

MAUI MEDICAL PLAZA AT KANAHA
WETLAND MITIGATION PLAN

Location:

WAILUKU DISTRICT, MAUI
STATE OF HAWAI'I

Prepared for:

Maui Medical Plaza at Kanaha
350 Hukilike Street, Suite D
Kahului, Hawai'i 96732

11 June 2009

Prepared by:

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PROJECT LOCATION: Wailuku District, Island of Maui, Hawai'i.
Lot 8: TMK: (2) 3-7-011:028; mitigation site TMK (2) 3-8-001:019

ZONING: Lot 8: State - Urban; Community Plan - Heavy Industrial; County - M2 Industrial. Mitigation site - Conservation

ESTIMATED ACREAGE: Lot 8: Total on-site acreage: 2.5 acres (108,900sqft)
Wetland loss: .94ac Total off-site wetland acreage: 5 acres

MITIGATION PRIMARY GOAL: *Enhance existing wetland ecosystem function in Kanahā Pond Wildlife Sanctuary by removal of invasive vegetation, outplanting of native species and minimization of human disturbance.*

Lot 8 is a severely disturbed site of minimal wetland value in its current state. Off-site wetland mitigation is proposed for the Maui Medical Plaza at Kanahā development within the fenced boundary of Kanahā Pond Wildlife Sanctuary adjacent to the property. Mitigation will remove invasive species and re-establish native plants in approximately five (5) kiawe, palm and pluchea infested acres within the pond, a permanent wetland waterbird habitat. This represents a desirable goal for the Department of Land and Natural Resources – Division of Forestry and Wildlife (DOFAW) for Kanahā.

LAND OWNER(S): Lot 8: Kanahā Professional Plaza LLC Mitigation site: State of Hawai'i

PARTY RESPONSIBLE FOR MITIGATION: Kanahā Professional Plaza LLC

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REVIEWING AGENCY(S): US Army Corps of Engineers
Environmental Protection Agency
US Fish and Wildlife Service
DLNR-DOFAW Maui

Applicable State and Federal Recovery Plans:

Draft Revised Recovery Plan for Hawaiian Waterbirds: Second Draft of Second Revision, USFWS May 2005

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APPENDIX A: MAPS AND IMAGES

Maui Medical Plaza at Kanahā TMK Plat Map
Wetland delineation for Lot 8 (TMK (2) 3-7-11-028)
Wetland series aerial images
Elevations within the mitigation site, Kanahā Pond Wildlife Sanctuary
US-ACE map of KPWS

APPENDIX B. ATTACHMENTS

Jurisdictional Determination Letter, US-ACE, 25 April 2008
Letter describing search for alternative properties dated 20 January 2009
DLNR-DOFAW letter KPWS option, dated 9 February 2009
DLNR-DOFAW generated list of fauna species observed in KPWS
Drainage summary for Maui Medical Plaza at Kanahā 2006
Tidal Influence Investigation, MEV LLC 3 January 2008

APPENDIX C. LOT 8 DESIGN ELEMENTS

Maui Medical Plaza design elements for drainage, infiltration and ecosystem enhancement
Maui Medical Plaza at Kanahā design map

DRAFT

1. PROPOSED ACTIVITY SUMMARY

The proposed development is located at TMK (2) 3-7-11:028 (Lot 8), henceforth referred to as the Maui Medical Plaza at Kanahā development. The site, zoned M-2 (heavy industrial; Section 19.26.020 Maui County Code), is owned by Kanahā Professional Plaza LLC. A six-story state-of-the-arts, LEED certified, steel and metal structure medical offices facility with an interior atrium, roof garden, modular planter system on exterior lanais, dark green exterior windows designed to reduce confusion for birds, and attached parking is proposed.

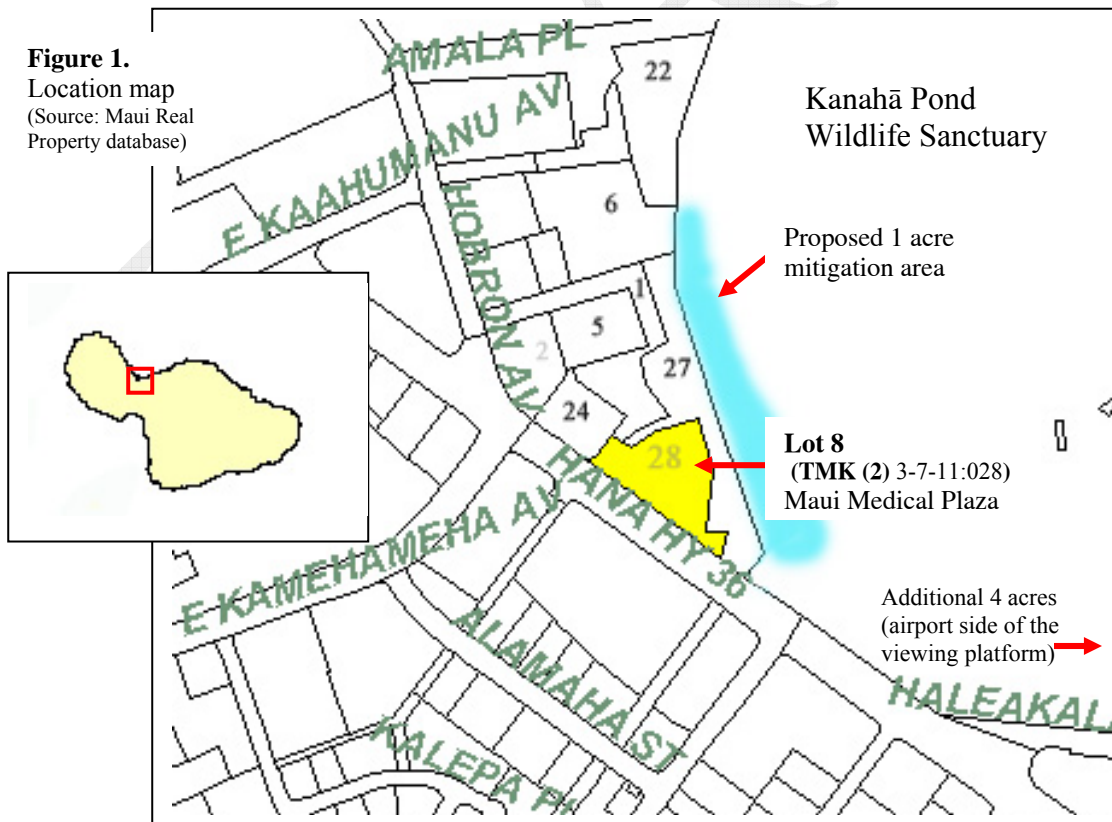
Underground sewer and utility lines will be required for the property. Approximately 0.94 acre of the uneven, triangle-shaped 2.5 acre parcel is determined to be a severely disturbed jurisdictional wetland of low biological/ecological value based on existing conditions, historic records of fill including by the US-ACE, agency site reviews and determinations (US-ACE JD 25 April 2008). The jurisdictional wetland is located largely in the center of the property, making a loss unavoidable. On-site engineering addresses and increases drainage and water infiltration functionality with two retention basins, landscaping and a green roof. Ecosystem continuity and buffers between the wetland and Lot 8 will be improved with appropriate native lowland and coastal plant species. Brief descriptions of rain gardens, water infiltration and detention actions on Lot 8 are provided in Appendix C, however, details are found within the building and construction plan for the facility and are not presented as a component of the compensatory mitigation requirement for this parcel. DOFAW has offered lands for off-site wetland mitigation as an appropriate alternative for this project (P. Conry, 2/9/09). *This compensatory mitigation and adaptive management plan is for off-site mitigation action.*

Proposed off-site wetland mitigation action is located within Kanahā Pond Wildlife Sanctuary in the coastal zone makai (seaward) of Kaahumanu Avenue, Kahului, Maui. The property and the mitigation site fall within Maui Watershed Unit 20020000 2-04 (Iao). An easement containing a drainage canal maintained by Alexander and Baldwin (A&B) and a portion of TMK (2) 3-7-11:027 belonging to M. Kitagawa, as well as a raised perimeter road between Lot 8 and the canal completely isolates Lot 8 from Kanahā Pond (TMK (2) 3-7-001:019). No surface water exchange occurs between Lot 8 and the sanctuary.

Wetland mitigation will occur within the fenced boundaries of the Kanahā Pond Wildlife Sanctuary in coordination with the Department of Land and Natural Resources – Division of Forestry and Wildlife (DOFAW). In early discussions with US-ACE and other federal agencies, this site represented a preferred option for its proximity to Lot 8. An appropriate one (1) acre site was initially selected inside the pond with the assistance of Dr. Fern Duvall, Wildlife specialist for DOFAW Maui, who has worked extensively on the restoration of Kanahā and management of the waterbird populations there. Subsequently, based on the recommendations of the US-ACE, an additional 4 acres have been selected for mitigation as needed. It is noted that a 1:5 mitigation is a highly unusual and unique situation in Hawai'i, as unprotected wetland acreage of this size is typically non-existent, unavailable or unaffordable within most Maui watersheds. A perpetual management agreement will be attached to Lot 8. This represents a new partnership for DOFAW within the Sanctuary and an opportunity to improve a significant portion of a USFWS designated Core Wetland for endangered waterbirds.

Two endangered waterbirds, ae’o or Hawaiian stilt (*Himantopus mexicanus knudseni*) and ‘alae ke’oke’o or Hawaiian coot (*Fulica alai*) are found in the wetland. Hybrid koloa (Hawaiian duck, *Anas wyvilliana* x *A. platyrhynchos*) are also present. The site is listed as critical habitat for one endangered insect, Blackburn’s sphinx moth (*Manduca blackburni*). The focus of mitigation is removal of invasive species. The hybrid date palm (*Phoenix x dactylifera*), California washingtonia palm (*Washingtonia filifera*), kiawe (*Prosopis pallida*), and three pluchea species (*Pluchea indica*, *P. carolinensis*, and *P.x fosbergii*) are the primary alien species in the mitigation area. Outplantings of native hydrophitic species recommended by DOFAW will follow to stabilize the site. Removal of date palms and kiawe will improve the function and structure of this section of the sanctuary, a desired outcome for which DOFAW Maui has lacked both funding and staff to accomplish in recent years (F. Duvall, pers. com. 2/24/09) and represents a significant cost-savings for DOFAW in its obligations to manage the wetland. Long term monitoring and management is supported with dedicated resources; a perpetual obligation in agreement with DOFAW will be attached to Lot 8.

This mitigation plan is written in response to Clean Water Act (CWA) Section 404 requirements for permit applicants preparing compensatory mitigation and adaptive management plans based on 2008 guidelines (Authority 33 U.S.C. 401 et seq; 33 U.S.C. 1344; and Pub. L. 108-136. FR 332 Compensatory Mitigation for Losses of Aquatic Resources, April 2008, and Honolulu District Joint Agency Compensatory Mitigation and Monitoring Guidelines). The proposed mitigation will occur within the same watershed as the property to be developed.



2. MITIGATION GOALS AND OBJECTIVES

The Impact Site and the Mitigation Site (off-site) are on two separate parcels in this plan. Both properties are within the same watershed unit. This section of the plan describes the mitigation goals and objectives, resource type and function, and potential losses from the project, followed by a description of the compensatory actions to achieve the goals and objectives set forth.

