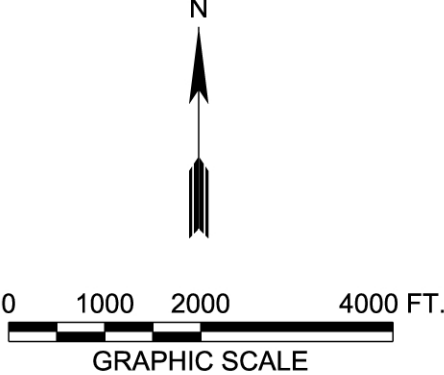


PROJECT BOUNDARY

- LEGEND:**
- MmA Mala silty clay
 - BS Beaches
 - KKTC Kapuhikani extremely stony clay
 - rVS Very stony land
 - rVT2 Very stony land, eroded

REFERENCE: SOIL SURVEY MAP FROM SOIL SURVEY OF ISLANDS OF KAUAI, OAHU, MAUI, MOLOKAI, AND LANAI, STATE OF HAWAII BY UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE IN COOPERATION WITH THE UNIVERSITY OF HAWAII, AGRICULTURAL EXPERIMENT STATION. ISSUED AUGUST 1972. PAGES 70 AND 71.



SOIL SURVEY MAP
 LA'AU POINT DEVELOPMENT
 ISLAND OF MOLOKA'I, COUNTY OF MAUI, HAWAII

			GEOLABS, INC.	
			<i>Geotechnical Engineering</i>	
DATE	JULY 2007	DRAWN BY	KHN	PLATE
SCALE	1" = 2000'	W.O.	5916-00	3

APPENDIX A

Laboratory Test Results

APPENDIX A

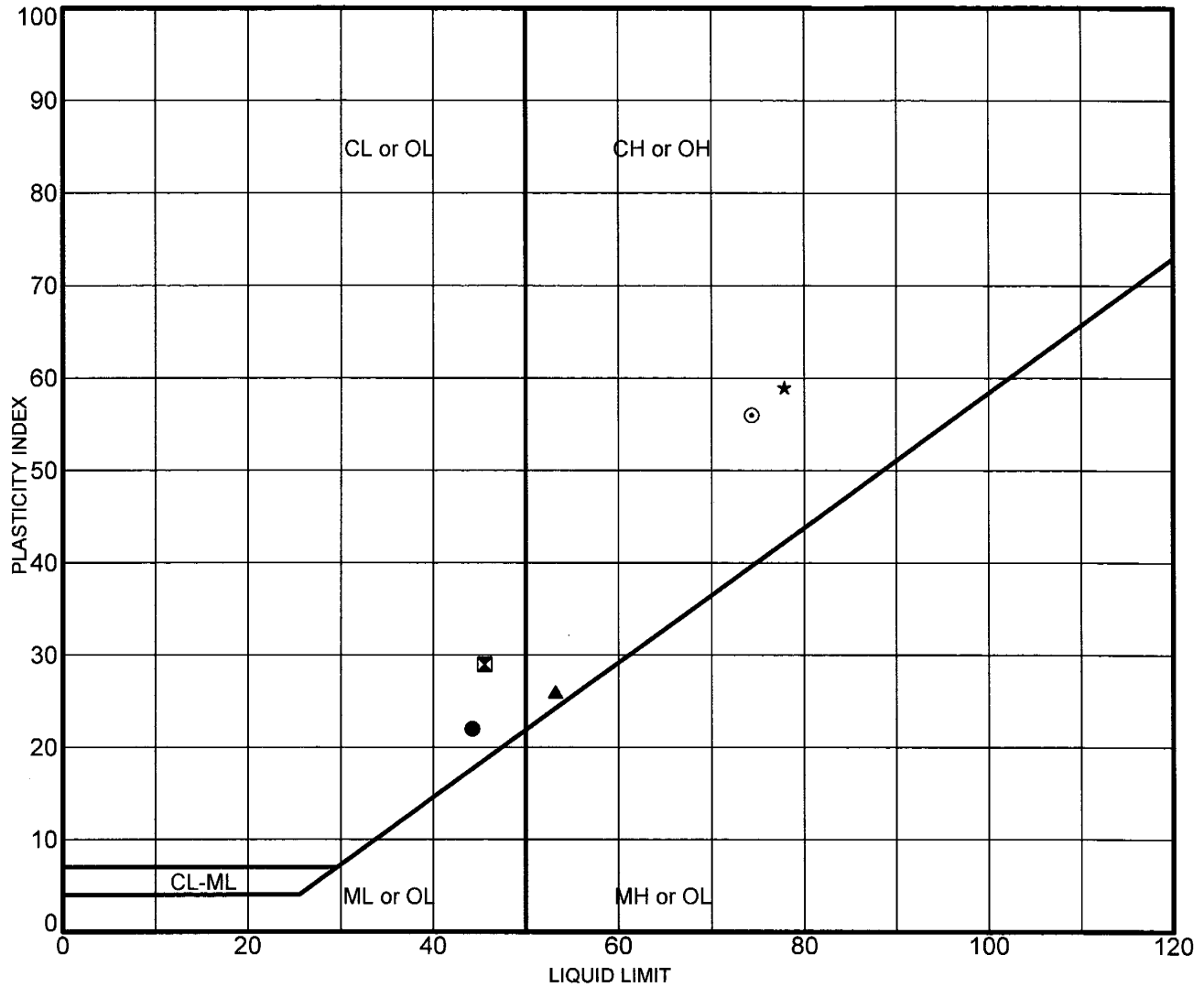
Laboratory Testing

Five Moisture Content (ASTM D 2216) determinations were performed on selected soil samples as an aid in the classification and evaluation of soil properties. The results of these tests are presented in the text of the report.

