale ungulate fencing resulted in a 'no effect' as long as vegetation clearing was done by hand. The Service conducted a cultural resource inventory of a portion of the fence corridor in 2002 (Maly 2020), which included the area of the Hiʻi predator-proof fence. One site, the Heiau at Hiʻi (SIHP 50-40-98-29), was identified at about the 2,000 ft elevation, approximately 80 ft (25 m) northeast of the original ungulate fence corridor. At the time, members of the survey party were satisfied that

construction of the initial ungulate-proof fence would not impact the site (Maly 2020). The site is also outside the Hi‘i fenced unit.

There are no documented cultural, historic or archaeological features located within the Hi‘i fenced unit. Appendix D contains (1) the 1996 letter from the State Historic Preservation Division regarding the Lāna‘i Hale fencing; (2) a summary of the 2003 Cultural Resource Investigation (pulled from Maly 2020); and (3) the Service’s June 16, 2023, letter determining no effects under section 106 of the National Historical Preservation Act and its implementing regulations 36 CFR § 800.

Native seabirds have value in traditional Hawaiian culture and practice. Some families consider the seabirds as their ancestors or guardians, called the ‘aumākua in Hawaiian language. This is particularly true of families that engage in fishing and have ties to the ocean. More broadly native seabirds are important symbols in Hawaiian culture and are considered special because they inhabit all three realms: land (because they nest in burrows), air, and sea. Seabirds were also of practical value to Native Hawaiians for feathers and food (Rose et al. 1993, Boynton 2004; Xamanek Researches 1989). Seabird feathers held spiritual power (mana), reflected in their incorporation in cultural artifacts such as kāhili (staff), ‘ahu ‘ula (cloaks), lei hulu (feathered lei), mahiole (feathered helmets), and akua hulu (feathered images). Some species were of particular value, including ‘iwa (Great Frigatebird, *Fregata minor*) and koa‘e‘ula (Red-tailed tropicbird, *Phaethon rubricauda*) (Brigham 1918).

Seabirds that feed at sea and return to shore at night were used to navigate back to land from fishing or trading voyages (Hebshi et al. 2008). Hawaiians observed seabird behavior to indicate changing weather patterns (KESRP 2017). Hawaiian proverbs also reflect the role of seabirds and finding fish: “Ka i‘a ‘imi i ka moana, na ka manu e ha‘i mai,” or “The fish sought for in the ocean, whose presence is revealed by birds” and “Pōhai ke manu maluna, he i‘a ko lalo” or “When the birds circle above, there are fish below” (Pukui 1983). In modern times, seabirds continue to play a role for aku (skipjack tuna) fishermen, as the behavior of seabirds at sea tells what is happening in the ocean miles away, providing valuable information for a successful fishing trip (Boynton 2004).

Description of Cumulative Impacts, Environmental Trends, and Planned Actions

There are no other planned actions or environmental trends anticipated to impact cultural and archaeological resources in the Hi‘i fenced unit.

Impacts on Affected Resource

The evaluation of impacts on cultural, historic, and archaeological resources is based on identifying cultural resources within or close to the project area and determining the direct and indirect impacts that may affect these resources. Impacts to historical and archeological resources would be considered significant if (1) prehistoric or historic resources that are listed or potentially eligible for listing on the National Register of Historic Places are disturbed or destroyed; (2) Native Hawaiian resources are physically desecrated or destroyed; or (3) access to traditional areas is affected.

No Action Alternative – Current Management Strategies

The No Action alternative would maintain existing management and result in no changes to archaeological or cultural resources or access to traditional areas.

Proposed Action – Aerial Application of Rodenticide

Based on literature reviews, previous discussions with the State Historic Preservation Division regarding the Lānaʻi Hale Watershed Fence construction, archaeological inventory surveys previously conducted in the broader project area by the Service, and interservice consultation with our zonal archeologists, no known archaeological, historic, or cultural resources are present within the Hiʻi fenced unit (Appendix D). Moreover, the activities proposed, the targeted aerial application of diphacinone, and post-release monitoring, will involve minimal ground disturbance, are located away from areas of human activity, and are consistent with existing conservation activities. Successful rodent eradication within the Hiʻi fenced unit, and the corresponding increase in seabird populations, would be considered to have a beneficial impact on cultural resources by enhancing a species with cultural importance.

Monitoring

A number of monitoring activities are in place in the project area, including: (1) assessment of the distribution and status of breeding ʻuaʻu; (2) assessment of the distribution and status of alien plant and animal species within the Hiʻi fenced unit; (3) assessment of the status and stability of native plant and snail communities within the Hiʻi fenced unit; (4) monitoring for ungulate, cat, and rat activity to assess the integrity of the ungulate and predator-proof exclosure fence. Pūlama Lānaʻi and partners have been conducting reproductive success and song meter monitoring in the (what was then-planned) predator-fenced area since 2016, and in the adjacent colonies starting in 2017. Static song meter units have been deployed inside the fenced area as well as other petrel colony locations around Lānaʻi since 2015 to monitor long-term colony change. Existing and planned camera monitoring of trails will allow for comparison of predator activity and movement in colonies (independent of predation rates on burrows) before and after rat eradication within the fenced unit (Pūlama Lānaʻi 2021).

USDA NWRC will guide the monitoring design and conduct sample analysis for diphacinone residue to help determine non-target impacts. Toxicological monitoring will occur before and after aerial application of rodenticide. Water samples will be taken before and after rodenticide application from a Lānaʻi Water System well ~820 ft (250 m) downslope from the fence and analyzed for diphacinone. Tissue samples will be taken from feral cats, trapped rodents, and any other potential bycatch and analyzed for diphacinone by USDA NWRC (Pūlama Lānaʻi 2021). Given how quickly diphacinone breaks down in the environment, all toxicological monitoring should be completed within six months of the aerial application of diphacinone.

Rat activity is currently camera monitored at seabird burrows as a primary metric for impact on the ʻuaʻu. Tracking tunnels and the use of snap traps to detect and assess relative activity of rodents before and after the eradication effort may also be deployed. Tracking tunnels consist of ink cards baited and inserted into tunnel boxes. Rodent activity levels are based on foot-tracks in

the tracking tunnels. Snap traps would be used to both detect presence as well as remove any remaining rats. Under the Proposed Action, rodent monitoring will continue indefinitely within the Hi‘i fenced unit. Monitoring efforts would be more intensive immediately following the aerial application of rodenticide, to confirm the presence/absence of rats after treatment. Once eradication is confirmed, monitoring for rats would be focused along potential entry points (e.g., along the fencelines) to facilitate identification of rat entry into the fenced area, should it occur.

Summary of Analysis

No Action Alternative – Current Management Strategies

As described above, the No Action alternative would be anticipated to allow rat populations to remain within the predator-proof fenced area due to the limited access to all portions of the fenced unit. The negative direct and indirect impacts of rats on native wildlife and plants would continue: seabirds would be subject to predation, seeds and leaves of native plants would continue to be eaten, and seeds of invasive plants would be distributed within the fencing. This alternative does not meet the purpose and need of the Service as described above, because it would maintain the rat population within the Hi‘i fenced unit.

Proposed Action – Aerial Application of Rodenticide within the Hi‘i Fenced Unit

As described above, the Proposed Action would eradicate rats from within the Hi‘i fenced unit. This would benefit ‘ua‘u by removing a major predator and lead to an increase in the number of individuals of this species. Other native plants and native land snails would be anticipated to benefit from reduced predation by rats, resulting in overall healthier native habitat conditions. Non-target wildlife species are either not anticipated to be adversely impacted by the Proposed Action (e.g., *Partulina* spp., ‘ōpe‘ape‘a) or have a minor impact with mortality extremely unlikely (e.g., pueo, game birds). No negative impacts to water resources are anticipated due to the rapid degradation of diphacinone, the lack of intermittent or perennial streams in the project area, and the distance of the Hi‘i fenced unit from the ocean. No negative impacts to archaeological or cultural features are anticipated because there are no documented sites within the Hi‘i fenced unit. This alternative meets the purpose and needs of the Service as described above because it would eradicate rats from the Hi‘i predator-proof fenced unit.