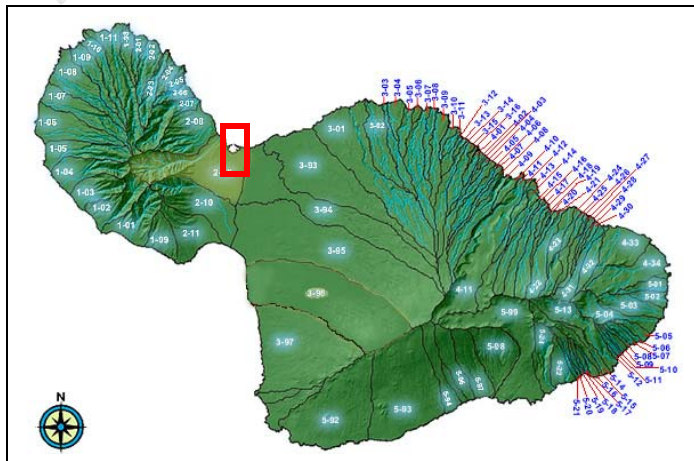
2.1. MITIGATION GOALS AND OBJECTIVES

Wetland acreage in the islands has declined more than 30 percent (DLNR-DOFAW) over the last 50 years. Central Maui wetlands, particularly in the area of what is now designated as Kanahā Pond Wildlife Sanctuary, have been severely restricted by fill, development, barriers and drainage canals over the past 100 years. The Kanahā Pond sanctuary was established in 1952 and currently includes approximately 235 acres in Central Maui, providing breeding, feeding, nesting and loafing grounds for endangered waterbirds and numerous migratory shorebirds. The property at Lot 8 is approximately 2.5 acres and not representative of a class of valuable wetland waterbird habitat or retention basin function desirable for set aside. Enhancement of a degraded portion of Kanahā Pond represents a net gain of improved wetland function and structure in the lowest reaches of the watershed and meets a desirable goal of the managing agency (DLNR-DOFAW). The cost of relocating out of the jurisdictional determined wetland area or repairing the degraded wetland at the development site is grossly prohibitive at this time and will be less beneficial to the watershed than the proposed mitigation (see Section 4 pg 24 and Appendix B).

The mitigation goals and objectives of the proposed plan are consistent with national and state guidance and policy on surface water runoff retention and wetland habitat recovery in coastal areas.

The goals and objectives are also supportive of both national and statewide goals under the USFWS Revised Recovery Plan for Hawaiian Waterbirds (2005) for improving the overall quality of core wetlands under state and federal protection for waterbird habitat in Maui.

Figure 2. *Maui Watersheds
Unit 2-04
Iao*



The primary mitigation goal (A) addresses the issue of wetland functionality and quality within Kanahā Pond Wildlife Sanctuary and in coastal waters makai of the parcel. **All compensatory mitigation actions occur off-site.**

A. Improve existing wetland ecosystem structure and function in Kanahā Pond by removal of invasive tree and shrub species, removal of vegetation debris, re-establishment of native hydrophitic species, reduction of potential predator habitat and minimization of human disturbances within five acres of the wetland.

Objective 1: Remove alien tree and shrub species and all related debris from approximately five acres of the pond.

The US-ACE originally recommended a single contiguous area along the west fence line of the sanctuary which is heavily invaded by palms and pluchea as a preferred site for mitigation activity. Additional acreage is available for mitigation in a second section of the pond dominated by kiawe.

Objective 2: Limit to the highest degree possible, soil and wetland disturbance through carefully engineered mitigation and best management practices (BMPs) at the mitigation site.

Objective 3: Replace non-native vegetation with native (indigenous and/or endemic) hydrophitic species appropriate to Central Maui wetlands and which supports Hawaii's endangered waterbird needs such as niches for food sources, hiding and nesting materials and improves the overall quality of the Sanctuary.

Objective 4: Support continued agency action for predator control within the mitigated portion of the sanctuary.

Objective 5: Monitor the mitigated wetland area regularly for regeneration of invasive species and unnecessary site disturbance during project implementation; and for maintenance of healthy wetland ecosystem function and structure long term.

2.2. AQUATIC RESOURCE TYPE AND FUNCTION

TMK (2) 3-7-11:028 is 108,900sqft (2.5 acres) in size of which 0.94 acres (41,149sqft) has been verified as a jurisdictional wetland that falls into the category of “waters of the US” as defined within the CWA 33 CFR 328. The US-ACE has indicated the wetland type to be PEM1F (palustrine, emergent, persistent, semi-permanently flooded [non-tidal water regime]) USFWS Cowardin classification (US-ACE JD 4/28/08).



The soils at the site are highly compacted and disrupted. The site is underlain by 1 to 2.5ft of historic fill material over an original mix of lagoonal, alluvial and wetland soil deposits to a depth of more than 90ft. Ground water was recorded at a depth of 1.6 to 3.3ft below the surface and is not tidally influenced (MEV 2/23/07). Estimated pre-mitigation water retention volume in the wetland is 80,036 gallons (10,700cuft/396cuyd) based on all surfaces below 4ft elevations (per US-ACE determinations). The upland (non-wetland) area based on the delineation completed for the site is measured at roughly 67,518.6sqft or 1.55 acres.

Surface soils are determined to be abnormal and man-made; the result of fill material including from US-ACE dredging of the adjacent canal in the 1970s (GeoLabs 3/16/07; J. Vuich and MEV 2/23/07 and 5/1/07; Engeldow 2009). The development parcel has never been considered to be inside the boundaries of the recognized Kanahā wetland during historic times (Hobdy 2006) and is completely dry during all but the heaviest flooding conditions.

Mitigation site:

Kanahā Pond Wildlife Sanctuary. The aquatic resource at the mitigation site is classified as a brackish water estuarine wetland and represents a portion of one of three large remnant wetlands in Central Maui (Keālia on the south shore, and Waihe’e to the west of Kanahā, are the other two). Kanahā (and Keālia), however, was also a functioning Hawaiian fishpond for an estimated 500 years prior to disturbance by the military in the 1930s (see Section 3.3).

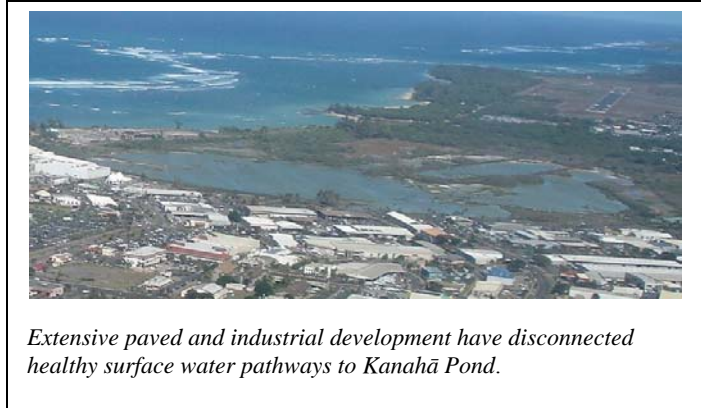


A portion of Kanahā Pond, March 2009.

The site meets the criteria defining wetland ecosystems under the U.S. Army Corps of Engineers (1987 Manual) and the Environmental Protection Act, including soils, hydrophytic vegetation, and a frequency and duration of soil saturation and inundation sufficient to support wetland flora within the context of Hawai'i's

unique seasonal conditions and habitats. It is designated as a Core Wetland for endangered Hawaiian waterbirds for Maui County, essential to larger populations of Hawaiian waterbirds in the state (USFWS 2005:69).¹

Water sources to Kanahā once came directly from the north streams of the Na Wai Eha region (Waihe'e, Waiehu, Wailuku and Wakapū). The development of the Wailuku-Kahului agricultural, industrial and residential districts during the last 150 years has severely disrupted the connectivity of these streams to their original coastal outlets. Surface water that once contributed to the pond is now heavily diverted. Remaining channelized surface water is heavily contaminated with trash, urban runoff and invasive fish and snail species. To preserve functional water levels in the Sanctuary, DOFAW maintains a pump which provides fresh water to the wetland during low water periods (DOFAW 3/31/09).



Native waterbirds are present in the mitigation area of the sanctuary, including auku'u (*Nycticorax nycticorax hoactii*), the federally listed ae'o (*Himantopus mexicanus knudseni*), 'alae ke'oke'o (*Fulica alai*) and hybrid koloa ducks. See Section 3 for a more complete discussion of biota present.

The boundary and sanctuary status of the wetland was formally established in 1952 by the State of Hawai'i. A fence was installed to clearly define its boundaries in 1974; the most recent replacement occurred in 2005. The one acre mitigation area adjacent to the development site was delineated using GPS by Wil Chee & Associates in February 2009 under guidance from DOFAW staff. A topographical analysis was also conducted for this area (Appendix B. Elevations in the mitigation area of KPWS). The additional four acres was mapped out with the assistance of DOFAW staff in May 2009 but was not GPS'd to prevent disturbance of waterbirds during the breeding season (April through August).

Mean sealevel elevations in the mitigation area range from 3.4ft to 4.9ft above sealevel in the higher areas of the wetland, with an elevation at 3.1ft to 3.4ft at the edges of the water.

The establishment of alien species, particularly palms and kiawe, causes hardening and impairs natural saturation and inundation. They also provide habitat for rats, mongoose, egrets and other predators that remain the number one threat to Hawaii's endangered waterbirds (FWS 2005:44). A remnant cement surface extends into the wetland in the area

¹ Core wetlands represent the bulk of the numbers (acreage and bird population size) prescribed for recovery of endangered waterbirds that would allow for delisting from the federal endangered species list. Mitigation supports USFWS Priority Actions 1.3.2 to manage vegetation to maximize nesting success and brood survival; 1.3.3 eliminate or reduce predator populations; and 1.3.5 minimize human disturbance, for this wetland.

adjacent to Lot 8 and provides a staging area for wetland management staff. The additional four acres begins east of the Sanctuary Observation Platform and pump which maintains water levels in the pond (see Appendix A).

2.3. LOSSES

A total surface area of 41,149sqft (0.94 acres) of severely disturbed jurisdictional wetland out of 108,900sqft (2.5 acres) of total area will be permanently lost on Lot 8 after completion of the development through filling and grading (less than one acre). Water infiltration functions will be temporarily disrupted during the grading stage of the project but improved capacity will be realized upon completion (see Appendix C). Given the improvements to capture function (compensations), no net loss of water retention basin functions will occur overall.

No water from Lot 8 enters Kanahā Pond; any potential flooding that might occur under extreme rain events would be captured by the adjoining private property (TMK (2) 3-7-11:027 or Lot 7) and the drainage canal which lies between Lot 8 and the pond. The canal moves existing watershed runoff from the urban core of Kahului to a sediment basin behind the shoreline. The easement portion of the canal belongs to the Kitagawa property. Responsibility for and maintenance of this drainage lies with A&B Properties.

Mitigation site:

Kanahā Pond Wildlife Sanctuary. The existing stands of non-native palms, kiawe and pluchea were able to establish on hardened soil flats and edges (Appendix A. US-ACE map of KPWS). The trees have reduced inundated habitat in the wetland, edging out native plant communities that allow more natural fluxuation. Vegetation impairs approximately 40 percent of the one acre mitigation site and more than 90 percent of the four acre site.

No loss of wetland function or wetland wildlife habitat will occur. Roosting and loafing habitat for ‘auku’u (*Nycticorax nycticorax hoacti*) will be temporarily lost during removal of invasive palm species; however, this species is readily adaptable to the natural character of the pond and its low-lying hummocks and islands. Other sites within the wetland provide alternative habitat. No nests were observed within the date palms during survey.