Five Atterberg Limits tests (ASTM D 4318) were performed on selected soil samples to evaluate the liquid and plastic limits and to aid in soil classification. The test results are presented on Plate A-1.

Five one-inch Ring Swell tests were performed on selected remolded samples to evaluate the swelling potential of the near-surface soils. The test results are summarized on Plate A-2.

[h:\5900 Series\5916-00.sc1 – p14]



Sample	Depth (ft)	LL	PL	PI	Description
● S-1	0.5	44	22	22	Reddish brown silty clay (CL)
⊠ S-2	1.0	46	17	29	Brown silty clay (CL)
▲ S-3	0.5	53	27	26	Reddish brown w/ tan mottling silty clay (CH)
★ S-4	0.5	78	19	59	Dark grayish brown clay (CH)
⊙ S-5	0.5	74	18	56	Dark grayish brown clay (CH)

G-ATTERBERG_5916-00.GPJ_GEO LABS.GDT 8/8/07



GEOLABS, INC.
 GEOTECHNICAL ENGINEERING
 W.O. 5916-00

ATTERBERG LIMITS TEST RESULTS - ASTM D 4318

LA'AU POINT DEVELOPMENT
 ISLAND OF MOLOKA'I, COUNTY OF MAUI, HAWAII

Plate
A - 1

SUMMARY OF RING SWELL TESTS

La'au Point Development
West Moloka'i, County of Maui, Hawai'i

<u>Location</u>	<u>Depth</u> (feet)	<u>Soil</u> <u>Description</u>	<u>Dry</u> <u>Density</u> (pcf)	<u>Moisture Contents</u>			<u>Ring</u> <u>Swell</u> (%)
				<u>Initial</u> (%)	<u>Air-Dried</u> (%)	<u>Final</u> (%)	
S-1	0.5	Reddish-Brown Silty Clay	92.2	27.3	20.2	31.2	2.2
S-2	1.0	Brown Silty Clay	98.1	22.8	18.8	29.1	6.3
S-3	0.5	Reddish-Brown Silty Clay	78.4	33.7	25.4	41.7	1.2
S-4	0.5	Dark Grayish- Brown Clay	82.8	24.8	19.4	52.6	23.6
S-5	0.5	Dark Grayish- Brown Clay	86.6	23.3	18.6	46.6	20.0

NOTE: Samples tested were remolded in 2.4-inch diameter by 1-inch high rings. They were air-dried overnight and then saturated for 24 hours under a surcharge pressure of 55 psf.

[h:\5900 Series\5916-00.sc1 - p15]

APPENDIX B

Site Condition Photographs

*La'au Point Development
West Moloká'i, County of Maui, Hawai'i*



Photograph No. 1: Collection site for Soil Sample S-2 on the alluvial plain at Aholehole Flats and the typical surrounding ground surface conditions. (photo 0292)



Photograph No. 2: Typical dark brown clay soil with desiccation cracks encountered as generally thin deposits along the western coastline trail northerly of the existing Coast Guard property. Note the embedded coral fragments. (photo 0297)

*La'au Point Development
West Molokā'i, County of Maui, Hawai'i*



Photograph No. 3: Collection of Soil Sample S-3 and the typical surrounding ground surface conditions. (photo 0298)



Photograph No. 4: Collection site for Soil Sample S-4 and the typical surrounding ground surface conditions. Note the moderate desiccation cracks indicative of expansive soil conditions. (photo 0300)

*La'au Point Development
West Moloká'i, County of Maui, Hawai'i*



Photograph No. 5: View of localized concentrated surface boulder deposits just easterly and inland from the existing Coast Guard property. (photo 0303)



Photograph No. 6: View towards the east along the south facing shoreline showing typical sea cliffs and exposed rock formation. (photo 0306)

*La'au Point Development
West Molokā'i, County of Maui, Hawai'i*



Photograph No. 7: Collection site for Soil Sample S-1 and the typical surrounding ground surface conditions. Note that the reddish brown surface soils grade at relatively shallow depth to a multicolored saprolitic soil with highly weathered rock formation. (photo 0315)



Photograph No. 8: Collection site for Soil Sample S-5 and the typical surrounding ground surface conditions. The subject dark grayish brown clay soils were often encountered as isolated deposits within regional soil deposits consisting of reddish brown silty clay. (photo 0319)

Appendix E

Botanical Survey

LA'AU POINT PLANT SURVEY

November 2005 – June 2006

Prepared by: Bill Garnett

Revised: 9 Sept 2006

1. Introduction

La'au Point is the southwest corner of the island of Moloka'i. The study area includes lands along the coastline from Kaunala Bay in the north to Hale o Lono Point in the east. The Coast Guard Reservation that includes La'au Point is not included. Low annual rainfall is a defining characteristic of this region. Historical use of this area for grazing and wild land fires have left few native plants, except for those that grow on the sandy beaches. Even there, Axis deer have significantly reduced the abundance and diversity of native plants.

This botanical survey of La'au Point was contracted by Molokai Properties Limited (MPL) in September 2005 to provide information on native and rare plants and natural communities within the La'au Point area. The study area was defined by the "project boundary" provided by MPL (see Map 1).

This report summarizes the findings from a combination of ground and aerial surveys. It includes:

- Brief descriptions, plant checklist and map for the seven plant communities currently found on La'au Point – from the coastline to inland areas.
- Location & relevant natural history for three rare Hawaiian plant species observed during the survey
- List of eight additional rare Hawaiian plant species known historically from the area but not observed during this survey
- Brief vegetation management options for future consideration.

Photographs, sample field forms and additional information are included as appendices on the report CD.