List of Sources, Agencies and Persons Consulted

DLNR Office of Conservation and Coastal Lands

DLNR DOFAW

Grey Boar Wildlife Services

Hawai‘i Endangered Species Recovery Committee

Hawai‘i Environmental Council

National Fish and Wildlife Foundation

Pacific Rim Conservation

Pacific Seabird Group

Pūlama Lānaʻi

U.S. Army Garrison, Oʻahu Army Natural Resources Group

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State Coordination

There is limited State involvement in this action. It does not affect State land, and the State Office of Conservation and Coastal Lands has advised that no separate conservation district use permit or State chapter 343 requirements would be triggered by the Proposed Action. The State Division of Forestry and Wildlife is supportive of conservation efforts to expand predator-free areas for the benefit of native plants and animals.

Public Outreach

Informal public outreach has occurred through the actions of Pūlama Lānaʻi. The Proposed Action is located on private land, in an area with restricted public access. Public presentations on the Hiʻi predator-proof fencing, ʻuaʻu conservation, and the Proposed Action have been discussed at previous Hawaiʻi Conservation Conferences and Pacific Seabird Group meetings. Community outreach on Lānaʻi includes discussions with the Island Club Homeowners Association, community meetings in 2020 and 2021, and informal one-on-one talks with members of the community. In general, the public on Lānaʻi is supportive of efforts to protect native species such as the ʻuaʻu and no significant direct or indirect impacts to members of the general public have been identified. An informational public meeting was held June 19, 2023, in advance of the publication of this environmental assessment. A press release will announce availability of this environmental assessment for comment, and another public meeting will be held, if necessary, based on inquiries or comments on this environmental assessment.

Determination

This section will be filled out upon completion of the public comment period and at the time of finalization of the Environmental Assessment.

- ☐ The Service's action will not result in a significant impact on the quality of the human environment. See the attached **"Finding of No Significant Impact".**
- ☐ The Service's action **may significantly affect** the quality of the human environment and the Service will prepare an Environmental Impact Statement.

Signatures

Submitted By: U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, 300 Ala Moana Boulevard, Suite 3-122, Honolulu, Hawai'i 96850

Field Supervisor Signature/Date:

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Appendix A

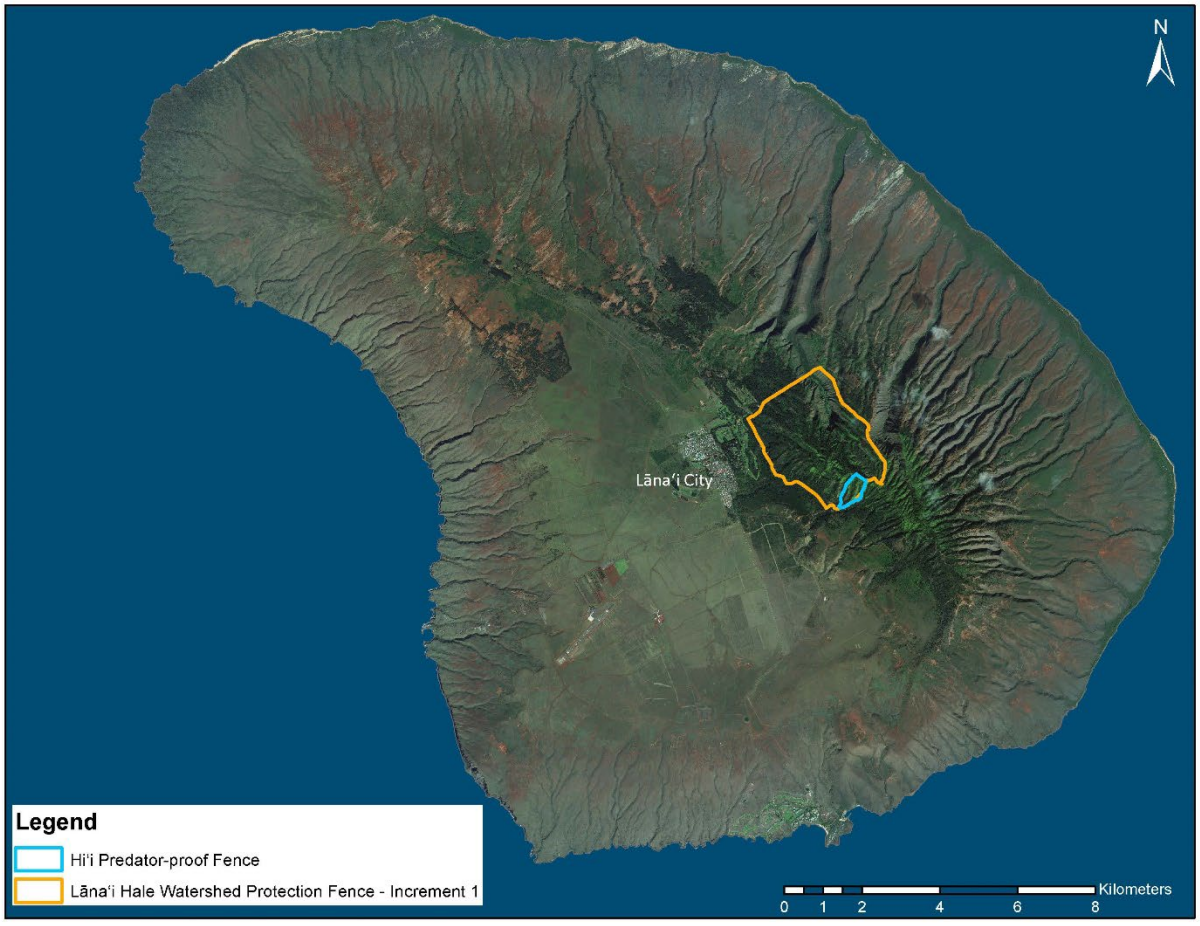

Figure 1: Map of the island of Lānaʻi showing the location of the existing Lānaʻi Watershed Protection ungulate-exclusion fence (Increment 1), enclosing approximately 1,800 acres and built in the early 2000s, and the Hiʻi Predator-proof Fence.

Appendix B

Predator Proof Fence Schematics

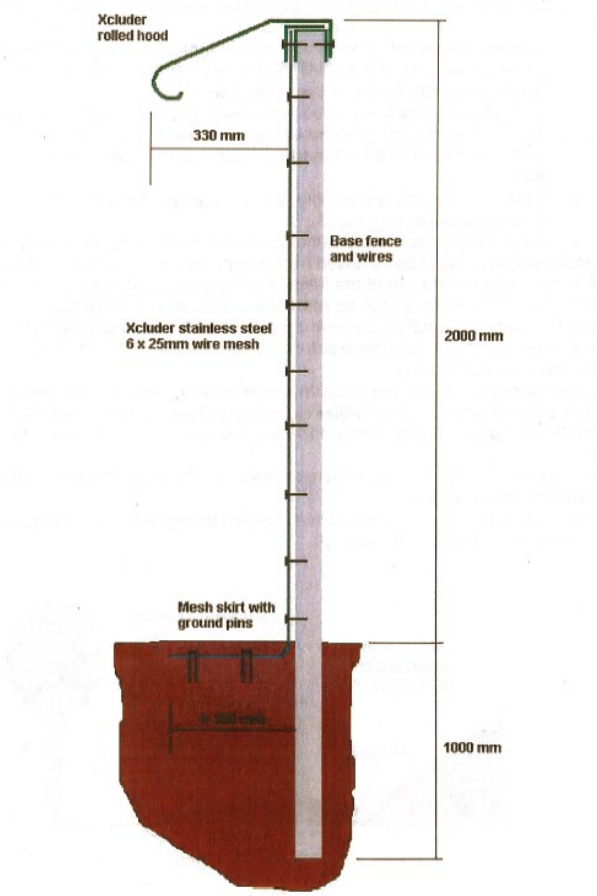

Figure B-1. Illustration of Fence Design. Schematic provided by Xcluder, New Zealand Fence Company.