Neither ‘Ae’o (*Himantopus mexicanus knudseni*), ‘alae ke’oke’o (*Fulica americana alai*), nor hybrid koloa (*Anas wyvilliana* x *A. platyrhynchos*) have been observed to use the densely overgrown portions of this habitat.

2.4. COMPENSATION

Compensation for short term water infiltration and capture losses and wetland footage are addressed off-site with the implementation of the following long-term actions.

Mitigation site:

Kanahā Pond Wildlife Sanctuary. Total square footage of off-site mitigation is estimated at 217,800 sqft (5.0 acres) or a 1:5 ratio of the total jurisdictional wetland that will be lost on Lot 8 (.94ac/41,149sqft). This represents a gain of five acres of improved wetland waters and a replacement of lost wetlands from the Maui Medical Plaza site at five times the actual loss. This mitigation exchange rate is not likely or able to be found at any other project site in the state, and is only possible through a partnership with DLNR in an existing protected area where degraded habitat is in need of action.

In the larger landscape of the watershed of Iao (MWU 2-04) and the industrial district in which Lot 8 sits, the size of the parcel represents little or no impact to the area. Enhancement of acreage within the Kanahā sanctuary represents a significant improvement to the overall quality of the wetland, meets a desirable goal for managers of the sanctuary, and a reduction in work load and budgetary costs for state agencies.

Wetland improvement will include the following actions:

- Non-intrusive removal of invasive palms, kiawe, other alien tree species and pluchea in the designated mitigation areas of the pond.
- Re-establishment of native obligate (wetland) plant species in a pattern and character that enhances waterbird survival.
- Monitoring and management to protect water quality and prevent re-generation of alien species.

These compensatory actions will enhance wetland functionality, improve ponding capacity, nesting habitat and foraging sources for native wetland waterbirds and native insect populations. A well-established and maintained ecosystem will reduce opportunities for invasive species re-encroachment.

A viable, funded mechanism for monitoring and management will be implemented to ensure ongoing protection of the wetland in coordination with the Maui DOFAW staff who set all goals for management of Kanahā Pond (Section 10: Financial assurances).

3. BASELINE INFORMATION - SITE DESCRIPTION

3.1 LOCATION

The mitigation site is a 5 acre portion of TMK (2) 3-8-001:019 (Kanahe Pond Wildlife Sanctuary) owned by the State of Hawai'i and located just east of the junction of Ka'ahumanu and Hana Highways in Kahului in Maui Watershed Unit 20020000 2-04 (Iao).

The wetland is bounded by Hana and Haleakala Highways on the mauka (south) side. To the west, TMK (2) 3-7-11:027 (Lot 7) and a drainage canal owned by M. Kitigawa and managed by A&B Properties borders the mitigation site. The makai (seaward) portion of the west fence line is bounded by the VIP warehouse (TMK (2) 3-7-11:006) and further makai, by a dirt parking lot (TMK (2) 3-7-11: 022; same owner). The second mitigation area is located across from the Costco site and immediately adjacent to Haleakala Highway and Keolani Place, beginning just east of the observation platform and moving toward the airport.

The drainage canal and TMK(2) 3-7-11:027 separate Lot 8 completely from Kanahe Pond (images below and Appedix A: TMK Plat Map). A predator fence separates these two attributes from the wetland and surrounds the entire sanctuary. An elevated road on the Kitagawa/VIP side of the fence and a walking path inside the fence are used by DOFAW staff for maintenance.

Heavy industrial properties, including fuel storage tanks are visible on nearby lots. Light industrial facilities are located across the highway from Lot 8, one of which houses a 24-hr Fitness Center. Kanahe county beach park begins nearby at the airport side of the wetland.



Properties across the street from Lot 8 and the mitigation site along Hana Highway.



The palm thicket at the south end of the mitigation site near the entrance gate and the VIP warehouse at the south end along the fenceline, above.

Below, fuel storage tanks and the drainage canal visible through the boundary fencing from inside the pond and the access corridor (Lot 7) separating the Maui Medical Plaza property (Lot 8) from the drainage canal that abuts the sanctuary fenceline.



Pipes direct runoff from the industrial sector of Kahului and transport water under the road to the drainage canal in the direction of the VIP property (below).





Triangle Park building and Haleakala Highway (above left) and the palm thicket near Lot 8 (above right) from the observation platform. Beginnings of the kiawe thicket with an example of the type of low-growing plants that should be found in the pond to the left (below left). Dense kiawe, palm, underbrush and debris typical of vegetation found in the four acre mitigation area (below right and bottom right). Bottom left demonstrates the narrow setback between the highway and the Sanctuary fenceline.



3.2. PHYSICAL ATTRIBUTES

The following maps and images are included in this report in the body of the text:

- Location map (Fig 1, pg 6)
- Watershed unit identification (Fig 2, pg 7)
- Mitigation area in Kanahā Pond (Map 1, between pages 6 and 7)
- On and off-site images in relation to Kanahā Pond (pg14-16)

The following maps and images are found in Appendix A:

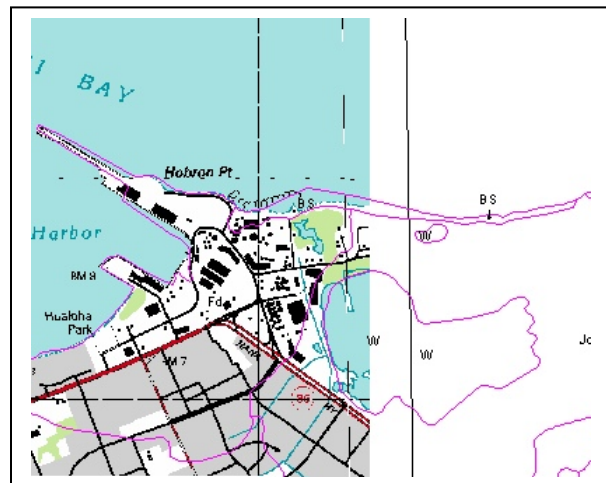
- Maui Medical Plaza at Kanahā TMK Plat Map
- Wetland delineation maps for Lot 8
- Wetland series aerial images
- Elevations within the mitigation site at KPWS
- US-ACE map of islands, roads and open waters in KPWS

3.2.1. SURFACE ELEVATION

Elevations at the off-site mitigation area range from 4.9ft to 3.1ft mean sealevel (MSL). Based on these elevations and observations of waterlines within the invasive species area, it is estimated that inundation does not occur over the entire acre even in high water. Ponding has been limited in the mitigation area due to invasive species and the presence of historic coral and cement hardened and paved surfaces where old roads once existed (see Engeldow 2008 for more information). Water levels are controlled by DOFAW through the use of a pump during low water states. A weir near Amala Place (below VIP) provides a break in the coastal sand bar that allows floodwaters to escape and prevents flooding in the industrial sector (pers. com. DOFAW staff, Feb 24, 2008 and letter DOFAW 3/31/09). The main body of the sanctuary remains permanently flooded with depths that vary seasonally.

3.2.2. SOILS AND SUBSURFACE WATER

Kanahā Pond can be described as a lagoon surrounded by sand dunes (Duvall 2002). The USDA-NRCS soil classification for the area is Fb (fill land) and JcC (Jaucus sands, saline, 0-12 percent slope) with organic deposits consistent with coastal wetlands in Central Maui. The soils meet the saturation criteria for hydric soils (USACE 1987). The sandy soils with salt marsh inclusions are typical of estuarine wetlands in Maui (USDA Soil Conservation Service 1994; Hobdy 2006).



Numerous coastal wetlands on Maui are formed on Jaucus sands where the water table is near the surface, frequently in low-lying areas behind sand, cobble or lava beaches along the

island's south shores and central plains. Jaucus soils are poorly drained in depressions and excessively drained at raised elevations. In depressions, there is often a layer of silty alluvial material with a high concentration of salts (NRCS 2001). Soil profile analysis was not conducted inside the wetland due to well-established parameters for the sanctuary.

Water for the wetland comes from natural rainfall, groundwater and is springfed. Rainfall averages 18-25 inches per year, primarily between November and March (Duvall 2002; Hobdy 2006). Water levels in the pond are managed by DOFAW using a pump which draws an estimated 155 million gallons of freshwater from more than 160ft below the surface daily (DOFAW staff 2/24/09). The wetland stores 50 million gallons per day and loses 1.5 million gallons per day in evaporation.



The pump which provides subsurface water near the lookout.

In 2002, chlorinates in the water were documented at 3,927mgcl/20,000mgcl/1 (by comparison drinking water is 30-50mgcl/1). Most of the pond and its sediments are impacted by sewage injection nutrients (Duvall 2002).

3.2.3. EXISTING VEGETATION

Historically, little is known regarding the character and species composition of coastal wetlands in Hawai'i. Pollen records from core samples indicate a diverse lowland plant community that included loulou palms prior to the arrival of Hawaiians; however, beginning about 800AD this coastal flora experienced a radical decline (Athens 1997). For perhaps the last 1,200 years, "it is quite probable that during Hawaiian tenure, all or most of these marshland areas were used for kalo (taro) culture [and that]...some of these areas were converted to fish ponds by the ancient Hawaiians and were then of great economic importance (Wagner et al, 1999:65). This is certainly true of Central Maui.

Kanahā Pond in the area of the mitigation site, as well as the adjoining private parcels, is dominated by non-native vegetation. A total of 170 plant species have been documented in the pond of which more than 60 percent were non-native in 2002 (Duvall 2002). A mix of native and alien species is found along the interior of the A&B drainage canal. An estimated 90 acres (approximately 40 percent) of open water characterize the wetland. The area designated as Waione ponds (see Appendix A: US-ACE map) is dominated by kiawe which has pushed water out of the area. Alien species in Hawai'i are often aggressive, particularly in wetlands. In the case of Kanahā, the kiawe, palms, pluchea, and non-native grasses have compromised the quality of many sectors of the sanctuary. Within the mitigation area, the dominant feature without invasive species would be shallow open water and/or inundated low-lying aquatic vegetation (see available aerial series images; Appendix A).

The following non-native species are present at the mitigation areas: kiawe (*Prosopis pallida*), ironwood (*Casaurina* sp.), hybrid datepalm (*Phoenix x dactylefera*), California

washingtonia palm (*Washingtonia filifera*), Indian fleabane (*Pluchea indica*), sourbush (*P. carolinensis*) and *P. x fosbergii* (a hybrid pluchea), Flora's paintbrush (*Emilia sonchifolia*), pualele or sow's thistle (*Sonchus oleraceus*), swollen fingergrass (*Chloris barbata*), Bermuda grass (*Cynodon dactylon*) and seashore saltgrass (*Distichlis spicata*). Along the inside of the fence line north of the palms, a small infestation of five horn smotherweed (*Bassia hyssopifolia*) was observed originating from a source on Lot 8 (this will be eliminated during construction). An estimated 90 percent of existing vegetative cover within the mitigation areas is non-native based on GPS outline of the mitigation site, on-the-ground observation and consultation with DOFAW field staff.²

Dense clusters of non-native trees also represent potential and real predator habitat for mongoose, rat and feral cats, as well as perching predators such as cattle egrets. Organic matter buildup above wetland water levels creates further predator habitat and dries out the pond. Both egrets and 'auku'u are known to hunt chicks, facilitated by high perches where ground nests are more visible. The FWS species recovery plan states "currently predation by introduced animals may be the greatest threat to [these endangered birds] (2005:44). Mongoose and rats feed on eggs and chicks, impacting successful nesting and hindering waterbird population expansion.