2. Survey methods

A total of five person-days were spent surveying La'au Point from 28 November 2005 through 6 June 2006. Ground surveys were conducted on foot covering the varying terrain and the areas that promised the highest native plant species diversity. A GPS was used to log the survey routes and record significant features. On 15 May 2006, a helicopter was used to conduct an aerial photographic survey and spot any unique areas that were not previously visited on the ground.

The survey period was extended to allow for adequate observations after the winter rains, which came in late March 2006. This was necessary to detect rare and native plants that only come up in the wet season, including species historically known from the area.

3. Results

Healthy native plant communities are still found in the sandy beach habitat of La'au Point, including the most extensive example of *Cressa* herbland in the main Hawaiian islands. In addition to *Cressa*, which is considered rare in Hawaii, localized populations of two rare Hawaiian plant species were found in areas dominated by non-native species. The federally endangered 'ihi`ihilauakea (*Marsilea villosa*) was found near one of the seasonal wetlands, and a population of the endemic Hawaiian cotton or ma'o (*Gossypium tomentosum*) was found where the Kamakaipo drainage meets the coast. Otherwise, the vast majority of La'au Point is vegetated by non-native plants.

The location of each major habitat/plant community and rare plant population are indicated on Maps 2 and 3. A complete checklist of both native and non-native plant species observed in each habitat is provided in Table 1.

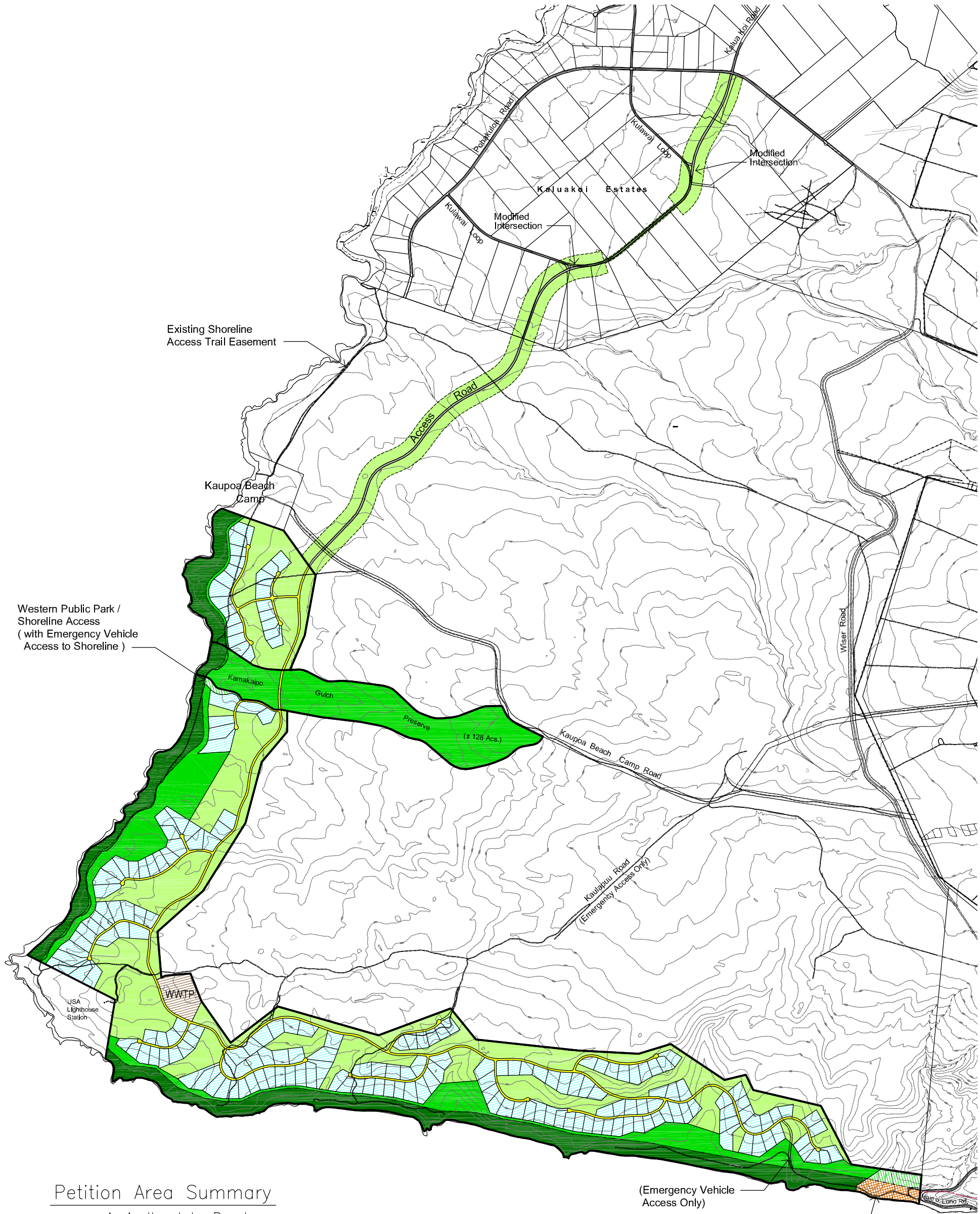
Plant Communities Found in Study Area

Sandy Beach

The sandy beach strand habitat contains examples of three native plant communities, including the best, most extensive example of a seasonal herb-land dominated by *Cressa truxillensis* in the main Hawaiian islands. The strand also includes scattered surviving patches of 'aki 'aki (*Sporobolus virginicus*) grasslands along the west facing beaches, and small patches of 'akulikuli (*Sesuvium portulacastrum*) herbland are found spreading onto the beach in areas that have seasonal streams. Other native plants found growing on the beach include: pohuehue or beach morning glory (*Ipomoea pes-caprae*), the sedge *Fimbristylis cymosa*, and pohinahina (*Vitex rotundifolia*). Kiawe and animal grazing have been the main pressures on these plant communities.