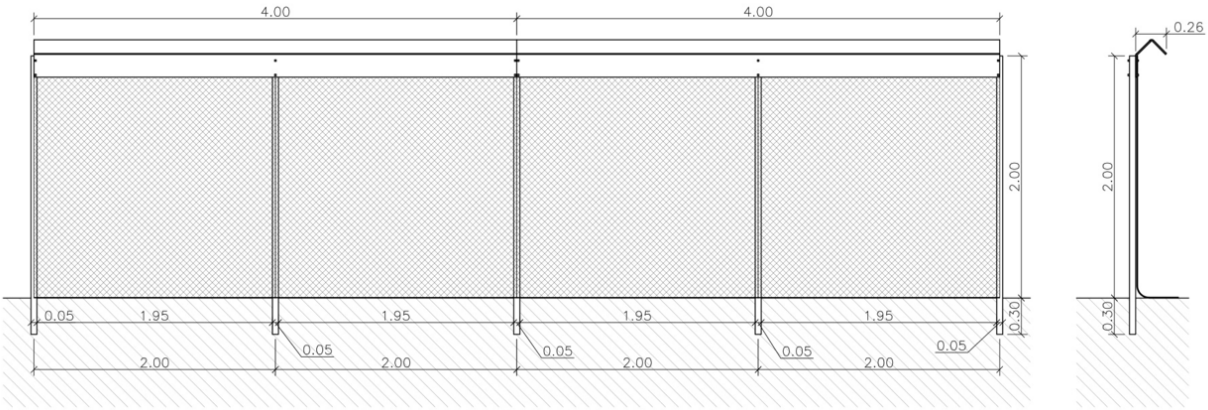

Figure B-2. Fence schematic, front and side view (measurements in meters). Illustration credit: Young et al., (2018).

Figure B-3. Photo of predator-proof fence at Kaʻena Point NAR, Oʻahu. View from above towards Kaʻena Point. Photo by Lindsay Young.

Appendix C

D-50 Conservation Label

RESTRICTED USE PESTICIDE

DUE TO HAZARDS TO NON-TARGET SPECIES

For retail sale only to employees of federal agencies responsible for wildlife management to be used only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification.

DIPHACINONE-50 CONSERVATION

A fish-flavored, weather-resistant rodenticide for control or eradication of invasive rodents on islands or vessels for conservation purposes.

STATE OF HAWAII
Department of Agriculture
ACCEPTED
LICENSE NO.
8600.1

ACTIVE INGREDIENT:	
Diphacinone (2-Diphenylacetyl-1,3-Indandione):	0.005%
OTHER INGREDIENTS:	99.995%
TOTAL:	100.000%

KEEP OUT OF REACH OF CHILDREN

CAUTION

FIRST AID

IF SWALLOWED:
- Call a physician or poison control center immediately for treatment advice.
- Have person sip a glass of water if able to swallow.
- Do not induce vomiting unless told to do so by a poison control center or doctor.

IF ON SKIN OR CLOTHING:
- Take off contaminated clothing.
- Rinse skin immediately with plenty of soap and water for 15-20 minutes.
- Call a poison control center or doctor immediately for treatment advice.

IF IN EYES:
- Hold eye open and rinse slowly and gently with water for 15-20 minutes.
- Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
- Call a poison control center or doctor immediately for treatment advice.

Have the product container or label with you when calling a poison control center or doctor or going for treatment. If you need immediate medical attention, call the Poison Control Center at 1-800-222-1222 or a doctor. For non-emergency information concerning this product, call the National Pesticide Information Center at 1-800-858-7378.

NOTE TO PHYSICIAN: If swallowed, this material may reduce the clotting ability of the blood and cause bleeding. If ingested, administer Vitamin K_1, intramuscularly or orally, as indicated in bishydroxycoumarin overdose. Repeat as necessary based on monitoring of prothrombin times.

TREATMENT FOR PET POISONING: If pet eats the bait, call a veterinarian at once.
NOTE TO VETERINARIAN: For animals ingesting bait and/or showing poisoning signs (bleeding or elevated prothrombin times), administer Vitamin K_1.

Manufactured for:
United States Department of Agriculture
Animal and Plant Health Inspection Service
4700 River Road, Unit 149
Riverdale, MD 20737
EPA Est. 61282-WI-1

Net Contents: _____

Batch Code: _____

PRECAUTIONARY STATEMENTS

CAUTION

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Harmful if swallowed. Harmful if absorbed through the skin. Causes moderate eye irritation. Avoid contact with eyes, skin, or clothing. Keep away from humans, domestic animals, and pets.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Applicators and other handlers must wear:

- Long pants, shoes plus socks, and barrier laminate gloves.

Any person who retrieves carcasses or unused bait following application of this product must wear:

- Barrier laminate gloves.

USER SAFETY REQUIREMENTS

Follow the manufacturer's instructions for cleaning/maintaining PPE. If no such instructions are provided for washables, use detergent and hot water. Keep and wash PPE separately from other laundry. Remove PPE immediately after handling this product. Wash the outside of barrier laminate gloves before removing. As soon as possible, wash hands thoroughly after applying the bait and before eating, drinking, chewing gum, using tobacco, or using the toilet, and change into clean clothing.

ENVIRONMENTAL HAZARDS

This product is toxic to mammals, birds, and other wildlife. Predatory and scavenging mammals and birds might be poisoned if they feed upon animals that have eaten bait. **DO NOT** contaminate water when disposing of equipment wash water or rinsate.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

READ THIS LABEL: Read the entire label. This product must be used strictly in accordance with this label's precautionary statements and use directions, as well as with all applicable State and Federal laws and regulations.

USE RESTRICTIONS

- **IMPORTANT: DO NOT** expose children, pets, or livestock to this product. Take all appropriate steps to limit exposure to and impacts on nontarget species, especially those for which special conservation efforts are planned or ongoing. To help prevent accidental exposures:
  1. Store this product in a location out of reach of children, pets, livestock, and nontarget wildlife.
  2. Apply bait only as specified on this label and in strict accordance with the **USE RESTRICTIONS** and **APPLICATION DIRECTIONS**.
  3. For applications involving bait stations, the bait stations must be tamper-resistant. Tamper-resistant bait stations must deny access to bait compartments by children, pets, and nontarget species larger in body size than the rodents being targeted by the control or eradication operation. Lock and secure bait stations, as necessary, to exclude nontarget species. In locations where captive or feral livestock occur, either remove or exclude such animals from the application site prior to treatment or make sure that the bait stations used are capable of denying them access to bait compartments.
  4. Dispose of the product container and any unused, spoiled, or unconsumed bait as specified under **STORAGE AND DISPOSAL**.
- This product may be used only to control or eradicate Norway rats (*Rattus norvegicus*), roof rats (*Rattus rattus*), Polynesian rats (*Rattus exulans*), house mice (*Mus musculus*), or other types of invasive rodents on islands for conservation purposes, or on grounded vessels or vessels in peril of grounding.
- This product is to be used for the protection of State or Federally-listed Threatened or Endangered Species or other species determined to require special protection.
- **DO NOT** apply this product to food or feed.
- **DO NOT** reuse implements used for applying bait for food or feed use.
- Treated areas with public access must be posted with warning signs appropriate to the current rodent control or eradication operation.
- Broadcast applications are prohibited on vessels or in areas of human habitation.
- The pilot in command has final authority for determining safe flying conditions. Do not make aerial broadcast applications in sustained winds exceeding 35 mph (30 knots).

APPLICATION DIRECTIONS

HAND BAITING APPLICATIONS:

Applicators may use the hand baiting methods at use sites for rats and mice as specified in Table 1.

Table 1.