Indigenous species observed within the mitigation site include the following: makaloa (*Cyperus laevigatus*), kaluhā (*Bolboschoenus maritimus* subsp. *paludosus*), 'aki'aki (*Sporobolus virginicus*), akulikuli (*Sesuvium portulacastrum*), 'uhaloa (*Waltheria indica*), kipukai (*Heliotropium curassavicum*), and popolo (*Solanum americanum*).

'Ae'ae (*Bacopa monnieri*) and ahu'awa (*Cyperus javanicus*) were observed along the margins of the drainage canal and would be expected in the mitigation site under less invasive cover conditions.

No Threatened or Endangered plant species were found within the mitigation area.

Tree and shrub cover densities are estimated at 90 percent where present with a small amount of edge areas supporting mixed native/non-native sedge (makaloa) communities.

The table below indicates the wetland status of plant species at the site based on US Army Corps of Engineers (1981) and US Fish and Wildlife Service/Bishop Museum (2004) plant lists. Photographic images below and on pages 14-15 provide detail of the existing conditions at the site.

²The biological resources survey conducted for the Maui Medical Plaza at Kanahā property identified 32 plant species of which only five were indigenous and common; none were endemic (Hobdy 2006). A rapid survey of vegetation in the mitigation area was conducted by P. Levin in February 2009; DOFAW wetland managers were also consulted.

Table 1. Existing vegetation by wetland status

Common Name	Scientific Name	Species Status	RHIND Status ³	Wetland Status*
Kiawe	<i>Prosopis pallida</i>	Non-native	FACU-	FACU ²
Ironwood	<i>Casaurina</i> sp.	Non-native	FACU-	FACU ²
hybrid date palm	<i>Phoenix x dactylefera</i>	Non-native	NI	FAC ²
California washingtonia palm	<i>Washingtonia filifera</i>	Non-native	NI	FACU ²
Indian fleabane	<i>Pluchea indica</i>	Non-native	FAC	FAC ^{1,2}
Sourbush	<i>Pluchea carolinensis</i>	Non-native	FAC	FAC ^{1,2}
Hybrid sourbush	<i>Pluchea x fosbergii</i>	Non-native	FAC	FAC ^{1,2}
Kaluhā	<i>Bolboschoenus maritimus</i> subsp. <i>paludosus</i>	Indigenous	FAC	FAC ^{1,2}
‘Ahu’awa	<i>Cyperus javanicus</i>	Indigenous	FAC	FAC ^{1,2}
Makaloa	<i>Cyperus laevigatus</i>	Indigenous	OBL	OBL ^{1,2}
‘Aki’aki	<i>Sporobolus virginicus</i>	Indigenous	FAC	FAC ^{1,2}
‘Akulikuli	<i>Sesuvium portulacastrum</i>	Indigenous	FAC	FAC ^{1,2}
‘Uhaloa	<i>Waltheria indica</i>	Indigenous	NI	FACU ²
Kipukai	<i>Heliotropium curassavicum</i>	Indigenous	FAC	FAC ²
Popolo	<i>Solanum americanum</i>	Indigenous	FACU	FACU ²
Flora’s paintbrush	<i>Emilia sonchifolia</i>	Non-native	NI	FAC ²
Pualele/sow’s thistle	<i>Sonchus oleraceus</i>	Non-native	FACU	FACU ^{1,2}
Swollen fingergrass	<i>Chloris barbata</i>	Non-native	FACU	FAC ^{1,2}
Bermuda grass	<i>Cynodon dactylon</i>	Non-native	FACU	FAC ^{1,2}
Seashore saltgrass	<i>Distichlis spicata</i>	Non-native	FACW	FACW ^{1,2}
Five horn smotherweed	<i>Bassia hyssopifolia</i>	Non-native	NI	FACW* ^{1,2}

* OBL = Obligate wetland species (99% found in wetlands); FACW = Facultative wetland species (67-99% found in wetlands); FAC = Facultative species (33-66% found in wetlands); FACU = Facultative upland species (1-33% found in wetlands); OPL = Obligate upland species (<1% found in wetlands) and NI = No indicator status at this time. A + or - indicates a plant occurs more (+) or less (-) frequently in wetlands. (*) this species is being studied for final status.

¹ Erickson and Poddack 2006.

² Puttock and Imada 2004.

³ Stemmermann, R 1981. RHIND (Regional Hawaii Indicator)

IMAGES OF KANAHA MITIGATION CONDITIONS



*Above: Dense stand of hybrid palm and large kiawe trees at the mauka end of the site.
Below: Ironwoods along the southwest fenceline and pluchea thickets.*



*Below left: A clump of makaloa.
Below right: A mixed mat of 'akulikuli, Bermuda and 'aki'aki grass.*



3.2.4. FAUNA

Birds

The ae'o or Hawaiian stilt (*Himantopus mexicanus knudseni*), a species listed as Endangered under the Endangered Species Act with a U.S. Fish and Wildlife Service recovery priority number of 9 (USFWS 2005) frequents the mitigation site. Another protected species present in the wetland is the 'alae ke'oke'o or Hawaiian coot (*Fulica alai*); listed as 14 on the recovery scale. Hybrid koloa or Hawaiian duck (*Anas wyvilliana* x *A. platyrhynchos*), domestic ducks and transient mallards are known to the wetland but have not been observed in the immediate area. No pure koloa exist in the wetlands (A. Engilis, Hawaii Wetlands meeting; Feb 17, 2009); however as more than 40 mixed koloa have been observed in the wetland in a single count and DOFAW is managing this population to improve its status. An estimated 20 to 40 percent of all ae'o, and 20 to 60 percent of all 'alae ke'oke'o in the State were found in Kanahā during bi-annual bird counts from 1996 through 2002 indicating the importance of this wetland. The 'auku'u or black-crowned night heron (*Nycticorax nycticorax hoactii*), an indigenous species, pueo or Hawaiian owl (*Asio flammeus sandwichensis*), an endemic species, and non-native cattle egrets (*Bubulcus ibis*) are the largest birds present regularly in the mitigation area and the sanctuary.



More than 40 species of waterbirds, both palustrine (i.e. ducks) and shorebird species (i.e. kolea, sanderlings, tattlers), as well as gulls and terns protected under the Migratory Bird Treaty Act, have been recorded as transient and seasonal users of Kanahā Pond (see Appendix B: DLNR-DOFAW generated list of fauna species observed in KPWS). A total of 86 native and non-native resident and migratory birds have been observed within the sanctuary (Duvall 2002).

Feeding and habitat preferences

Understanding feeding and nesting habits and needs are critical to selecting wetland mitigation actions to improve functionality and aquatic plant choices for revegetation. The ae'o prefers nesting on open mudflats (of which there are few in the sanctuary) or areas interspersed with low-growing vegetation, and builds its nest out of grass stems and rocks. They feed on a wide variety of invertebrates and other aquatic organisms available in shallow water (optimal depth 13cm/5in) and mudflats, including insects, small crabs, tilapia fry and mosquito fish, both present in the pond. These birds "require early successional marshlands with water depths less than 9in and favor perennial vegetation that is limited in growth" (FWS 2005:30-31).

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'Alae ke'oke'o nest in open fresh and brackish water ponds and small openings of marsh vegetation, constructing floating or semi-floating nests from aquatic plants and anchored to emergent vegetation. The coot uses both shallow and slightly deeper waters from under

30cm to 120cm (12-48in) foraging in mudflats and diving. They prefer more open water for feeding. Food sources range from seeds and leaf parts of aquatic plants, invertebrates, snails, crustaceans, insects, to tadpoles and small fish (FWS 2005: 16-17).

Koloa are ground nesting birds. Observed feeding occurs in water less than 24cm deep (about 8in). Diet includes snails, insect larvae, green algae, seeds and leaf parts of wetland plants (FWS 2005:10).

‘Auku’u are hunters, although they have been known to occasionally predate stilt and coot chicks, they are mostly observed feeding on invertebrates, crabs, crustaceans and fish in the shallow waters of the pond.

Insects

No native insects were observed with the exception of non-native dragonflies and damselflies which favor wetlands; excellent habitat for larvae and nymphs which prefer shallow water and muddy bottoms. The recently discovered and rare Kahului ‘aweoweo long-horn beetle (*Plagithmysus kahului*) is found in lowlands associated with the ‘aweoweo plant (*Chenopodium oahuense*) but is not known to the mitigation site.

Most of the Kanahā Pond Wildlife Sanctuary has been designated as critical habitat for the Blackburn’s sphinx moth (*Manduca blackburni*), a federally listed endangered species. The moth’s currently known habitat is arid lowlands on Maui, Kaho’olawe and Hawai’i (Bishop Museum HBS). Its preferred food source is ‘aiea (*Nothocestrum latifolium*; Maui sp), an endemic dry to mesic forest tree species occurring from about 450m to 1,500m above sealevel (Wagner et al, 1999). The moth also feeds on non-native tree tobacco (*Nicotiana glauca*), tobacco (*Nicotiana* spp), tomato (*Solanum lycopersicum*) and pōpolo (*Solanum americanum*). Tree tobacco is invasive in Hawai’i and has not been found at the mitigation site or the development site. ‘Aiea does not grow within the wetland and prefers more complex and well-drained organic and/or volcanic soils than the Jaucus sands noted for the area.

Fish

An assortment of non-native fish species dominate Kanahā and in the adjacent canal, including armored catfish (S. Hau 1/29/09), tilapia, cichlids, guppies and mosquito fish (fresh water minnows). Marine fish that make their way into the pond often die quickly due to high water temperatures and limited circulation between the wetland and the ocean (Duvall, pers. com. 4/29/09). As vegetation is removed these fish will recruit naturally into new areas.

A perimeter fence keeps most large predators (dogs) and humans out of the wetland. Feral animals, including mongoose, mice and rats are known to the area.

Other fauna

Data compiled by the Hawaii Biodiversity and Mapping Program, indicates the endangered ‘ōpe’ape’a (Hawaiian hoary bat, *Lasiurus cinereus semotus*) may also occur within the

project area.³ There is a general lack of historic or current data for this species limiting ability to infer either its historic or present distribution, and its present status is not well understood (USFWS 1996). Females are assumed to roost in trees during gestation and pupping but breeding has only been documented on Hawai'i and Kaua'i islands (DOFAW Terrestrial Manual 2005). They feed on insects during the early evening. The heavily urbanized and industrial character of the area surrounding the mitigation site, as well as the long flight distances across open, agricultural lands from more natural habitats greatly reduces, but does not eliminate, the likelihood of observing 'ōpe'ape'a in the project area.

3.3. HISTORIC LAND USE AND IMPACTS

The mitigation site, and the entirety of what is now known as Kanahā Pond Wildlife Sanctuary was originally part of the ahupua'a (district) of Wailuku. The estuarine marsh covered an extensive portion of the sandy flats that now make up Kahului town and were fed by freshwater streams from the region known as Na Wai Eha (the four waters) – Waihe'e, Waiehu, Wailuku and Waikapū. The coastal flats along the bay supported a significant Hawaiian fishing community.