Rocky Shoreline Shrubland/Grassland

Only 10% of this habitat currently has native plant cover, but it contains the highest number of native plant species including: naupaka (*Scaevola sericea*), uhaloa (*Waltheria indica*), ma'o or Hawaiian cotton (*Gossypium tomentosum*), 'ilima (*Sida fallax*), alena (*Boerhavia diffusa*), pau o Hi'iaka (*Jacquemontia ovalifolia* ssp. *sandwicensis*), 'ihi (*Portulaca lutea*), akulikuli (*Sesuvium portulacastrum*), the grass *Panicum fauriei* var. *latius*, aki'aki (*Fimbristylis cymosa* ssp. *umbellato-capitata*), and kakonakona (*Panicum torridum*). The non-native components that dominate this community are golden crown beard (*Verbesina encelioides*), Australian salt bush (*Atriplex semibaccata*), dog fennel (*Dessodia tenuiloba*) and kiawe (*Prosopis pallida*). Endangered plants historically known from this community are *Lipochaeta degeneri*, *Sesbania tomentosa* and *Portulaca vilosa*.



Petition Area Summary

	Agricultural to Rural	
	House Lots (200)	± 400 Ac.
	Roadways	± 46 Ac.
	Infrastructure (Wastewater Treatment Plant)	± 14 Ac.
	Parks	± 8 Ac.
	Open Space	± 382 Ac.
Total Agricultural to Rural		± 850 Ac.
	Conservation to Rural (for Park Use)	± 9 Ac.
	Agricultural to Conservation	± 254 Ac.
Total Petition Area		± 1,113 Ac.

Project Area Summary

	Petition Area	± 1,113 Ac.
	Existing Conservation District (along Shoreline)	± 180 Ac.
	Offsite Road Corridor	± 139 Ac.
Total Project Area		± 1,432 Ac.

(Emergency Vehicle Access Only)

Southern Public Park / Shoreline Access (with Emergency Vehicle Access to Shoreline)

Figure 1
Project Area & LUC Petition Area
Lā'au Point

Seasonal Wetlands

This community is found in mud flats that are flooded when consistent seasonal rains saturate the soil. Under drought situations, the community is dominated by several dryland weed species, including cocklebur (*Xanthium saccharatum*), bristly foxtail (*Setaria verticilata*), finger grass (*Chloris barbata*) and the vine *Merremia aegyptica*. The perimeter of the seasonal wetlands is dominated by kiawe trees (*Prosopis pallida*) and in some areas guinea grass (*Panicum maximum*). The population of endangered `ihi`ihilauakea (*Marsilea villosa*) is found 50 meters from one of the seasonal wetlands and most likely occurred in that community before, as this is the plant's preferred habitat. Seasonal wetlands are natural settling basins which can reduce soil loss and near shore siltation.

Kiawe Lowland Dry Forest

Kiawe forests are the most widespread plant community in the study area. In many areas, these forests stretch up to the high tide line due to the trees' ability to utilize brackish groundwater. The kiawe forest is most developed in areas where groundwater is available, just inland of the coastal strand and in the drainages. The native components of this community are `ilima, *Abutilon incanum*, and pili grass (*Heteropogon contortus*) which is currently rare in the study area. Historically, `ilima and pili grass along with *Chamaesyce skottsbergei* and ohai (*Sesbania tomentosa*) would have been the dominant plant community in the inland areas of the study area before grazing, fire and weeds dramatically changed the community structure. Historic native components of the drainages in this zone would have included wiliwili (*Erythrina sandwicensis*), ohe makai (*Reynoldsia sandwicensis*) and ma'o (*Gossypium tomentosum*). Endangered species historically known from this kiawe-dominated zone of the study area include Hawaii's state flower, ma'o hau hele (*Hibiscus brackenridgei ssp. molokaianus*).

Lowland dry mixed shrub and grasslands

This plant community occupies the inland areas where rocky terrain, erosion and lack of water have created gaps in or slowed the ingress of the kiawe forest community. Lantana is a dominant species in these dry exposed nutrient poor areas.

Map 2.