Method	Use sites	Application rate	Additional baiting instructions
Tamper-resistant bait stations	• All use sites allowed on this label. • For canopy baiting: Follow the instructions below, as applicable, for **Bait bolas (sachets)** used for canopy baiting.	Rats: • 4.0-16.0 ounces (113.4-453.6 grams) per station or tray. • Space stations or trays at intervals of approximately 16-82 feet (5-25 meters) in a grid over the control area. • Check and replenish stations or trays at least once every 7 days. Mice: • 0.25-1.0 ounces (7.1-28.4 grams) per station or tray. • Space stations or trays at intervals of approximately 10-65 feet (3-20 meters) in a grid over the area. • Up to 3.0 ounces (85.1 grams) per station or tray may be needed at locations with high mouse activity. • Check and replenish stations or trays at least once every 7 days.	• See Item #3 under **USE RESTRICTIONS** and "**IMPORTANT:**" regarding the performance characteristics needed for tamper-resistant bait stations. • Where a continuous source of infestation is present, permanent bait stations may be established and bait replenished as needed.
Burrow baiting	• Uninhabited non-crop areas	Rats: • 3.0-4.0 ounces (85.1-113.4 grams) per active burrow entrance. • Flag treated burrows and inspect them frequently, daily if possible. • Reapply bait if the bait has been removed. Mice: • 0.25 ounces (7.1 grams) per active burrow entrance. • Flag treated burrows and inspect them frequently, daily if possible. • Reapply if the bait has been removed.	• Place bait within burrows in piles or within small bags made of rodent accessible material. • Holes should be made in plastic bags to allow the bait odor to escape. Plastic bags may be left unperforated if applied in areas where occasional immersion in water may occur. • Place bait far enough into burrow so that it can barely be seen. Do not plug burrows.
Bait bolas (sachets)	• Uninhabited grounded vessels or vessels in peril of grounding that are difficult or unsafe for applicators to enter. • Canopy of trees and shrubs in non-crop areas where sufficient food and cover are available to harbor populations of rodents in canopies of trees and shrubs.	Rats: • 4.0-16.0 ounces (113.4-453.6 grams) per small bag made of rodent accessible material. • Space bolas at intervals of approximately 16-82 feet (5-25 meters) in a grid over the area. • Check at least every 7-14 days and reapply if the bait has been removed. Mice: • 0.25-1.0 ounces (7.1-28.4 grams) per small bag made of rodent accessible material. • Space bolas at intervals of approximately 10-65 feet (3-20 meters) in a grid over the area. • Up to 3.0 ounces (85.1 grams) per bag may be needed at locations with high mouse activity. • Check at least every 7-14 days and reapply if the bait has been removed. Canopy baiting: • 4.0-16.0 ounces (113.4-453.6 grams) per small bag made of rodent accessible material. • Place bolas in the canopy at intervals of ≤160 feet (≤49 meters). • If possible, check at least every 7-14 days and reapply if the bait has been removed.	• Bait bolas should be knotted or otherwise sealed to avoid spillage. • Holes should be made in plastic bags to allow the bait odor to escape. Plastic bags may be left unperforated if applied in areas where occasional immersion in water may occur. • Throw or drop bolas into areas that are unsafe for applicators to access. • Place bolas in the canopy of trees or shrubs by hand or use long poles (or other devices). Bolas may be fitted with line or string to ensure canopy entanglement.

DIRECTIONS FOR USE, continued

APPLICATION DIRECTIONS, continued

BROADCAST APPLICATIONS:

Aerial and Ground Broadcast: Broadcast applications are prohibited on vessels or in areas of human habitation.

Broadcast bait pellets by helicopter or manually at a rate of 10 to 12.5 lbs. of bait per acre (11.1 to 13.8 kg/ha) per treatment. Make a second broadcast application typically 5 to 7 days after the first application, depending upon local weather conditions, at a rate no higher than 12.5 lbs. (13.8 g/ha) of bait per acre. In situations where weather or logistics only allow one bait application, a single application may be made at a rate no higher than 20.0 lbs. bait per acre (22.5 kg/ha).

Assess baited areas for signs of residual rodent activity after the last broadcast application (typically 7-10 days post-treatment).

If rodent activity persists, conduct hand baiting applications as specified in Table 1 in areas where rodents remain active. If the terrain does not permit use of hand baiting methods, continue with broadcast baiting, limiting such treatments to areas where active signs of rodents are seen. Maintain treatments for as long as rodent activity is evident in the area and rodents appear to be accepting bait.

POSTTREATMENT CLEAN-UP

For all methods of baiting, monitor the baited area periodically for carcasses during and after the operation, if possible. Using barrier laminate gloves, collect and dispose of any carcasses in accordance with federal, state, and local regulations. Carcasses do not need to be collected in areas where non-target animals have naturally high mortality rates and collecting and disposing of carcasses is impractical (e.g., some bird breeding areas).

Using barrier laminate gloves, collect and dispose of bait stations and trays at the end of control or eradication operations as specified under **STORAGE AND DISPOSAL**. Bait stations and bolas applied in grounded vessels, vessels in peril of grounding, canopies, abandoned structures or infrastructure, or landscape features that are unsafe for applicators to access, do not have to be retrieved.

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

PESTICIDE STORAGE: Store only in original closed container in a cool, dry place inaccessible to unauthorized people, children, and pets. Store separately from fertilizer and away from products with strong odors that may contaminate the bait and reduce acceptability. Spillage should be carefully swept up and collected for disposal.

PESTICIDE DISPOSAL: Wastes resulting from the use of this product may be disposed of at an approved waste disposal facility.

CONTAINER HANDLING: ***Nonrefillable container.*** Do not reuse or refill this container.

Plastic Containers: Triple rinse (or equivalent) promptly after use. Offer for recycling, if available. Otherwise, puncture and dispose of empty container in a sanitary landfill or by incineration if allowed by state and local authorities.

Paper Containers: Dispose of empty container at an approved waste disposal facility or by incineration if allowed by state and local authorities.

RESTRICTED USE PESTICIDE

DUE TO HAZARDS TO NON-TARGET SPECIES

For retail sale only to employees of federal agencies responsible for wildlife management to be used only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification.

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ACTIVE INGREDIENT:	
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OTHER INGREDIENTS:	99.995%
TOTAL:	100.000%

KEEP OUT OF REACH OF CHILDREN

CAUTION

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Harmful if swallowed. Harmful if absorbed through the skin. Causes moderate eye irritation. Avoid contact with eyes, skin, or clothing. Keep away from humans, domestic animals, and pets.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Applicators and other handlers must wear:

- Long pants, shoes plus socks, and barrier laminate gloves.

Any person who retrieves carcasses or unused bait following application of this product must wear:

- Barrier laminate gloves.

USER SAFETY REQUIREMENTS

Follow the manufacturer's instructions for cleaning/maintaining PPE. If no such instructions are provided for washables, use detergent and hot water. Keep and wash PPE separately from other laundry. Remove PPE immediately after handling this product. Wash the outside of barrier laminate gloves before removing. As soon as possible, wash hands thoroughly after applying the bait and before eating, drinking, chewing gum, using tobacco or using the toilet, and change into clean clothing.

ENVIRONMENTAL HAZARDS

This product is extremely toxic to mammals, birds, and other wildlife. Predatory and scavenging mammals and birds might be poisoned if they feed upon animals that have eaten bait. Do not contaminate water when disposing of equipment wash water or rinsate.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

READ THIS LABEL: NOTE: This is the container label. See the enclosed full product label for **Diphacinone-50 Conservation** (EPA Reg. No. 56228-35) for complete **DIRECTIONS FOR USE** and all other label and use information. Read the entire label. This product must be used strictly in accordance with this label's precautionary statements and use directions, as well as with all applicable State and Federal laws and regulations. **A copy of the full product label must be in the possession of the user at the time that the product is applied.**

STORAGE AND DISPOSAL

Do not contaminate water, food, or feed by storage or disposal.

PESTICIDE STORAGE: Store only in original closed container in a cool, dry place inaccessible to unauthorized people, children, and pets. Store separately from fertilizer and away from products with strong odors that may contaminate the bait and reduce acceptability. Spillage should be carefully swept up and collected for disposal.

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CONTAINER HANDLING: ***Nonrefillable container.*** Do not reuse or refill this container.

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Paper Containers: Dispose of empty container at an approved waste disposal facility or by incineration if allowed by state and local authorities.

Manufactured for:
United States Department of Agriculture
Animal and Plant Health Inspection Service
4700 River Road, Unit 149
Riverdale, MD 20737
EPA Est. 61282-WI-1

Net Contents: _____

Batch Code: _____

Appendix D

Supporting Archaeological Documentation

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY
GILBERT COLOMA-AGARAN

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

February 22, 1996

MEMORANDUM

LOG NO: 16040 ✓
DOC NO: 9512SC03

TO: Karl R. Dalla Rosa, Coordinator
Forest Stewardship Program
Division of Forestry and Wildlife

FROM: Don Hibbard, Administrator
State Historic Preservation Division

SUBJECT: **Historic Preservation Comments on the Forest Stewardship Plan for the Lanaihale Stewardship Area**
Multiple Ahupua'a, Lanai
TMK:4-9-02:1

Our comments are late, and we apologize; we hope that they are of use to you in finalizing your plans. Our review is based on historic reports, maps, and aerial photographs maintained at the State Historic Preservation Division; no field inspection was made of the subject parcel.