Sometime in the 16th century, it is thought that either the Maui chief Kiha-a-Pi'ilani or the O'ahu chief Kapi'iohokalani, built two massive fishponds named Kanahā and Mau'oni within the marsh (Sterling 1998). These ponds were loko wai, or inland fishponds created out of the natural contours and flows of the surrounding wetland. Their resources fed the chiefs and inhabitants of Maui and the warring chiefs who arrived to do battle on the plains of Na Wai Eha and within valley of Iao for power over the islands.

In the 1880s, Claus Spreckels and later Alexander and Baldwin obtained control of the ahupua'a of Wailuku and the lands surrounding the ponds. Ethnographic literature recalls that through the time of Kamehameha III (mid -1850s), Hawaiian ali'i still cared for Kanahā and Mau'oni, but by the early 1900's the ponds had fallen into disrepair (Engeldow 2008). Soon after, Kahului harbor was built. The dredge from the port was used to fill in the inland reaches of Kanahā wetland, and later portions of the ponds themselves. The town of Kahului grew up on the newly formed fastland, eventually moving closer to the shoreline and beginning a hardening process of the shoreline that continues to the present. Freshwater streams still fed the wetlands through the first half of the 20th century and made the connection between the ponds and the ocean, bringing 'ama'ama (mullet) into the ponds to feed the community.

By WWI parts of Kanahā fishpond and possibly all of Mau'oni had been filled in and a canal dug in an attempt to drain the surrounding lands and lower the water table. The U.S. annexed the pond in WWII and a naval station was built there. The remnants are visible within the pond, where roads and military buildings once dissected the wetland. Limu, shellfish, salt, and other marine resources from the area were still gathered by the local community.

³ The majority of Maui sightings are on the slopes of Haleakala. A single observation between 1816 and 1975 was made in the Pukalani area and one between 1975 and 1996 was recorded in the Wailuku-Kahului area (USFWS Recovery Plan for Hawaiian Hoary Bat 1996).

Kanahā Pond Wildlife Sanctuary was set aside in protective status in 1951, initially only 143 acres. It was later designated a National Natural Landmark in 1971 ending a long period of encroachment as well as regular interaction between local users and the wetland. It was around this time that the US-ACE re-dredged a series of canals to further drain water from the industrial park, depositing another layer of fill on Lot 8 and nearby properties and further altering the elevation, topography and soil horizons of the area (Vuich 2006; Hobdy 2006; Engeldow 2007). In 1994, the size of the sanctuary was increased to 235 acres and placed under DLNR-DOFAW management (Engeldow 2008, Hobdy 2006, F.Duvall 2002). A series of coastal images (Appendix A) documents the tremendous change this area has undergone over time.

The surrounding landscape is now a well-developed light and heavy industrial community. Kanahā Pond sits along the highway from the airport into town, as a reminder of a former panorama. Few today are aware of the legendary status of the twin fishponds that are the source of its name.

3.4. REFERENCE SITES

Reference site comparisons are difficult in Hawai'i's range of degraded wetland systems. In Maui, only Nu'u in Kaupo exhibits a high percentage of native species and represents one of the healthiest sites ecologically and biologically in the state. Its substrate is a'a lava and its isolation from development, people, and other wetlands make it unique in Maui.

Kanahā Pond wetland (235ac) can be compared to Waihe'e (250ac) and Keālia (691ac) because of its similar substrate and plant composition, both native and invasive, as well as use as fishponds. Of the three, Kanahā retains the most permanent flooded conditions and permanent waterbird populations. This site is well documented by the US-ACE, EPA, USFWS and NRCS. Although native plant species are becoming more prevalent in the sanctuary, the mitigation site is still dominated by non-native species. After more than a decade of improved management by state and federal agencies, the pond now reflects a more stable and diverse native wetland ecosystem. A similar change and recovery can be expected in the mitigation area.

4. MITIGATION SITE SELECTION AND JUSTIFICATION

The mitigation site is located within and represents a portion of the Kanahā Pond Wildlife Sanctuary.

The proposed site was selected for the following reasons:

- Represents a significant increase in enhanced wetland acreage in the sanctuary, both functionally and structurally.

An estimated 41,149sft (0.94ac) of jurisdictional wetland will be permanently lost on Lot 8. An estimated 217,800sqft (5ac) of wetlands will be restored. This represents a compensation ratio of 1 to 5.

Left alone, this mitigation area will continue to degrade and invasive species will continue to expand and persist at the site, taking up water and reducing inundation capacity and the quality of the wetland. In its current condition it harbors predators (feral cats, mongoose, mice, rats and egrets) that negatively impact endangered waterbird young, increasing the costs of protection and maintenance for state and federal agencies and the success rate of endangered waterbird populations. Tree removal will allow water to re-inundate areas where vegetation currently inhibits water retention capacity and will prevent substantial future habitat loss.

- High level of connectivity to already enhanced wetland sectors in the pond.
The mitigation site is located within the fenced perimeter of the protected sanctuary. State wildlife staff monitor and manage the pond regularly for predator and fence conditions and weed control along the fence line but do not have the capacity to conduct major invasive species removal without outside collaborations and resources. The open area near the observation platform is regularly visited by waterbirds. Nearby kiawe has been expanding. Removal will greatly improve conditions for the birds, and enhance viewing experiences for birdwatchers.
- Lack of nearby available sites and prohibitive costs of acquiring suitable alternative acreage out of jurisdictional wetlands within the watershed drainage or recovering Lot 8.
No lots of equivalent size are able to meet the needs of the project at an affordable price within the immediate area at this time. A suitable replacement building site that met the needs of the medical facility (along a main road, close to Maui Memorial Hospital and the airport) was not found after a two year search. The last sale of a similar zoned parcel in this watershed was located at the corner of Kamehameha and Pu'unene Avenue and sold for approximately \$78/sqft or almost \$3.4 million/ac. Some sites that were considered had serious zoning, access, or environmental contamination concerns. An attached description (Appendix B: Letter describing alternative properties search dated 20 January 2009) describes all available lots that were evaluated in the watershed as evidence of this dilemma. Rebuilding the wetland on Lot 8 would render the parcel unusable by the owner; it would also require extensive machine work and permitting. To date, rebuilt wetlands in Maui (a total of 7 acres) have had only marginal success ecologically and biologically. Given the odd configuration of Lot 8, building around the wetland would be economically unfeasible and would be prohibited under existing county setback rules.
- Likelihood of success is high, given early guidance by agencies, conservation specialists, and a design based on lessons learned from existing mitigations and Maui-based wetland conservation efforts.

- Mitigation work can occur in a short time frame that will limit impacts to native biota and wetland function. Recovery with native plant species is sustainable and self-maintaining after a few years of monitoring and maintenance.

The wetland habitat represented by this mitigation site is part of the larger sanctuary. Initial invasive species removal can be accomplished in a few weeks. Observations from other enhanced wetland systems suggest plant community composition and density will stabilize in less than five years where native habitat is monitored and managed appropriately. Funding and resources to specifically support this effort in coordination with DLNR-DOFAW can be clearly established.

- No listed threatened and endangered plant species or archaeological features are found in the mitigation site which would hinder its improvement.

DRAFT

5. PROPOSED MITIGATION WORK PLAN

The following mitigation work plan is intended to achieve the goal and objectives outlined in Section 2.

5.1. BOUNDARIES OF PROPOSED MITIGATION

The proposed mitigation site is located in two portions of the pond. The smaller one acre site is bounded by a chainlink fence on the outer edges of the wetland where it abuts an adjoining private lots and the county drainage. The remaining boundaries of the mitigation site are part of the established sanctuary and have been established and flagged by GPS for initial invasive species removal. The second site is a larger four acre area bounded by the fence between the wetland and the highway and open to the wetland on all other sides. Non-permanent, white pvc pipe will be installed after vegetation is cleared to monitor and manage the site for a period of five years and will be removed upon completion of this period.

Map 1 (between pgs 6 and 7) indicates the boundaries of the site and the location of the proposed mitigation.

5.2. TIMING OF MITIGATION WORK

Mitigation work will take place in phases separate from breeding and nesting periods for the ae'o and 'alae ke'oke'o, which occur from April 1 through August 31st. This also coincides with the recommended breeding and pupping period for 'ope'ape'a (Hawaiian bat).

Removal of non-native vegetation represents the highest level of disturbance. The estimated amount of time for this work is one week (7 days) during allowable daylight hours for the one acre site and 3-4 weeks (28 days) for the four acre area. This will occur prior to heavy rains from September to November.

Outplanting will occur from December through March in coordination with the seasonal rains and non-breeding times. Primary planting will begin in the first available year as permitted by DLNR-DOFAW. Drought conditions will have impacts on plant mortality rates and replacement plantings may occur in subsequent years through year three during the same time frames. Coordination for seed collection, propagation and outplanting will be coordinated with a local nursery six months in advance of outplanting.

No work will occur until authorization of impacts and mitigation by reviewing and permitting agencies is provided.

5.3. INVASIVE SPECIES REMOVAL

Invasive species removal in the mitigation area will be conducted using an excavator and/or cherry picker on fastland outside of the fencing that can reach into most of the overgrowth in the mitigation area from the fence line within the one acre site and inside the fence in the larger mitigation area. No disturbance below soil surfaces is expected. Trees will be cut at

the base and lifted out of the site by the excavator. Stumps will be ground to surface level to discourage resprout. This machinery has been used successfully by DLNR-DOFAW to remove invasive species in 20 acres of the wetland under the direction of local agency staff. Proposed activity follows earlier protocols.

Invasive species beyond the reach of the excavator will be done by hand using chainsaws, machetes and other appropriate hand tools in the one acre site.

All non-native vegetative material will be removed to a green waste facility. Dewatering of material is not an issue as the vegetation is above the water line. No soil disturbance is expected.

Invasive species removal after initial mitigation is described in Section 7.3.

Applicable BMPs:

1. To avoid impacts to endangered bird species vegetation removal will not occur during the breeding and nesting season established by DOFAW for the pond (April through August). Trees that might provide suitable hosts for the endangered Hawaiian hoary bat during breeding season will not be removed or trimmed during this same period, as recommended by the USFWS (Greenlee 3/31/09). A qualified monitor will survey the area for nests prior to vegetation clearing work. Vegetation will not be cut or otherwise cleared unless the area is free of birds. If host plants for the Blackburn's sphinx moth are found, they will be flagged and the soil around the plants will be protected from disturbance within a 10m buffer.
2. Equipment will be cleaned off-site prior to work on-site to reduce potential for further invasive species introductions.
3. Invasive species will be removed mechanically adjacent to the fence and by hand in areas unreachable by machine in the one acre area to minimize impacts to open water there, and mechanically in the four acre area.
4. Floating silt booms with a 1ft skirt will be installed immediately adjacent to the vegetation area to be cleared and outplanted in order to control potential soil movement. A second boom line will be installed at a distance of 7 to 8m (20-25ft) from the first to further inhibit potential for turbidity and protect open water. A silt fence with a buried toe will be used along the pond edge of the mitigation areas where it will not impede with removal of invasive species. The outer boom will remain in place for 6 months and the inner booms for 1 year to allow for native plant root establishment.
5. If a visible turbidity plume is noted outside the silt boom/curtain during implementation, work will be immediately halted and measures will be taken to repair the silt curtain and to stop the plume. The curtain will be checked quarterly and maintained for one year.