2006 La'au Point Vegetation Survey Vegetation Communities

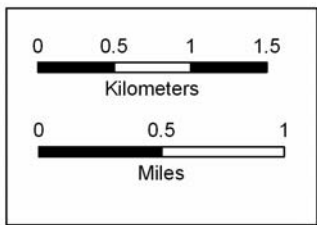
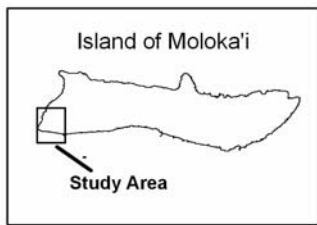
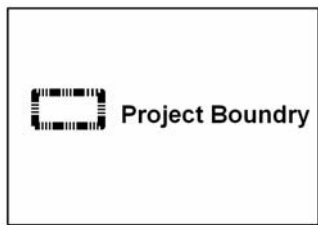
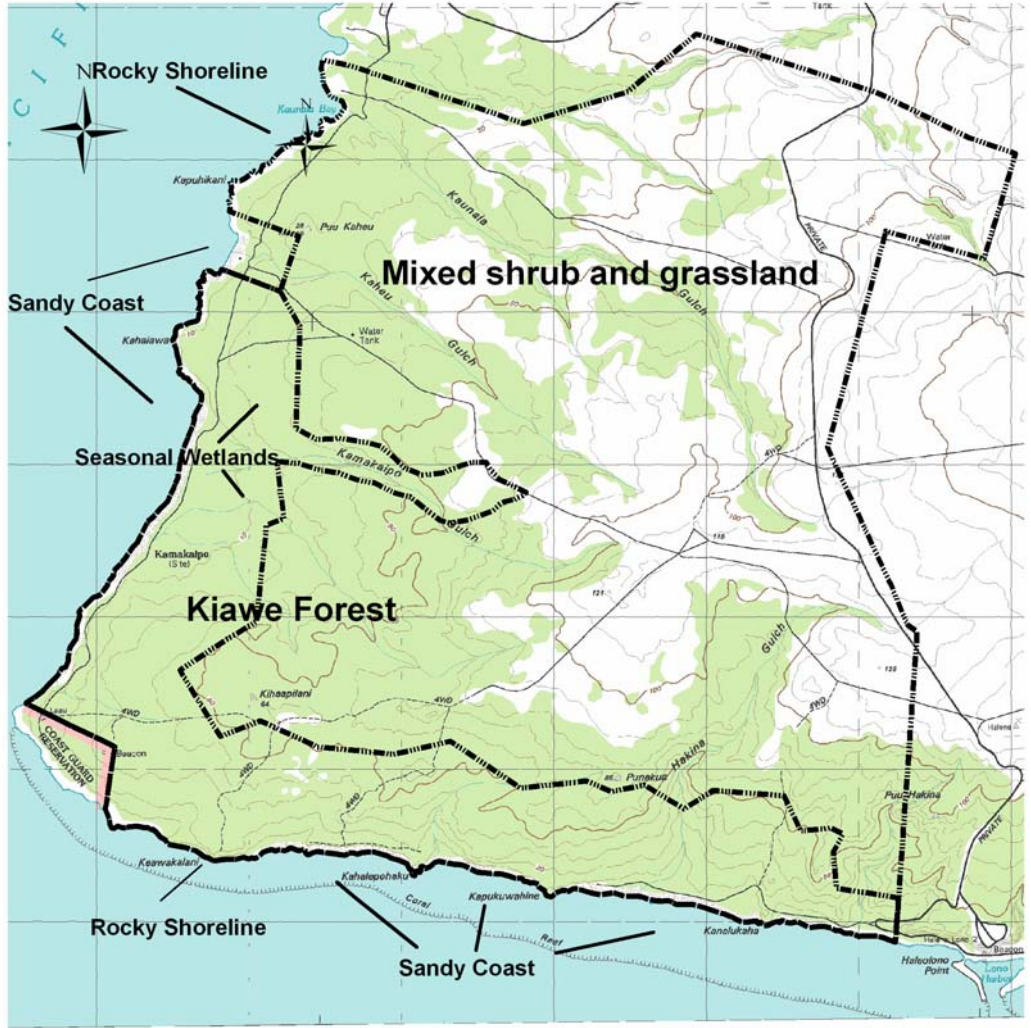


Table 1

LA'AU POINT PLANT CHECKLIST

November 2005 – June 2006

STATUS	SCIENTIFIC NAME	COMMON NAME	Beach	Coastal Strand	Shrubland	Kiawe Forest	Seasonal Wetland
A	<i>Abutilon grandifolium</i>	Hairy abutilon, ma`o			X	X	
I	<i>Abutilon incanum</i>	Ma'o		X	X	X	X
A	<i>Acacia farnesiana</i>	Klu, kolu		X	X	X	
A	<i>Amaranthus spinosus</i>	spiny amaranth			X		X
A	<i>Ageratum conyzoides</i>	Maile hohono					
A	<i>Anagallis arvensis</i>	Scarlet pimpernel					
A	<i>Arenaria serpyllifolia</i>	Thyme-leaved sandwort					
I	<i>Artemisia australis</i>	Hinahina kuahiwi					
A	<i>Atriplex semibaccata</i>	Australian saltbush					X
A	<i>Bidens pilosa</i>	Spanish needle					
I	<i>Boerhavia repens</i>	Alena					
A	<i>Bothriochloa barbinodis</i>	Fuzzy top		X	X		
A	<i>Bothriochloa pertusa</i>	Pitted beardgrass			X		
A	<i>Bromus rigidus</i>	Ripgut grass		X	X		
A	<i>Cenchrus ciliaris</i>	Buffelgrass		X	X	X	
A	<i>Centaurium erythraea</i> <i>ssp. erythraea</i>	Bitter herb, European centaury		X	X		
A	<i>Chamaecrista nictitans</i> <i>ssp. patellaria</i> var. <i>glabrata</i>	Partridge pea, lauki		X	X	X	X
E	<i>Chamaesyce degeneri</i>	`Akoko, koko, kokomalei		X			
A	<i>Chamaesyce hirta</i>	Hairy/garden spurge, koko kahiki	X	X	X	X	X
A	<i>Chamaesyce prostrata</i>	Prostrate spurge	X	X	X	X	
A	<i>Chenopodium carinatum</i>	Tasamnian goosefoot	X	X	X		
A	<i>Chenopodium murale</i>	Lambs quarters		X			
A	<i>Chloris virgata</i>	Feather fingergrass			X	X	
A	<i>Conyza bonariensis</i>	Hairy horseweed				X	
A	<i>Coronopus didymus</i>	Swinecress		X	X	X	
I	<i>Cressa truxillense</i>						
E	<i>Cuscuta sandwichiana</i>	Dodder, kauna`oa, kauna`oa lei				X	
A	<i>Cynodon dactylon</i>	Bermuda grass, manienie		X			
A	<i>Dactyloctenium aegyptium</i>	Beach wiregrass	X				
A	<i>Datura stramonium</i>	Jimson weed,		X	X		
A	<i>Dichanthium annulatum</i>	Blue stem			X		
A	<i>Digitaria ciliaris</i>	Henry's crabgrass, kukaepua`a			X		
A	<i>Digitaria insularis</i>	Sourgrass			X	X	
A	<i>Doryopteris decipiens</i>	Kumuniu			X	X	