According to our records, several known historic sites may be within the boundaries of the proposed project area for the Lanaihale Stewardship Area. The attached map shows the general locations of these sites, as recorded in our files. These historic sites include the following properties, given with their State Inventory of Historic Places (SIHP) numbers:

> 50-40-98-29: Hi'i Heiau. Situated at the foot of Pu'u Ali'i, Hi'i Heiau is located at about the 2000-foot elevation. The *heiau* is one of only 11 that are known to exist on Lana'i.
>
> 50-40-98-33: The Ho'okio Fortified Ridge Complex. One of the few fortified ridge sites recorded in the islands, the Ho'okio Complex consists of three artificially cut notches in the Ho'okio Ridge at the head of Mauanlei Gulch, at about the 2500-foot elevation. There are legendary accounts of battles which took place at the Ho'okio fortifications.

50-40-98-144: The Maunaloi Taro Complex. The Maunalei Taro lo'i complex is located on the stream flats of Maunalei Stream, from approximately 70 to 650 meters *mauka* of the pump house. Although the site's location falls within the Lanaihale Project area boundaries, the complex is below the 900-foot elevation.

50-40-98-207: The Kealiaaupuni Complex. Most of the sites within this complex, including the Luahiwa Petroglyphs and the Piliamoe Workshop lie outside of the Lanaihale Project Area boundaries; an arbitrarily drawn rectangle encloses the sites in the complex. However, at least several sites thought to be associated with the Kealiaaupuni Complex (including a heiau, other petroglyphs, an adze quarry, and terraces) may lie in the upper portion of the Site -207 rectangle, which appears to overlap with the proposed Lanaihale Project Area.

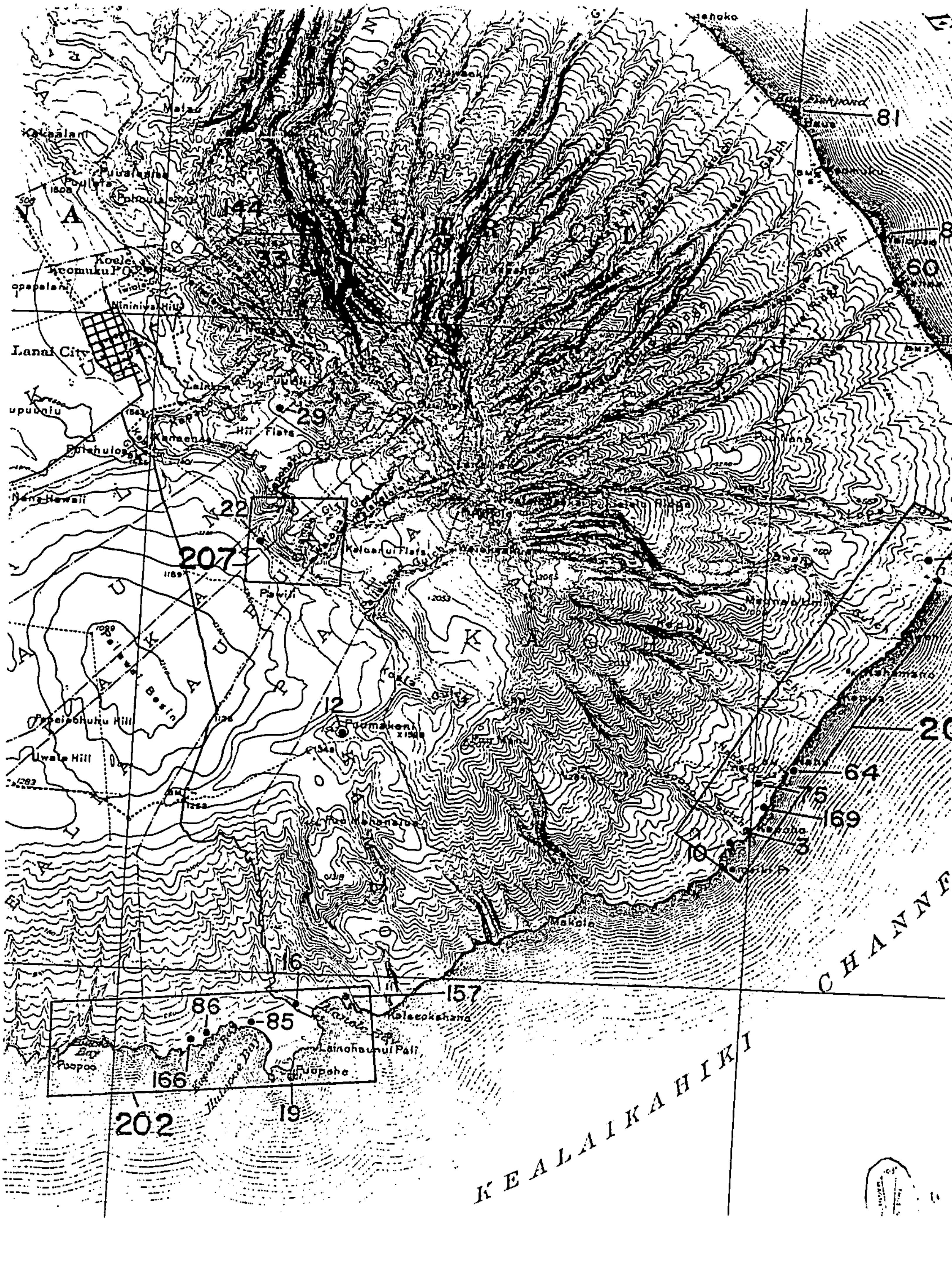
All of these historic sites and site complexes are eligible for inclusion, under multiple criteria, on the Hawai'i and National Registers of Historic Places. In addition, it is likely that there are other, as-yet-unidentified historic sites within the boundaries of the proposed Lanaihale Project Area. Since, as noted above, some of the sites listed above (i.e., Sites -144 and parts of Site -207) lie below the 2000-foot contour which will demarcate the lower limits of the reforestation activities, the proposed undertakings will have "no effect" on the sites below this elevation point.

In the case of the other previously identified historic sites (Sites - 29, -33, and portions of -207), it appears that they lie at or above the 2000-foot elevation. In order for the activities planned for the Lanaihale Stewardship Program to have "no effect" on significant historic sites, we recommend the following actions:

(1) All clearing of vegetation, including the removal of trees such as ironwood or guava, shall be done by hand.
(2) Should historic sites such as walls, platforms, pavements, or mounds, or remains such as artifacts, burials, concentrations of shell or charcoal be encountered during construction activities, work shall cease immediately in the immediate vicinity of the find, and the find shall be protected from further damage. The project crew shall immediately contact the State Historic Preservation Division (587-0013), which will assess the significance of the find and recommend an appropriate mitigation measure, if necessary.