6. Only a small portion of the fence line will be opened at any one time during invasive species removal work. Fences will be closed nightly to prevent ingress of predators and permanently closed once mitigation is complete.
7. No project related materials or vehicles will be stockpiled or stored within the wetland area.
8. No trash or debris disposal or polluted runoff will be discarded or released to wetland site.
9. Containment supplies such as absorbent pads and other materials will be kept on Lot 8 to facilitate immediate cleanup of any accidental spills of petroleum products or other chemicals. A tall silt fence will be placed around Lot 8 to prevent dust movement into the pond and to discourage inappropriate access to the wetland.
10. Contractors and others involved in invasive plant control will be required to demonstrate to DOFAW sanctuary managers, or their designee(s), their ability to identify native plants likely to be found in the wetland to ensure that no accidental removal of native species occurs.

5.4. GRADING PLAN

No grading will occur within the mitigation site.

There are two ways to achieve offset of lost ponding functionality from Lot 8 – by deepening the bottom of the pond in the mitigation area (lowering elevation), or expanding the capacity of the pond for horizontal inundation (removal of vegetation and plant debris).

The original depth of the wetlands is unknown. As a fishpond of historical record, the depth was likely considerably more than its present state. Extensive infilling was done by the military. However, as described in Section 3.2.4, increasing water depth may directly contradict USFWS goals for this Core Wetland as designated endangered and migratory waterbird habitat. These birds thrive in shallow water habitats (1ft or less) currently supported by the elevations in the pond. Deeper water would reduce usability by the birds. Increasing the capacity for horizontal inundation rather than depth still allows for improved water storage capacity and provides a healthier environment for the waterbirds.

Elevations noted in the wetland (Section 3.2.1) were not substantial enough to prohibit inundation after tree and shrub removal. Work in other portions of the sanctuary with similar topography and water levels has resulted in full ponding during the wet season (functional lift) and use by waterbirds after tree removal (Duvall, pers. com 4/29/09). Aquatic vegetation readily establishes in such sites; grading is not necessary to achieve this. While 100 percent inundation may be desirable from a standard wetland definition standpoint, it is clear from long term observation that the levels of the pond, and the percent of exposed flats,

fluctuate seasonally. Some mudflat-like habitat provides important waterbird nesting and feeding habitat that is currently scarce within this section of the sanctuary.

5.5. CONSTRUCTION METHODS

No construction will occur within the mitigation site.

5.6. MITIGATION SCHEDULE

The start date for construction activities on Lot 8 and for mitigation within Kanahā Pond is dependent on agency concurrence and approval of the mitigation plan and issuance of appropriate permits. The nonbreeding/ nesting season makes work in the pond feasible only from September through March each year. This also coincides with the rainy season further restricting the number of potential work days available during the implementation phase.

A schedule of one week is estimated for alien species removal within the one acre mitigation area and four to six weeks for the four acre area. Native wetland plants have limited availability without long term planning. Seed collection and grow out time of 6 months for sedges and herbaceous species are necessary to provide enough planting material for the project. A seven months to one year cycle from initial seed gathering to outplanting is expected.

Soil erosion control measures as described above will be installed prior to mitigation work and maintained for one year after initial plantings. Plant seedlings will be ready in the nursery and available for outplanting by no later than December of the implementation year.

Action	Start date	End date
Baseline water inundation and vegetation mapping to monitor change	Implementation year (September 2009)	3 days (September 2009)
Installation of booms and skirts	Implementation year (September)	Removed at 3-6 months and one year after planting
Coordination with selected plant provider(s)	Implementation year (June)	6-8 months prior to outplanting action through March 2010
Fence opening and closure	Implementation year (September)	March 2010
Initial invasive species removal	Implementation year (September)	November 2009
Outplantings	Implementation year (December 2009)	March 2010
Maintenance (weed control, plant replacement)	Year 1	2015
Monitoring	Year 1	perpetual

5.7. PLANNED HYDROLOGY

DLNR-DOFAW manages water levels in Kanahā through a pump system. No additional waters are needed to maintain the wetland. Seasonal fluctuations per existing management strategies implemented by the state mimic naturally occurring conditions for coastal wetlands in Maui. Its source of water is the natural brackish water table, pumped freshwater, springs and seasonal rainfall.

Heavily overgrown sectors of the mitigation area will become naturally inundated as trees are removed and do not require additional hydrologic action.

5.8. PLANNED VEGETATION - PLANTING PLAN

More than 2,500 plant species have been recorded as being opportunist colonizers of wetland and former wetland habitats or true obligate species in Hawai'i's wetlands (Bishop Museum 2005). The number of indigenous and endemic aquatic species, however, is relatively low. While non-native species can, in some cases, replace native plant function, they tend to be highly aggressive in Hawai'i's climates. Aquatic alien plant species rapidly colonize and take up open water creating impenetrable tracts that render wetlands unusable by native waterbirds. Managing vegetation to maximize nesting success, brood survival, food availability and recruitment of water birds is a Priority 1 Action (1.3.1) for Core Wetlands in the state. Native plant species are determined to be most advantageous towards that goal.

The following native species are selected for outplanting in the wetland for their hydrophytic, soil retention and water filtering properties as well as documented presence within coastal fresh and brackish water wetland ecosystems in Maui and usefulness to native waterbirds. Revegetation will occur in viable planting areas mindful of the predominantly open water pattern in the one acre section of the mitigation area. A planting map is provided on page 35.

Species were selected in consultation with DLNR-DOFAW.

Hawaiian Name	Common Name	Scientific Name	Species Status	Height (meters)	Wetland Status*
Sedges and rushes (to 1.5m)					
'Ahu'awa	Java sedge	<i>Cyperus javanicus</i>	I	0.4 to 1.1	FACW
Makaloa	Smooth flatsedge	<i>Cyperus laevigatus</i>	I	0.2 to 1.0	OBL
Kaluhā	Saltmarsh bulrush	<i>Bolboschoenus maritimus</i>	I	0.5 to 1.5	OBL

Hawaiian Name	Common Name	Scientific Name	Species Status	Height (meters)	Wetland Status*
Trees and shrubs					
'Ohelo kai		<i>Lycium sandwicense</i>	I	1.5m	UPL
Loulu	---	<i>Pritchardia</i> sp.	E	15m +	FAC

* OBL = Obligate wetland species (99% found in wetlands); FACW = Facultative wetland species (67-99% found in wetlands); FAC = Facultative species (33-66% found in wetlands); FACU = Facultative upland species (1-33% found in wetlands); OPL = Obligate upland species (<1% found in wetlands) and NI = No indicator status at this time. A + or - indicates a plant occurs more (+) or less (-) frequently in wetlands.

Some flexibility in species choice will be essential in the event that the needed amounts of seedlings are not available. 'Ohelo kai (*Lycium sandwicense*) is found in coastal plant communities, including mudflats within Kanahā. It is an appropriate species along edge and elevated areas for this wetland. Mitigation team members will work closely with DOFAW staff to ensure the best mix of species for the site for all plantings.

Planting will occur in the areas of invasive species removal where soil exists to support them. An area approximately 5ft in width along the edges of the fence line is above the water line and is regularly treated for invasive species. These areas will not be planted.

Open water will be maintained for up to 60 percent of the one acre mitigation site based on inclusion of a significant portion of the area within the largest open water section of wetland (Main Pond) as articulated by the US-ACE for Kanahā (Appendix A: US-ACE Map of KPWS). In the larger four acre site, planting will occur over approximately 80 percent of the area.

Source, size, spacing and numbers for outplanting

Seed stock will come from existing populations within Kanahā or neighboring wetlands in Central Maui, or approved nurseries known to have a healthy source of local plant material.

Plant stock will be grown to 4in pots, with the exception of loulu which will be at least 3ft in height prior to planting to ensure root ball development (7-10 gal). An estimated six months are needed for herbaceous species growth in the nursery prior to outplanting.

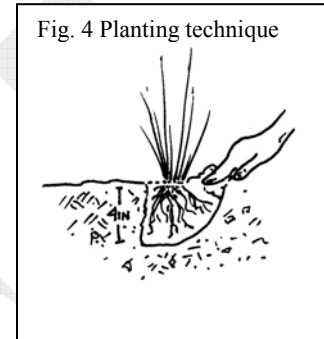
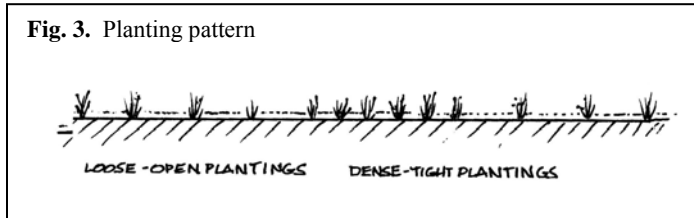
Minimum spacings will be 2ft on center to allow for healthy root development, plant growth and infilling. Plantings will be clustered to form both loose and tight growth patterns to mimic islands and diverse edge habitats most useful to native waterbirds. An estimated 30 to 40 percent of the one acre mitigation site will be planted; however, not at all at the same densities or patterns. For this reason, planting numbers are estimates. Approximately 40,000 starts will be established. A total of 8-12 loulu will be planted, if seedling sources can be acquired. Outplanting will be coordinated to meet the needs of DOFAW managers.



This portion of Kanahā provides an example of the mix of open water, low islands and edge vegetation desired for rehabilitation of the mitigation site.

A minimum 2ft on center (FOC) (or 4ft diameter) is recommended for sedges and rushes.

Hawaiian Name	Species	Height (meters)	Spacing FOC	Sq FOC	Estimated Numbers
'Ahu'awa	<i>Cyperus javanicus</i>	0.4 to 1.1	2ft	4ft	8,000
Makaloa	<i>Cyperus laevigatus</i>	0.2 to 1.0	2ft	4ft	20,000
Kaluhā	<i>Bolboschoenus maritimus</i>	0.5 to 1.5	2ft	4ft	10,000
'Ohelo kai	<i>Lycium sandwicense</i>	0.5 to 1.5	2ft	4ft	2,000



A providing nursery(s) will be chosen based on its presence on Maui, use of clean potting materials, weed and insect free plants/soil, and availability of species from appropriate sites and seed sources in sufficient numbers to meet implementation schedules.

The species selected are available at only a limited number of local nurseries, of which at least one, Ho'olawa Farms (Haiku), sources and documents its seed within Maui over a wide range of locations within the island ensuring a healthy degree of genetic diversity at the nursery. This nursery also has the greatest diversity of appropriate species and has provided seedlings for a number of wetland recovery projects and large restoration projects throughout Maui County. Advance coordination with a nursery will be required by the party(s) responsible for mitigation to allow for reasonable growing time; a minimum of 6 months prior to seed collection and outplanting where necessary.

Stilts nest on mudflats and low piles of plant material close to water in wetlands. The nests are often shallow depressions lined with stones, twigs and other debris (Hawaii Audubon Society 1993). Ae'o are adaptive in their use of plant materials for nesting and have been observed to utilize both native and non-native dried material in nest building. The native plant species listed provide sturdy material for nesting and cover for both ae'o and 'alae ke'o ke'o.

Applicable BMPs:

1. Planting material will not be brought in from other islands or high risk nurseries as a caution against invasive species and soil or plant pathogen introductions, including cocqui frogs (Hawai'i, O'ahu, and Maliko gulch area on Maui), little red fire ant (Hawai'i and Kaua'i), ants, nematodes and root aphids (O'ahu and Hawai'i), powdery mildew and other fungal diseases. In addition, plant material will be inspected upon delivery and rejected if disease, insect or weed infestations, or poor vigor are observed.