STATUS	SCIENTIFIC NAME	COMMON NAME	Beach	Coastal Strand	Shrubland	Kiawe Forest	Seasonal Wetland
A	<i>Dyssodia tenuiloba</i>	Dog fennel	X	X	X	X	
A	<i>Emilia fosbergii</i>	Pua lele, sow thistle		X	X	X	
A	<i>Eragrostis tenella</i>	Japanese lovegrass			X		
A	<i>Erodium cicutarium</i>	Alfilaria, pin clover			X		
I	<i>Fimbristylis cymosa</i> ssp. <i>umbellato-capitata</i>	Aki'aki	X				
E	<i>Gnaphalium sandwicense</i> var. <i>sandwicense</i>	`Ena`ena		X			
E	<i>Gossypium tomentosum</i>	Ma'o		X			
E	<i>Heliotropium anomalum</i> var. <i>argenteum</i>	Hinahina, hinahina ku kahakai	X	X			
I	<i>Heliotropium curassavicum</i>	Seaside heliotrope, nena	X	X			
I	<i>Heteropogon contortus</i>	Pili grass			X		
A	<i>Hypochoeris radicata</i>	Gosmore, Hairy cat's ear		X			
A	<i>Indigofera suffruticosa</i>	Indigo		X	X	X	
I	<i>Ipomoea pes-caprae</i> ssp. <i>brasiliensis</i>	Beach morning glory, pohuehue	X	X			
E	<i>Ipomoea tuboides</i>	Hawaiian moonflower, koali pehu					
E	<i>Jacquemontia ovalifolia</i> ssp. <i>Sandwicensis</i>	Pa`u-o-Hi`iaka		X			
A	<i>Lantana camara</i>	Lantana		X	X	X	X
A	<i>Lepidium oblongum</i>	Pepper grass			X		
A	<i>Lepidium virginicum</i>	Garden pepper grass			X	X	
A	<i>Leucaena leucocephala</i>	Haole koa, koa haole, ekoa		X	X	X	
I	<i>Lipochaeta integrifolia</i>	Nehe		X			
I	<i>Lycium sandwicense</i>	`Ohelo kai, `ae`ae		X			
A	<i>Lycopersicon pimpinellifolium</i>	Currant tomato			X	X	
A	<i>Macroptilium lathyroides</i>	Wild bean, cow pea				X	
A	<i>Malvastrum coromandelianum</i> ssp. <i>Coromandelianum</i>	False mallow		X	X	X	
LE	<i>Marsilea villosa</i>	`ihi`ihi, `ihi`ihilauakea					X
A	<i>Medicago polymorpha</i>	Bur clover					
I?	<i>Merremia aegyptia</i>	Hairy merremia					
A	<i>Nicotiana Glauca</i>	tree tobacco		X	X		
A	<i>Oxalis corniculata</i>	Yellow wood sorrel, `ihi makole				X	
E	<i>Panicum fauriei</i> var. <i>latius</i>	Faurie's panicgrass	X				
A	<i>Panicum maximum</i>	Guinea grass		X			
E	<i>Panicum torridum</i>	Kakonakona					
A	<i>Plantago lanceolata</i>	Narrow-leaved plantain					
A	<i>Pluchea symphytifolia</i>	Sourbush					

STATUS	SCIENTIFIC NAME	COMMON NAME	Beach	Coastal Strand	Shrubland	Kiawe Forest	Seasonal Wetland
A	<i>Polycarpon tetraphyllum</i>	fourleaf manyseed					
I	<i>Portulaca lutea</i>	`Ihi		X			
A	<i>Portulaca oleracea</i>	Pigweed, `ihi		X			
A	<i>Prosopis pallida</i>	Algaroba, kiawe					
A	<i>Reichardia tingitana</i>	False sow thistle					
A	<i>Rhynchelytrum repens</i>	Natal redtop					
I	<i>Scaevola sericea</i>	Naupaka kahakai					
A	<i>Schinus terebinthifolius</i>	Christmas berry, wilelaiki				X	
I	<i>Sesuvium portulacastrum</i>	Sea purslane, `akulikuli	X				
A	<i>Setaria verticillata</i>	Bristly foxtail		X			
I	<i>Sida fallax</i>	`Ilima					
A	<i>Silene gallica</i>	Pink		X	X		
I	<i>Solanum americanum</i>	Glossy nightshade, popolo					
A	<i>Sonchus oleraceus</i>	Sow thistle, pualele					
A	<i>Sporobolus africanus</i>	Smutgrass, African dropseed					
I	<i>Sporobolus virginicus</i>	`Aki`aki	X	X			
A	<i>Stachytarpheta jamaicensis</i>	Jamaica vervain, oi		X	X	X	
A	<i>Tournefortia argentea</i>	Tree heliotrope		X			
I	<i>Tribulus cistoides</i>	Nohu					
A	<i>Tridax procumbens</i>	Coat buttons					
A	<i>Turnera ulmifolia</i>	Yellow alder				X	
A	<i>Verbesina encelioides</i>	Golden crown-beard		X	X	X	X
I	<i>Waltheria indica</i>	`Uhaloa, hi`aloha		X	X	X	X

Key to status column: A-alien, I-indigenous, E.-endemic, L.E.-federally listed endangered species

Rare Plant Species Found in Study Area

`Thi`ihilauakea (*Marsilea villosa*)

`Thi`ihilauakea is an endangered, endemic water fern found only in the Hawaiian islands, restricted to areas with irregular flooding regimes. Currently, it is known from three populations on O`ahu and two populations on Moloka`i. Many of the historic populations on O`ahu were destroyed by drainage of ponding areas, habitat degradation, competition from alien plants, off road vehicles and development.