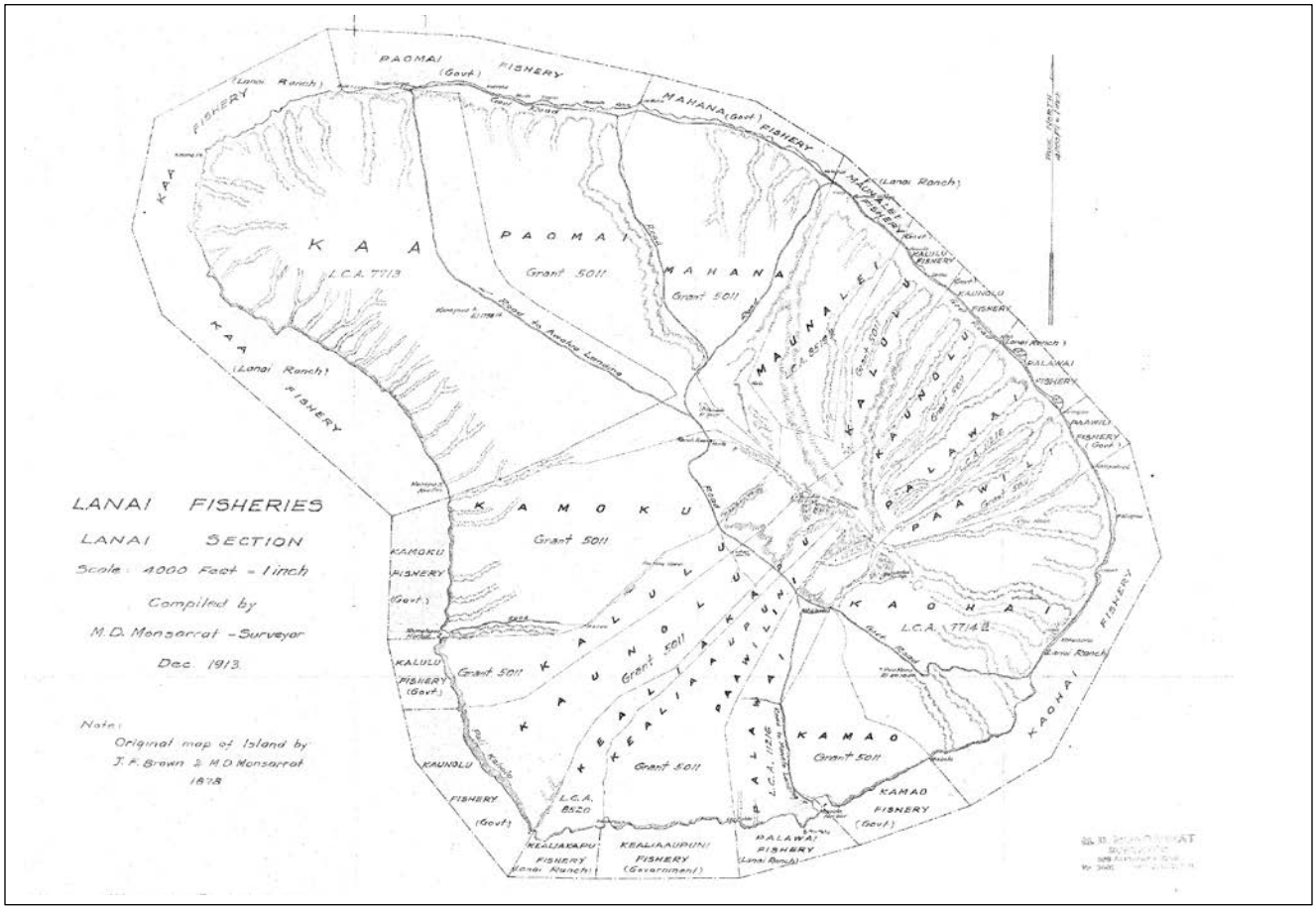
Should you have any questions, please feel free to call Sara Collins at 587-0013.

SC:jen



2003 SUMMARY--KUAHIWI A KAI —
HISTORICAL ACCOUNTS AND RECORDS
DESCRIBING LĀNA‘I’S BIO-CULTURAL LANDSCAPE RESOURCES
(V. 4 - compiled by Kepā Maly from the Lāna‘i Culture & Heritage Center/Pūlama Lāna‘i Archives)

BACKGROUND



Map of the Island of Lanai – Lanai Fisheries (M.D. Monsarrat, Dec. 1913. G. C. Munro Collection, Lāna‘i Culture & Heritage Center)

The documents presented in this collection of Lāna‘i narratives cover a wide range of subjects. Among them are:

- traditional Hawaiian knowledge of place based on the earliest written and oral historical accounts and archaeological evidence;
- eyewitness descriptions of the landscape, land use, and changes in the environment from the 1820s to the 1970s;
- rainfall, temperature, and storm events; and
- a sampling of scientific and resource management studies conducted on Lāna‘i over the last 140-plus years.

have agreed to review and update annually and which includes a ten-year plan to (a) construct exclosure fencing around the Lanaʻihale watershed (at approximately the 2000-foot elevation level) (the "Lanaʻihale Fencing Project"), (b) control and manage feral ungulates in this area, (c) engage in fire control measures, including controlling and managing non-native grasses and other fire hazards and (d) engage in nursery propagation of native flora and plantings of such flora upon the completion of the exclosure fencing…

April 2003
Raymond, A.
Lanai Summit Fence, Phase 1, Lanai Island: Cultural Resource Investigation. Sherwood, OR: U.S. Fish and Wildlife Service.

In 2003, the U.S. Fish and Wildlife Service conducted a cultural resource investigation for a wildlife control fence in the upland, forested area east of Lānaʻi City. …In compliance with Section 106 of the National Historic Preservation Act, the U.S. Fish and Wildlife Service conducted a cultural resource investigation in the area of potential effects (APE) of the proposed Lanai Summit Fence, Phase 1 in the mountains of Lanai Island. No cultural resources (historic properties) were identified within the fence APE. One cultural site 50-40-98-29 (Heiau at Hii) was identified and documented near, but outside, the fence APE.

Undertaking
To control feral deer, the U.S. Fish and Wildlife Service proposes to help the Lanai Company (Castle and Cooke Resorts LLC) construct a fence around the Lanaihale. The fence will ultimately stretch 41 kilometers around montane area of Lanai Island. The present project concerns Phase 1, a 7.5 kilometer section of the Lanai Summit Fence (Figure 1). The fence corridor will be 3-6 meters wide and has been previously cleared of vegetation with hand tools. Triple galvanized 8' steel poles or 10' kiawe posts will be placed every 20-30' along the fence line, at depths of 2' and 3' respectively. Fence posts will be installed with post pounders and post hole augers. Kiawe posts will serve as comer and load-bearing posts. Excavation is limited to construction of two deer (cattle) guards where an existing dirt road crosses the proposed fence line. The area disturbed by each excavation will measure approximately 30' x 15' to a depth of 3 feet.

Area of Potential Effects (APE)
The area of potential effects (APE) is limited to the fence corridor 6 meters wide by 7.5 kilometers long (Figure 1) on land owned by the Lanai Company. Portions of the Phase l Lanai Summit Fence follow an overhead power line, an underground water line, ditch, and a road.

Natural Setting
Phase 1 of the Lanai Summit Fence ranges between 550 meters and 865 meters above sea level and occurs primarily in a mesic montane forest. The highest portions of the project area edge into the cloud forest community (Hobdy 1993). Annual rainfall in the project area is only 35 inches, because Lanai lies in the rain-shadow cast by Maui. Under native conditions ohia, koa, and kolea, were the most conspicuous trees shielding an understory of ferns and shrubs.

The alignment of the fence includes portions of dry and wet forests, grasslands and brush lands at various elevations and with a variety of volcanic soil types. These areas are exposed to moisture laden northeast trade winds for most of the year and, seasonally, by dry kona winds. Much of the alignment has been severely altered botanically by the activities of man including clearing, planting, and the escape of non-native plants from cultivated areas. Only 10% of the

vegetative cover in the area is native. Appendix 1 lists native and non-native plants along the fence route.

Non-native livestock have dramatically altered the vegetation and increased soil erosion on Lanai. Goats and sheep were introduced in the early 1800s. Walter M. Gibson continued the introduction in mid-1800s, but his operation eventually failed. Pigs were brought to Lanai in the 1880s. They died out and were reintroduced along with cattle in 1911. Sport hunters welcomed the release of axis deer in 1920, mouflon sheep in 1954, and pronghorn in 1959. But the animals, particularly goats, destroyed much of the native forest in the Lanaihale. The ungulates decimated the shrubs and grasses leaving the bare ground open to devastating water and wind erosion. “It was a common sight to see clouds of red dirt being blown out ten miles to sea from the cliff-bound shores ... “(Gay 1965:83).

The Lanai Company purchased the island from the Gays in 1910. Their manager, George C. Munro, built a fence around the Lanaihale to control goats and sheep. Munro also supervised the reforestation of large areas of the Lanaihale with nonnative plants (Munro 1954). Today, most of the exotic animals are gone but much of the native forest in the project area has been replaced by nonnative Myrica and Psidium forest communities (Hobdy 1993).

Cultural Setting

The Lanai Summit Fence crosses the upper elevations of five ahupuaas: Kaunolu, Kalulu, Kamoku, Paomai, and Mahana. The exact boundaries of the ahupuaas have not been mapped or surveyed in the Lanai upland. Figure 1 shows the approximate boundaries of ahupuaa based on the map and gazetteer supplied by Emory (1924: plate 1, 29-37).