2. Minimize potential soil movement during grow out time where practicable. Floating booms with skirts will be maintained for one year after initial outplanting to support full root establishment and soil retention in the wetland.
3. Outplanting crews will clean their boots, clothing and equipment of any seeds or soil prior to entering into the mitigation site.
4. Planting depths for herbaceous seedlings will be no more than four inches.
5. Replacement plantings will be done where significant mortality (greater than 20 percent) in first year plantings occurs.

5.9. PLANNED SOILS

No planned soils are required for this mitigation effort. Nursery soils are sterile medium appropriate to outplanting in wetlands.

Applicable BMPs:

1. No soil amendments will be added for outplantings in the wetland to prevent impacts to water quality. Slow-release fertilizer packets (prepackaged; about 1tsp per packet) may be used in planting holes for loulu palms.

5.10 PLANNED HABITAT FEATURES

The ae'o prefers shallow ponds, marshy areas or mudflats and feed on fish, crabs, worms and aquatic insects. Existing soil surfaces will support nesting, feeding, wading and loafing sites for ae'o once re-planted with appropriate native species (see Section 5.8 above). No additional features are necessary to be installed.

5.11. PLANNED BUFFERS

A five foot setback from the perimeter fence will be implemented to reduce the chance of herbicide drift to native species from regular DOFAW fence maintenance and monitoring activities and to accommodate staff access along the fenceline.

5.12 OTHER PLANNED FEATURES

There are no additional planted features to this mitigation plan.

[insert planting plan map]

DRAFT

6. PERFORMANCE STANDARDS

Performance standards and monitoring techniques are selected appropriate to the status of the wetland as a federal and state wildlife sanctuary. The following practical performance standards will be used to quantify and qualify the status of desired outcomes and verify that objectives have been met.

6.1. MEASURES OF SUCCESS

The following measures (performance standards) will determine the level of project completion:

- *Hydrology* – a 30 percent (one acre site; open water exists in an estimated 60 percent of the site) and 75 percent (four acre site; little to no open water exists) increase in the area of inundation within the selected mitigation area after alien vegetation removal is complete;
 - water turbidity within the mitigation area shall not exceed turbidity outside the mitigation area by more than 5 NTU during restoration, and shall not exceed turbidity outside the mitigation area for 30 days or longer after restoration.
- *Vegetation* - a permanent increase in presence and cover of native obligate wetland species to 30 percent of outplanted areas after one year and 50 percent of outplanted areas in year two (allowing for natural spacing and water inundation between individual plants; increase realized by natural filling out of plants as they grow), representing stabilized soils and plant root systems.
 - a permanent reduction in the area covered by invasive and non-native vegetation within the mitigation area by 80 percent after one year and maintained in subsequent years; and
- *Fauna* - an increase in the number of days the site is used by ae'o, other native waterbirds or shoreline species (recruitment) as loafing, wading, foraging and nesting habitat.

7. SITE PROTECTION AND MAINTENANCE

There is no need for legal instrument to convey easement or deed for this mitigation project as the property is already protected in perpetuity under the State of Hawai'i. Lot 8 will carry a deed requirement for maintenance of the five acres of within the pond in perpetuity.

7.1. LEGAL PROTECTIONS AND PARTY RESPONSIBILITY

A legally binding agreement between DLNR-DOFAW and Kanahā Professional Plaza LLC will be created to ensure all mitigation measures and future monitoring and maintenance work is completed and supported either through funding, contract, or provision of necessary resources. A legally binding CC&R document that carries these obligations with the property in perpetuity will be attached to the deed of Lot 8

During implementation, Kanahā Professional Plaza LLC, or its designated representative(s), will be responsible for providing independent monitoring and compliance and for obtaining all permits as required.

Invasive plant species removal and disposal, plant propagation and/or purchase, outplanting and weed management inside the mitigation area will be handled by contract under Kanahā Professional Plaza LLC. They will be responsible for monitoring and maintenance after initial mitigation is complete and the resources required to support that.

Predator control and weed control along the fence line will be conducted under a certified, licensed pesticide applicator. Kanahā Professional Plaza LLC will be responsible to provide resources necessary to conduct and/or support regular maintenance (ie. purchase of materials and supplies).

After implementation, Kanahā Professional Plaza LLC, or its designated representative(s), will bear the responsibility of ensuring site protection, management, independent monitoring, compliance and reporting to county, state, and federal agencies on the status of the mitigation site.

The State will remain the owners and primary managers of the site as part of the sanctuary.

Educational sites and information regarding the Kahanā wetlands and what may be observed there, as well as how people can learn more and participate in long term stewardship will also be provided off-site on Lot 8. Responsibility for this action rests with Kanahā Professional Plaza LLC.

7.2. MAINTENANCE PLAN AND SCHEDULE

Maintenance is tied closely to monitoring. Two levels of maintenance scheduling will occur;

- Quarterly and bi-annual maintenance of fences, erosion and invasive species control coordinated with quarterly and bi-annual monitoring schedules.
- Day-to-day observation by agency staff (ie. a break in the fence) will guide maintenance and scheduling of other than quarterly or bi-annual maintenance.

Maintenance activities

Fence lines will be kept weed free and monitored for breaks.

Measures to control predation, invasive species, replacement plantings, fence maintenance and repair will be undertaken by Kanahā Professional Plaza LLC or its contracted site manager(s) and monitor(s).

7.3. INVASIVE SPECIES CONTROL PLAN - MAINTENANCE

The wetland will be monitored for invasive species regrowth and new introductions on a quarterly basis during the first two years of native plant establishment and expanded cover. More frequent monitoring and maintenance will be done if incipient (new) populations of alien species are found to rapidly eradicate them or if invasive encroachment persists heavily. Herbaceous plants will be removed using manual techniques (hand pulling).

Most alien species will be removed during project implementation as described above. Previous invasive species removal in Kanahā suggests there will be minimal recurrence from existing alien species once removed. No herbicide will be used inside the wetland except to maintain the fenceline or as approved by DOFAW and will be implemented by experienced personnel under a licensed pesticide applicator at all times. Aquamaster is approved for use in wetlands on emergent wetland plants and may be used to control persistent germination of invasive species (DOFAW 3/31/09).

In the event that stump re-sprout is observed (ie. kiawe or ironwood), alternative means may be applied to kill the stump, such as a stump grinder or basal bark pesticide application. This tool limits soil disturbance. Wetland inundation should eliminate additional regrowth of pluchea. Monitoring will continue for five years to ensure permanence of control action.

Invasive species will be removed and disposed of at a green waste facility off-site.

Applicable BMPs:

1. All project-related equipment and tools will be free of pollutants and weed seeds to the best possible degree during mitigation activities.
2. Wherever practical remove or top weeds prior to flowering and seeding so that a persistent seedbed does not develop. Vigilance during the early stages of native plant establishment will significantly reduce invasive species control work loads long term. Manual removal will be used in further weed eradication and control.
3. In the event that chemical control of invasive species is used, such application shall follow label and MSDS instructions for cleanup and disposal of chemical containers and applicators. A licensed pesticide applicator will be on-site. Cleanup will occur outside of wetland areas.
4. Herbicide use will be done on no or low wind days using a narrow spray range during dry weather to minimize peripheral impacts. Where non-native plants are in tight proximity to natives, removal with hand tools will be used.

5. Removing young plants and incipient populations of invasives as soon as observed will have fewer negative impacts on the wetland and the native plant community.

8. MONITORING PLAN

8.1. PARTIES AND RESPONSIBILITIES

The US-ACE, EPA and USFWS have federal authority over the permitting and action on the project. DLNR-DOFAW retains state authority and provides permits for access. Site visits will be coordinated with agencies to ensure access for monitoring in an affective manner.

Kanahā Professional Plaza LLC will be the responsible party for implementing and/or managing contracts for implementation, onsite management and monitoring. All implementation and monitoring will be carried out in coordination with DOFAW Maui.

8.2. DATA

The data collected and reported will provide sufficient information to evaluate performance standards without being overwhelming to a small project. The following types of data will be collected:

- Water presence/absence - date, area inundated and duration (if practical).
- Water quality – comparative turbidity sampling.
- Plant community composition (species) and cover (area).
- Ae'o and other wetland waterbird or migratory bird sightings within the mitigation area- presence, date, numbers, and activities (ie. loafing, wading, feeding, nesting, etc.).

8.3. ASSESSMENT METHODS

A general baseline has been established against which to measure change though aerial photographs, existing surveys, and GPS outline. Photographs and species composition lists have been developed by DOFAW. Aided by aerial photographs, rough estimates of vegetation cover can be derived from this material. Minimizing regular disturbance within the wetland is a priority for all assessment methods selected.

Vegetation

Percent cover method will be used to document changes in water inundation and plant cover. Cover data is a visual estimate which takes little time and is easy to implement and record (Elzinga, Salzer and Willoughby 1998). This is an effective method for this site.

A simplified, rapid data recording tool for estimating percent cover is mapping. This method can be adapted to both vegetative cover (native and non-native) and water inundation levels.

1. A scaled grid overlaying the original aerial photograph of the site will be developed as a standard data record sheet.
2. A baseline outline of existing non-native/native cover is drawn on the first sheet of record from on the ground survey two weeks prior to vegetation removal.
3. Sampling frequency:
 - Within the first week after vegetation removal is complete.
 - Within the first week after outplanting is complete.
 - Once every six months for three years.
4. Percent change is estimated based on the change in the grid maps.

Permanent photopoints will be established in coordination with DOFAW to document change over time at the site. Time dated digital photographs will also be used to record the accomplishments of goals and objectives during the implementation phase.

1. Point establishment:
 - Two photopoints will be established along the fenceline in the one acre mitigation unit (one facing each end of this linear site)
 - Eight photopoints will be established at accessible points along the edges of the four acre site.
 - The direction of each photograph will be established as a constant for each point.
2. Frequency:
 - A full set of photographs at point two weeks prior to vegetation clearing.
 - On a weekly basis during vegetation clearing and outplanting
 - Every six months in Year 1 and 2, and once a year in subsequent years.

Birds

A Presence/Absence checklist will be used to record protected waterbird and migratory shorebird visitation and use of the wetland and to track invasive species eradication effectiveness.

1. A checklist of key waterbird species and behaviors will be developed to standardize data collection in collaboration with DOFAW Maui staff to facilitate data exchange and usefulness.
2. Monitoring will occur at designated points outside the fenceline or in unobtrusive sites designated by DOFAW.

3. Frequency:

- Three days a week for two weeks before and after mitigation implementation.
- For three consecutive days every six months for three years.
- Observation will take place for 2 consecutive hours per day at early morning, midday and late afternoon to evaluate the range of likely behaviors and uses of the sites.

Water

Inundation coverage will use the percent cover method above. Turbidity will be monitored using the following method:

Multi-Increment (MI) Turbidity Sampling

This method supports consistent and efficient sampling of water quality inside and outside the mitigation area (inside and outside the silt booms/curtains) The methodology follows the recommendations of the Department of Health Clean Water Branch.

Multi-increment (MI) sampling involves the extraction of a representative portion of material from within a single decision unit, as opposed to simple composite sampling where samples may be collected without regard to a specific decision unit. The procedures for MI sampling are specifically designed to minimize the sampling error due to spatial and compositional heterogeneity. Sampling design is based on the following document from the Environmental Protection Agency: *Guidance on Choosing a Sampling Design for Environmental Data Collection for Use in Developing a Quality Assurance Project Plan, QA/G-5S* (U.S. EPA 2002).