This unique fern resembles a four-leaf clover, with four leaflets borne at the end of a leaf stalk. The plant occurs either in scattered clumps or as a dense interwoven mat, depending on the competition with other species for limited habitat resources. *Marsilea villosa* requires periodic flooding for spore release and fertilization, followed by a decrease in water levels for the young plants to establish, and finally dry soil for the plants to mature. For *Marsilea villosa*, flooding and sexual reproduction may occur as

infrequently as once every ten or more years, due to the infrequency of sufficiently heavy rains in the lowland areas of Hawai`i. Hence this plant can remain dormant and undetected for many years, yet continue to have viable sporocarps in the soil.

A few details on the sexual reproduction of *Marsilea villosa* may be useful. It is initiated through the production of a hard sporocarp borne on the rhizome leaf pair node. The sporocarp will mature only if the soil dries below threshold levels for leaf growth. The sporocarp remains in the soil for an extended period of time and must be scarified before it will open. It is not known how the sporocarp is scarified in *Marsilea villosa*, but bacterial action is thought to erode the wall of the sporocarp to the point that water can be absorbed and force the sporocarp to open. Standing water is necessary for the sporocarp to open and release the male and female spores. Standing water also is needed for the sperm to swim to the female spore containing the egg. The method of dispersal of *Marsilea villosa* sporocarps is unknown, although in other species, water birds have been known to disperse either internally or externally (USFWS 1996).

Cressa truxillensis

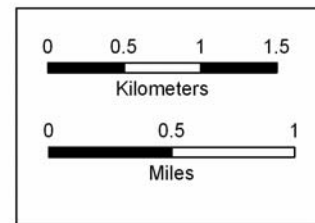
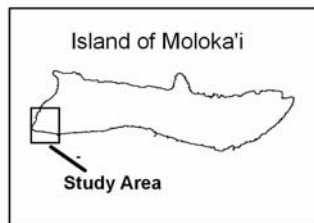
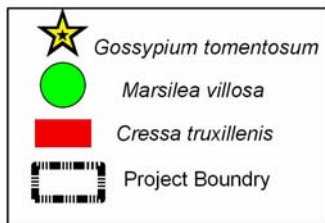
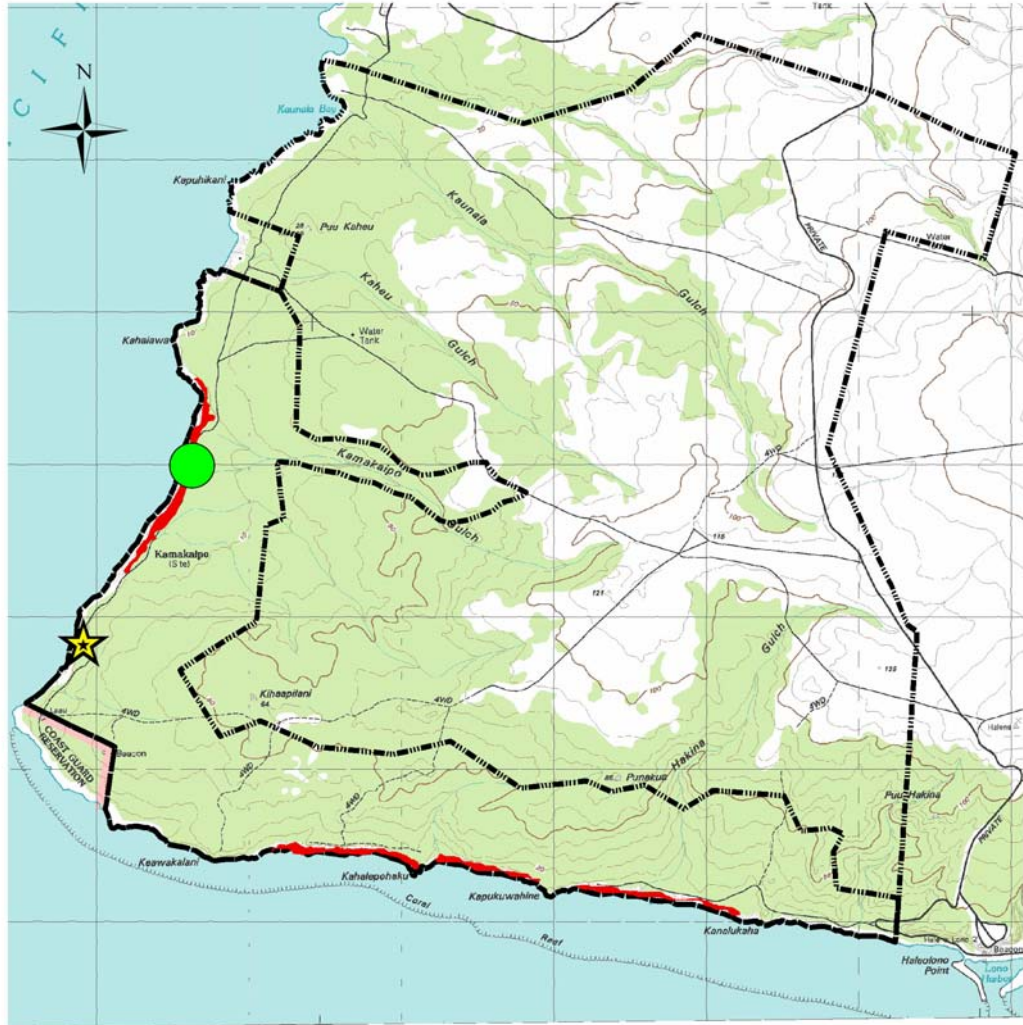
Cressa truxillensis is indigenous to Hawaii, where it is considered rare. The populations scattered along Molokai's sandy coasts from Ilio point to Kaunakakai are considered to be the best in the main Hawaiian islands. The next best known population is on Kahoolawe. As with many native plants found in dry coastal locations, *Cressa* is most abundant during the wet season.