Except for Emory's (1924) work in the early 1920s, there has been very little archaeological work on Lanai. Emory recorded 489 residential structures on the island, several petroglyph sites and 10 large heiaus. The population of Lanai was limited by its relative aridity. Except for Maunalei Gulch, the island boasts no permanent surface streams. Much of the island was unsuitable for native agriculture. Most sites identified by Emory occur along the coast, with a smaller number of sites in the central Palawai Basin.

The smallest of the 10 large heiaus recorded by Emory is called the “Heiau at Hii” (site number 50-40-98-29) and it occurs near, but outside the project area (Figure 1). Except for the Emory's identification of the Heiau at Hii no other archaeological investigations have been conducted in the mountainous upland of the project APE.

The fence APE has been subject to extensive grazing by nonnative herbivores in the 19th and 20th centuries. The two ends of the proposed fence segment terminate at spots along the Munro Trial. This road was built by the Lanai company in the early 1950s (Munro 1954:124).

Background Research

Background research was conducted by reviewing material from the Hawaii State Archives, the Bishop Museum Archives, University of Hawaii Hamilton Graduate Library, and Department of Land and Natural Resources. The Mahele database of Waihona Aina (Waihona Aina) returned negative results in a search for claims in the upland where the fence corridor is located.

Fieldwork

The FWS conducted a cultural resource inventory of the fence corridor APE on August 9, 2002. The field crew consisted of Anan Raymond MA, FWS regional archaeologist; and Virginia Parks

FWS archaeologist; Ron Walker, FWS wildlife biologist; Saul Kahihikolo, Lanai Company (Castle and Cooke Resorts LLC); Bryan Plunkett, Lanai Company (Castle and Cooke Resorts LLC); and Uncle Sol Kaopuiki of Lanai City.

The survey crew accessed the project area from the Munro trail and walked the fence corridor by starting in the upland at the south end of the APE. The survey route ended at the north end of the project under a powerline on an overlook of the uplands of Maunalei Gulch. Except for a couple steep tributaries to the Hulopoʻe gulch on the north end of the project, the entire corridor was inspected by this pedestrian survey.

The fence corridor had been cleared of vegetation with hand tools at the time of the cultural resource survey. Clearing vegetation required significant effort on the steep ridge that drops below the puu to the road at Kapohaku Gulch and in the gulches at the north end of the project. The section of fence between Kapohaku gulch and Kaiholena followed old and previously cleared roads and ditches and required much less vegetation clearing (Figures 2 and 3).

Results

No cultural resource sites were identified in the APE of the fence project.

One cultural site, 50-40-98-29 the Heiau at Hii, (Emory 1924:61, 67, Munro 1954:47) was relocated. The site lies outside the fence area of potential effects (APE). The site occurs about 25 meters northeast of the fence corridor within the area that will benefit by the presence of the fence. No cultural resources or features were identified within or near the fence APE. All members of the survey party, including representatives of the Lanai Company who will construct the fence, examined the cultural site and were satisfied that the fence will not impact it.

The Heiau at Hii is described in detail on the attached site inventory form (Appendix 2). The site covers a 2800 square meter area and contains rock alignments, earthen terraces, a platform with a rectangular stone wall enclosure structure and an oval shaped stone-lined pit. No artifacts were observed. The site is obscured by a dense cover of nonnative vegetation (principally albezia), forest litter, and duff. Our observations of the site corroborate Emory's. Uncle Sol was aware of the site but commented that little was known about its history or function. He said that the pit may have held pigs or perhaps water and the site may have also been a residential location as well as a heiau.

Conclusions and Recommendations

Given that no cultural resources occur in the APE, the fence construction project should proceed as planned. The Lanai Company is aware of the heiau site near the APE and is confident that they will not impact the site during fence construction. If workers discover cultural resources during fence construction, they should immediately halt work in the vicinity of the resources and contact the U.S.

Appendix 1

The following plant list, prepared by Ron Walker, identifies the common plants along the fence route.

Native	Endemic or Indigenous
Ohia	Metrosideros polymorpha
Uluhe	Dicranopteris spp.
Aʻalii	Dodonea viscosa

Pukiawe	Styphelia tameiameiae
Lama	Diospyrus sandwicensus
Mamane	Sophora Chrysophylla
Uhaloa	Waltheria indica
Naupaka Kuahiwi	Scaevola chamissoniana
Olopua	Nestegis sandwicensis
Iliahi	Santalum freycinetianum
Ulei	Osteomeles anthyllidifolia
Palapalai (fem)	Microlepia setosa
Koa	Acacia koa
Uluhe (fem)	Dicranopteris linearis
Kukui	Aleurites moluccana
Wiliwili	Erythrina sandwicense
Halapepe	Pleomele fernaldi
Ahakea	Bobea elatior

Alien	Introduced, naturalized
Balloon plant	Asclepias curassavica
Brooms edge	Andropogon virginicus
Molasses grass	Melinus minutiflora
Natal redtop grass	Rhynchelytrum repens
Bamboo	Bambusicola spp.
Gum Tree	Eucalyptus robusta
Formosan koa	Acacia confusa
Strawberry guava	Psidium cattleianum
Yellow guava	Psidium guajava
Lantana	Lantana camara
Cook pine	Araucaria columnaris
Silver oak	Grevillea robusta
Albizzia	Albizia lebbeck
Ironwood	Casuarina equisetifolia
Guinea grass	Panicum maximum
Glory bush	Tibouchina herbacea
Manuka	Leptospermum scoparium
Paperbark	Melaleuca quinquenervia
Coffee	Coffea arabica
Russian thistle	Salsola kali
Jamaican vervain	Stachytarpheta jamaicensis
New Zealand flax	Phormium tenax
Kahili ginger	Hedychium garnerianum

July 31, 2003
State Historic Preservation Division
Log No. 2003.1264, Log No. 0307MK25
Historic Preservation Review, Section 106 Review – Archaeological Inventory Survey U.S Fish and Wildlife Service Lanaʻi Summit Fence, Phase I Multiple Ahupuaʻa, Lahaina District. Lanaʻi. TMK (2) 4-9

…Thank you for the opportunity to review this report which our staff received on June 2, 2003 (Raymond 2003, Lanai Summit Fence. Phase 1, Cultural Resources Investigation. U.S. Fish

and Wildlife Service ms). We apologize for the delay in our review. The proposed project includes the erection of fencing around Lanaihale, This report is an effort to identify previously recorded archaeological/historic properties and locate any historic properties within the Area of Potential Effects. The ungulate exclusion fence stretches 41 kilometers around the montane area on Lana'i Summit.

The background section acceptably establishes the ahupuaʻa settlement pattern and predicts the likely site pattern in the project area. The summary of previous archaeological work in the area provides a baseline for the current work.

The survey has adequately covered the project area documenting no previously unidentified historic properties in the APE (area of potential effects). One previously documented site was relocated and a site inventory form has been presented in the appendix for this site (50-40-98-29, Heiau at Hiʻi). It is not, however, within the APE.

We find the brief report acceptable, and can recommend that the summit fencing project proceed as planned. Please submit a replacement cover page indicating the TMK. As always, if you disagree with our comments or have questions, please contact Dr. Melissa Kirkendall (Maui/Lanaʻi SHPD 243-5169) as soon as possible to resolve these concerns…

December 2004
Madeaus, J, J. Dockall, T. Lee-Greig, and H. Hammatt
An Archaeological Inventory Survey of 72.0 Acres at Maunalei and Wahane Gulch, Maunalei Ahupuaʻa, Lahaina District, Island of Lānaʻi. TMK: 4-9-02:01. Prepared for Castle and Cooke Resorts, LLC. Cultural Surveys Hawaiʻi, Inc.

This archaeological inventory survey was undertaken to document all historic properties on the two parcels before the planned conservation program within Maunalei and Wahane gulches. The inventory survey was contacted [conducted] to fulfill requirements for the Castle and Cooke's application for permit. The survey was also designed to assess the effect of the proposed conservation project on cultural resources present in the two gulches and result in a production of a report designed to satisfy SHPD and the county of Maui requirements prior to granting of the Permit. Previous archaeological work in this area did not satisfy the requirements for the permit application.