Two designated mitigation areas (DMA) exist within this plan.

1. Four paired decision units (DU) are designated for this mitigation plan.
 - a. One acre mitigation site - one unit inside the floating booms and a second unit of relatively equal size at a distance of 20ft beyond and parallel to the outside floating boom
 - b. Four acre mitigation site - four units randomly distributed inside the floating booms and four 20sqft units at a distance of 20ft beyond the outside floating boom.
 2. Increment samples are collected at an average mid-depth level of the pond at random locations within the DU and combined to form a single sample for each DU that is submitted for laboratory analysis. An extension-pole mounted polyethylene dipper will be used to collect the samples.
3. Sampling Frequency:
- Three site visits per week for two weeks prior to mitigation work for baseline/ambient water quality;
 - One daily site visit for every day vegetation removal mitigation work occurs “in-water” during first two months of mitigation activity;

- Three times a week for in-water operations during outplanting mitigation work.
- One time per week for four months post-mitigation completion.

4. QA/QC Methods:

- All sample collection devices shall be pre-cleaned for each of the ten sample points and triple rinsed; the final rinse with distilled water.
- The water vials or cuvettes shall be cleaned for each use in a manner as noted above.
- The Turbidity meter shall be calibrated each day prior to sampling with appropriate turbidity standards.
- The readings shall be recorded on field log sheets and transported later onto a suitable template for electronic mailing.
- The field log notes will include other physical (observed) data such as weather, time of day and nearby activities or events that may contribute to turbidity readings or influence to the readings not associated with mitigation activities.
- At least three duplicate samples will be collected during the pre-mitigation period and sent to a Honolulu-based and DOH certified water quality lab for comparison of accuracy in the field instrument.
- One duplicate water sample will be submitted as above for the post-mitigation work accuracy check.

8.4. MONITORING AND REPORTING FORMAT AND SCHEDULE

Baseline monitoring will be conducted two weeks prior to vegetation removal. Site inspection will occur immediately prior to vegetation removal to ensure no presence of waterbirds in the mitigation area.

Monitoring frequency is described above as part of methodology. Baseline monitoring will occur two weeks prior to vegetation removal. A monitor will be present on a regular basis throughout the implementation period and at bi-annual and annual intervals thereafter.

Reports will be filed with the US-ACE, EPA, USFWS and DOFAW quarterly during the implementation, bi-annually during the first year of plant establishment, and annually for all subsequent years. Reports will describe the status of goals and objectives, challenges, and status of outplantings, invasive species control and wetland function.

It is noted that the County of Maui has requested review of wetland mitigation projects every 5 years for some wetland properties. A request to the US-ACE Regulatory Branch for an outside site review and report to the Maui County Council will be made should this be required.

9. ADAPTIVE MANAGEMENT PLAN

Adaptive management is a key strategy in increasing the success of any habitat restoration project. Where a goal or objective is met, then mitigation activities have been effective. Where difficulties arise in achieving set standards, the methods or tools in use may need to be revised. The key tool in effective adaptive management is observation (monitoring).

Climate related events, newly observed behaviors or needs in wildlife using the habitat, natural plant community changes, and disease events are all factors beyond the control of wetland managers and the second reason for adaptive management to be included in mitigation. Flexibility within management and monitoring parameters and performance standards is a necessary part of responding to changes in the environment and recognizing the limits of the resources at hand.

9.1. PARTIES AND RESPONSIBILITIES

The US-ACE, EPA and USFWS have federal authority over substantive changes to management strategies. DLNR-DOFAW is the state authority for this site.

In the case of adaptive management response, Kanahā Professional Plaza LLC will be the responsible party in collaboration with DOFAW for managing contracts for onsite management and monitoring after implementation. Both parties will work together to respond to any needs for adapting practices based on changing conditions at the site.

9.2. POTENTIAL CHALLENGES

A number of potential challenges exist to meeting performance standards in a timely manner and to the success of the project, including:

- Rapid recolonization by aggressive invasive species from the soil seedbank or from new invaders.
- Heavy rain or flood event which could potentially disrupt implementation schedules, inundate outplantings and/or result in plant die-off.
- Malicious fence and/or habitat damage. This could also potentially open the door to predator access into the wetlands and is one of the challenges of conservation sites within urban areas.
- Plant species selected for this project may not be immediately available in the numbers required due to seed/stock shortages. This is often the result of drought conditions or rodent predation at seed gathering sites or selection of species that are habitat specific and not kept in large quantities by nurseries.
- Extended breeding seasons for waterbirds mean short windows for implementation (Sept-March) with the additional challenge of operating during the rainy season. A permit issued too late to coordinate with nurseries and grow out plants, will result in an unavoidable delay of a year in completion of outplanting. The species selected for

the project can not be held over in a nursery without becoming root-bound, making them unsuitable for outplanting (high failure rate); an extremely expensive loss for a nursery and the mitigation project.

- Botulism or insect pest outbreaks within the bird or plant community.
- Changes in project management, monitoring and oversight parties.
- Failure of mitigation efforts at the site due to uncontrollable circumstances.

9.3. POTENTIAL REMEDIAL MEASURES

Remedial measures to address the potential challenges listed above are:

- Rapid recolonization by invasive species will be handled by rapid response. Control of large infestations will be coordinated with DOFAW and appropriate actions taken using the above described BMPs.
- The site will be inspected after extreme rain or flood events (such as the event of February 2008) and damage assessed. The appropriate agencies will be consulted prior to remedial action in such cases. Flooded plantings may revive on their own. Replacement plantings of the same or similar hydrophitic native species will be done where needed.
- Fence lines and gates will be monitored for damage. Predator monitoring inside the fence is recommended to occur for four weeks after fence repair.
- If some plant species selected are not available when the site is ready for outplanting, partial planting or a shift in species composition will occur. Floating berms will remain in place to retain soils until the remaining plants become available and established.
- If permit issue is delayed, seed collection will continue in the summer of 2009. Grow-out time in the nursery will begin in May 2010 and outplanting will occur in December 2010 through March 2011. In order to prevent an abundance of non-native germination and re-establishment, clearing of invasive species will be held off until September 2010. Floating berms will remain in place until all plantings are established.
- Maui has seen several large botulism outbreaks within Keālia Pond with resultant losses in waterbirds. Any bird deaths within the wetland will be immediately reported to the Division of Forestry and Wildlife and USFWS. Carcasses of any animal (ie. rats) or large fish dieoffs will be reported immediately to minimize potential for fouling water quality. In the event of an outbreak, DOFAW and USFWS specialists are the responding and responsible agencies.
- The need for changes in project management are often unforeseen. Any new responsible party will be fully briefed on the history, current status of the project and required actions on the part of the managing entity. An alternative management and monitoring agency or individual will be required to have previous local wetland

- habitat management experience and familiarity with wetland plants and invasive species control.
- Mitigation efforts may fail for a variety of reasons beyond the control of the project. The property owner(s) will work with the US-ACE, EPA, USFWS, and DOFAW to seek out appropriate alternatives and/or wetland sites in need of assistance within the drainage. Fund and/or resources would be rededicated to the new site. If no appropriate wetland enhancement project is available within the immediate drainage, the fund/resources will be assigned to supplement work outside the immediate watershed.
 - Delays in outplanting schedules may occur due to natural and uncontrollable elements. Where outplantings can not be completed within a single season; they will be finished in the following year during allowable months to ensure no disruption of waterbird breeding and nesting activities takes place.

9.4. PLAN MODIFICATION PROCEDURE

The mitigation project may meet its goals but in unanticipated ways, particularly during the first year. Where substantive plan modification may be needed the following procedure will be used:

- The management party will consult with specialists (ie. species or habitat restoration or invasive species control specialists).
- The responsible managing party will document the unanticipated changes and the need for plan modification, and provide a report and request for modification for any substantive changes to USFWS, EPA, US-ACE and DLNR-OFAW.
- The agencies and the responsible management party will review the information and existing standards and develop appropriate alternative standards to fit the situation.

10. FINANCIAL ASSURANCES

Kanahā Professional Plaza LLC will contract third party oversight for implementation of the mitigation. This will include erosion control, invasive species removal, native species propagation and outplanting and the costs of turbidity monitoring. A perpetual CC&R will be attached to Lot 8 in the form of a Mitigation Fund, to assure continued monitoring and maintenance.

The cost of implementing mitigation within Kanahā is estimated at \$124,500

<u>BUDGET ITEM</u>	<u>ESTIMATED COST</u>
A. COSTS	
1. Non-native vegetation removal	\$30,000
2. Silt fence and floating boom installation (erosion control)	\$18,500
3. Native plant species propagation/outplanting	\$76,000

The cost of all monitoring and reporting and a perpetual mitigation fund, including coverage for wild card events that may occur, is assigned to Lot 8 development costs, along with the perpetual CC&R conditions assigned to the development property, irrespective of who owns the land. Maintenance and monitoring are estimated at \$55,000 over the first five years. A sum of \$10,000 is built into the initial fund to cover “wildcard” events such as the establishment of an aggressive invasive species currently not present on the site or plant replacement due flooding which may cause heavy siltation or other damage in the mitigation area in the wetland.

An initial fund of \$65,000 will be established.

B. MITIGATION FUND

1. Monitoring, maintenance and reporting	\$55,000
2. Wildcard events	\$10,000

An account will be established initially with a Hawai’i bank (the “Account”) into which the developer will deposit \$65,000 (the “Mitigation Funds”) for the first five years. Additional funding will be added as need in subsequent years. The “Mitigation Funds” will be restricted to use for the monitoring and maintenance described herein and as approved by the DLNR. The developer will maintain the Account and be solely responsible for all fees associated with the Account. The restrictions on access to the Mitigation Funds consistent with the terms of this plan shall be given to the designated bank or any successor holder of the Account. The Account and the Mitigation Funds shall be deemed an asset of the project and shall be transferred to any successor landowner to ensure available funds for compliance with this plan. Ongoing obligations relating to the mitigation shall also be set forth in a recorded document which shall encumber the developed property. In this way the developer shall ensure that it and any successor landowner shall be appraised of the ongoing obligations and shall be bound by the same.

Financial assurances will be reviewed by DOFAW and adjusted to reflect current economic conditions such as a rise in the cost of supplies, monitoring and maintenance.

11. REFERENCES

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11.1. PHOTOGRAPHS

- Aerial view of Kanaha Pond*. Open source photograph. 2009-01-03 22:02 (UTC).
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All other photographs, P. Levin. February – May 2009.

APPENDIX A.

Mau Medical Plaza at Kanahā TMK Plat Map
Wetland delineation for Lot 8 (TMK (2) 3-7-11-028)
Wetland series aerial images
Elevations within the mitigation site, Kanahā Pond Wildlife Sanctuary
US-ACE map of KPWS

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APPENDIX B.

Jurisdictional Determination Letter, US-ACE, 25 April 2008
Letter describing search for alternative properties dated 20 January 2009
DLNR-DOFAW letter KPWS option, dated 9 February 2009
DLNR-DOFAW generated list of fauna species observed in KPWS
Drainage summary for Maui Medical Plaza at Kanahā 2006
Tidal Influence Investigation, MEV LLC, 3 January 2008

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APPENDIX C:

Lot 8 design objectives and descriptions that address drainage and infiltration function and ecosystem character

Maui Medical Plaza at Kanahā design map

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APPENDIX D. Agency Comments received for the March 2009 MMPK Draft Mitigation Plan

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