Ma'o (*Gossypium tomentosum*)

Hawaii's endemic cotton was probably a dominant species in the rocky areas and clay flats of the study area before grazing and fires degraded the habitat. On this survey, a stand of ma'o was found only where the Kamakaipo drainage meets the coast. Individual plants may occur elsewhere off the survey routes. Ma'o populations are declining on Moloka'i and throughout the Hawaiian islands. *Gossypium tomentosum* is a shrub with yellow flowers. The short brownish fibers on the seeds of the Hawaiian cotton are not commercially useful, but the Hawaiian plants have been used in cotton breeding programs in attempts to improve disease resistance in commercial cotton.

Map 3.

2006 La'au Point Vegetation Survey Significant Plants



Historic Rare Plant Occurrences

A literature review revealed eight rare or endangered Hawaiian plant species that were recorded from West Molokai in the past but were not observed during this survey.

Rare Plant Species	Observer & Last Date Observed
<i>Achyranthes splendens</i>	Hillebrand 1850
<i>Hibiscus brackenridgei molokaianus</i>	Caum 1930
<i>Lipochaeta degeneri</i>	Degener 1928
<i>Portulaca villosa</i>	Munro 1920's
<i>Sesbania tomentosa</i>	Hillebrand 1850
<i>Solanum nelsonii</i>	Forbes 1880's
<i>Tetramolopium conyzoides</i>	Munro 1920's
<i>Chamaesyce skottsbergei</i>	Degener 1938

4. Conclusions

According to the Petition Area Summary map provided, none of the significant plant populations are found within the areas indicated for the 200 house lots or rezoning from Agriculture to Rural. The *Cressa truxillensis*, Hawaiian cotton (*Gossypium tomentosum*) and *Marsilea villosa* populations are all found within the existing or proposed Conservation Districts and Public Park/Shoreline Accesses shown on the map. The *Marsilea* population occurs on both sides of the existing unimproved road near where it crosses the Western Public Park/Shoreline Access and will require consideration in the new road. The seasonal wetlands are potential habitat for additional *Marsilea villosa* populations and also appear to be in the areas proposed to be re-zoned from Agriculture to Conservation.

While the native vegetation in the study area has been severely impacted by historical fire, grazing and non-native competitors, the remaining native elements, slopes and seasonal wetlands are worthy of stabilizing and will enhance the site. The high deer population in the watershed above the study area keeps all ground cover species (native and non-native) from developing and retaining rainfall. The lack of protective groundcover has resulted in erosion scars and excessive runoff, which causes siltation of the near shore waters after even minor rain events.

Management options for the rare and native plants and communities found in the study area should be considered. The *Marsilea villosa* population is located within the coastal set back zone and could be protected from impacts. A simple management plan could be developed to manage this significant population, including possible opportunities to use private land owner "safe harbor" conservation programs. *Marsilea* might also benefit from habitat created by any settling ponds planned for the site. Removal of kiawe from the beaches will improve the habitat for the surviving coastal plant communities and would restore the sandy beach areas to their original width. Finally, any landscaping in the study area should utilize the drought resistant native species that have persisted at La'au Point and should not utilize any invasive plant species.

5. References

Wagner, Warren L., Darrel R. Herbst, and S. H. Sohmer. 1990. *Manual of the flowering plants of Hawai'i*. 2 vols., Bishop Museum Special Publication 83. Honolulu: University of Hawaii Press and Bishop Museum Press.

USFWS. 1996. *Marsilea villosa Recovery Plan*. Portland, Oregon: U.S. Fish and Wildlife Service. p.55.

Hillebrand, W. 1888. *Flora of the Hawaiian Islands: a description of their phanerogams and vascular cryptogams*. Carl Winter, Heidelberg, Germany; Williams & Norgate, London; B. Westermann & Co., New York. 673p.

Wagner, W.L.; Bruegmann, M.M.; Herbst, D.R.; Lau, J.Q.C. 1999. *Hawaiian Vascular Plants at Risk: 1999*. Honolulu, HI: Bishop Museum Press Honolulu.

Garnett, W. 1990. Plants in the National Collection of the Center for Plant Conservation growing at Waimea Arboretum Botanical Garden.. Notes from Waimea Arboretum & Botanical Garden. 17, 2: 4-16.

USFWS. 1991. Listing Proposals. *Endangered Species Technical Bulletin*. 16, 3: 4-5.

USFWS. 1991. Proposed endangered status for a Hawaiian plant, *Marsilea villosa* ('ihi'ihii). *Federal Register*. 1991, 56: 6350-6353.

USFWS. 1992. Determination of endangered status for *Marsilea villosa* ('ihi'ihii). *Federal Register*. 57, 120: 27863-27867.

USFWS. 2000. Determinations of Whether Designation of Critical Habitat Is Prudent for 20 Plant Species and the Proposed Designations of Critical Habitat for 32 Plant Species From the Island of Molokai, HI. *Federal Register*. 65, 251: 83158-83216.

6. Appendices (on CD)

- Checklist of Historic Plants from West Molokai
- Sample Field Forms
- Aerial Photos