The proposed conservation project by Castle and Cooke Resorts LLC in the project area is to clear alien vegetation (especially kiawe trees) and Replanted [sic] with native trees and ground covered [sic] with native grasses. The conservation project also proposed to remove or clear silt from the two gulches. The gulches are over grown with alien vegetation and covered with silt, and therefore, the sites m the gulches would be disturbed by the proposed work. The areas of potential effect in the project area are the flood plains of the two gulches with agricultural features, ranching features, and historic features not related to ranching (wooden and corrugated houses) especially in Maunalei Gulch.

Thirteen sites comprised of 28 individual component features...

- State Site 50-40-98- 1948 is an agricultural wall and is considered significant under criterion “d.”
- State Site 50-40-98-1949 is a complex of agricultural enclosures, boundary walls and a rock shelter and is considered significant under criterion “d.”

United States Department of the Interior

FISH AND WILDLIFE SERVICE
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In Reply Refer to: FWS/R1

To: Joshua Fisher
Program: Ecological Services
Funding: Recovery

From: Alton Exzabe, Zone Archaeologist

Date: 16 June 2023

Subject: NHPA Section 106 review: **Rodent Eradication for Endangered Species Protection in the Hi‘i Predator-proof Fence, Lāna‘i Island, Hawai‘i**

Thank you for providing information to the U.S. Fish and Wildlife Service (FWS) Cultural Resources Team (CRT) on the subject undertaking for review in the context of Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations 36 CFR § 800.

Description of the Undertaking:
The FWS and partners Pūlama Lāna‘i and U.S. Department of Agriculture (USDA) propose to eradicate rats from ‘ua‘u (Hawaiian petrel, *Pterodroma sandwichensis*) habitat on Lāna‘i utilizing a targeted aerial broadcast of diphacinone within the new Hi‘i predator-proof fenced unit. The Hi‘i predator-proof fence unit is a subunit inside the Lāna‘i Hale Summit Fence on the island of Lāna‘i. The eradication of rodents will involve two aerial applications of rodenticide within the Hi‘i predator-proof fenced unit. There will be no ground penetration involved with this project.

The FWS will purchase the rodenticide through the USDA Animal and Plant Health Inspection Service (APHIS) local licensed Restricted Use Pesticide (RUP) dealer in Hawai‘i and will be the certified applicator responsible for the broadcast operation. As leaders in the safe usage of Diphacinone-50 for conservation, USDA APHIS National Wildlife Research Center (NWRC) and USDA APHIS Hawaii Wildlife Services will also lend their expertise to provide technical assistance on rodenticide application logistics, design/implementation of monitoring before and

after toxicant application to confirm eradication, and to assess potential impacts and non-target effects.

Rodenticide will be broadcast from a helicopter over the project area inside the Hi‘i predator-proof fence. The helicopter transects and planned broadcast area will not cross the predator-proof fence line.

To gauge effectiveness of the actions, independent monitoring of predator presence inside and outside the fence using trail cameras and tracking tunnels will be employed, including continued surveillance into the future with response if necessary. Pre- and post-rodenticide impact monitoring and sample analysis will be conducted in partnership with the NWRC. With support from Pūlama Lāna‘i, NWRC will collect and analyze up to 50 samples for any residual Diphacinone-50 from target and non-target organisms, as well as the collection of environmental samples (e.g., soil), to confirm cause of death of rodents and assess levels of toxicant in possible or suspected non-target mortalities.

Federal Involvement:
The FWS will be carrying out this project with partners. Thus, the project is subject to Section 106 and is considered an undertaking pursuant to 36 CFR § 800.16(y).

Finding of Effect:
The project is an undertaking according to Section 106 of the NHPA. The aerial application of the rodenticide does not require ground disturbance, nor will features that could be a part of a historic property be disturbed, and no interaction with cultural resources would occur. The method of application and the rodenticide does not have the potential to alter the characteristics of a property qualifying it for inclusion in or eligibility for the National Register, assuming they were present.

Pursuant to 36 CFR Part 800.3(a)(1) this undertaking is the type of activity that has *no potential to cause effects* on historic properties assuming they were present. Therefore, the FWS has no further obligations under Section 106.

This finding of effect applies only to the activities described above. In the event that cultural resources are discovered during the implementation of the project, the regional archaeologist should be notified in order to determine whether additional compliance is warranted. Thank you for considering cultural resources.

Digitally signed by ALTON EXZABE
Date: 2023.06.16 14:20:14 -10'00'

Zone Archaeologist

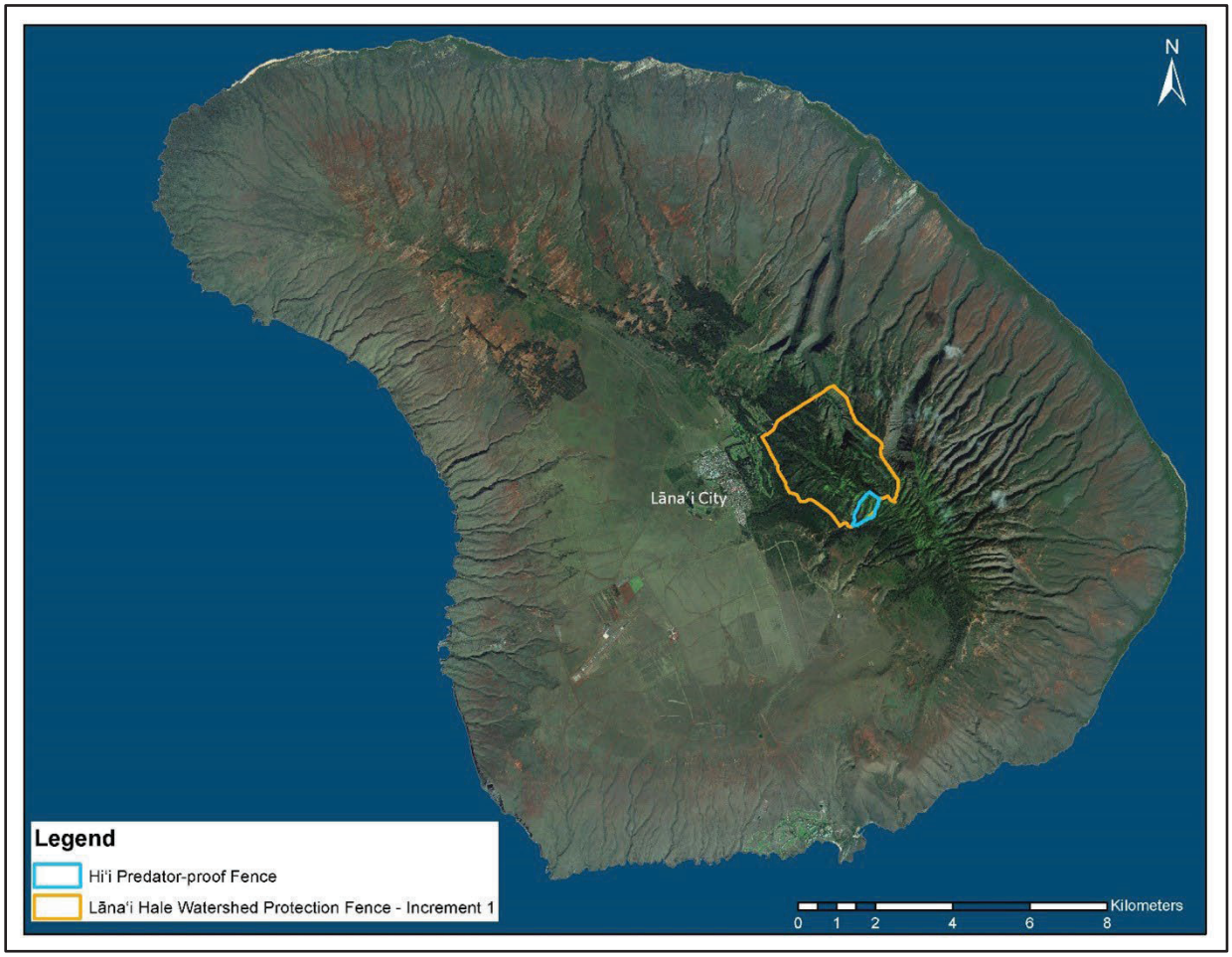

Figure 1. Project Location.