

APPENDIX E
Flora Survey

**BOTANICAL RESOURCE ASSESSMENT FOR THE
PROPOSED PU'UNENE HEAVY INDUSTRIAL SUBDIVISION
PU'UNENE, MAUI, HAWAII**

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INTRODUCTION

This report includes the findings of a plant inventory conducted in Pulehuani on the island of Maui, including portions of a parcel owned by CMBY2011 Investment, LLC [TMK (2) 3-8-08:19] and various easements required for access to the proposed subdivision. LeGrande Biological Surveys Inc. carried out a botanical field survey of the above location on the 16th and 17th of August 2011. The primary objectives of the field studies were to:

- 1) inventory the flora and;
- 2) provide a general description of the vegetation on the project site;
- 3) search for threatened and endangered species as well as species of concern; and
- 4) provide recommendations regarding potential impacts to the biological resources of the area in regards to the proposed development of the survey area.

Federal and State of Hawaii listed species status follows U.S. Fish and Wildlife Listed and Candidate Species (USFWS 2008) and Federal Register (2002).

GENERAL SITE DESCRIPTION

The 86-acre subject parcel is located in Pulehuani to the south of Pu'uhene town proper. The subject property lies to the east of the Old Pu'uhene Airport (Maui Airport). Currently the area to the west is being used for recreational motor sports, the areas to the east and south are in crop cultivation, and to the north bordered by Lower Kihei Road. Additional to the subject parcel, two roadway easements were surveyed for this project, a 56-foot wide easement owned by the state along the existing Kama'aina Road, and an alternative 56-wide easement which travels around the existing Reservoir No. 6 to the north of the subject property.

METHODS

Topographic maps were examined to determine terrain characteristics, access, boundaries, and reference points. Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. A walk-through survey method was used. The field survey included the 86-acre subject parcel as well and the two proposed roadway easements, both 56 feet wide. The easement transects were surveyed between 100 to 150 feet wide as the exact location of the easement could not be ascertained in the field and the construction of the roadway will no doubt include an area wider than the easement itself.

Notes were made on plant associations and distribution, disturbances, topography, substrate types, exposure, drainage, etc. Plant identifications were made in the field; plants that could not be positively identified were photo documented and described for later determination in the BISH herbarium, and for comparison with the recent taxonomic literature.

VEGETATION

The subject parcel is characterized by Dry Kiawe/Buifelgrass vegetation. The main subject property is at approximately 120 feet in elevation. The easements range from 110 to 140 feet elevations along the roadway from Mokuale Highway to above the reservoir. The Mean Annual Rainfall is 12 to 20 inches per year. The NRCS Soil Survey delineates the entire 86-acre parcel

and both easements as WID2: Waiakoa extremely stony silty clay loam, 3 to 25 percent slope, eroded (NRCS, 2011).

There were a total of 50 plant species observed within the survey sites. 44 are alien (introduced) and 6 are indigenous (native to the Hawaiian Islands and elsewhere). Therefore, 88% of the plant species observed are alien and 12% are native. An inventory of all the plants observed within the survey area is presented in the species list (Table 1) at the end of the report.

Main Parcel

The dominant vegetation of the subject parcel is a kiawe (*Prosopis pallida*)/buifelgrass (*Cenchrus ciliaris*) grassland with a koa hoole (*Leucaena leucocephala*) scrub transition between the southern boundary of the property. The northern section appears to have had relatively recent grading with large boulder piles near the gate entrance. Several other weedy native species were observed scattered throughout the property including; Jimson weed (*Datura stramonium*), cheese weed (*Melva parviflora*), Lion's ear (*Leonotis nepetalifolia*), hairy spurge (*Chamaesyce hirta*), *Anarrathus* sp., and golden crownbeard (*Yerbesina encelioides*). Few native species were observed within the survey area. They include three indigenous species, ilima (*Sida fallax*), popolo (*Solanum americanum*), and uhaloa (*Waltheria indica*).

The northeast corner of the subject property appeared to be in cattle operation historically. Several water troughs and barbed wire fencing are still evident in the area and other concrete structures that may be associated with ranching.

State Easement

The "lower 56' easement" follows Kama'aina Road (State owned), South Firebreak Road (State & privately owned), and Lower Kihei Road (privately owned) with current sugar cane cultivation to the west and a reservoir bank to the east. Dominant roadside weeds are buffel grass and koa hiale shrubs. Others species scattered along roadsides and the reservoir embankment include partridge pea (*Chamaecrista nictitans* subsp. *patellaria* var. *glabrata*), swollen finger grass (*Chloris barbata*), castor bean (*Ricinus communis*), mauienie (*Cynodon dactylon*), kaliko (*Euphorbia heterophylla*), graceful spurge (*Chamaesyce hypericifolia*), obscure morning glory (*Ipomoea obscura*), and smooth rattlespod (*Crotalaria pallida*).

Reservoir Easement

The "Upper 56' easement" borders the existing reservoir to the north and east. Monkeypod (*Samanea saman*) and Siris (*Albizia lebbek*) are the dominant tree species around the east boundary of the easement mixed with a Koa hiale scrub. At the northern end of the reservoir a portion of the easement crosses over a drainage canal. Large Java plum (*Syzygium cumini*) trees dominate the area around the canal. During our survey we observed 'auku'u (Black-crowned night heron) roosting in the Java plum trees. Several other plant species were noted in the area including two indigenous species: milo (*Thespesia populnea*) and hala (*Pandanus tectorius*), as well as Guinea grass (*Panicum maximum*), and banana (*Musa* sp.).

As the easement heads north from the subject parcel it crosses a road leading to the Hawaii Cement Plant and then heads west into current sugar cane fields. A drainage ditch near the area where the easement turns west (past the reservoir) contains some plant species that are usually found near standing or running water. They included one native species 'ae'ae (*Bacopa maritima*), and several non-native species such as water morning glory (*Ipomoea aquatica*), kalo

(*Colocasia esculentia*), false daisy (*Eclipta prostrata*), and vasey grass (*Paspalum urvillei*).

DISCUSSION & RECOMMENDATIONS

The vegetation on the project site is dominated by introduced species such as buffel grass, koa haole, kiawe, etc. Of a total of 50 plant species inventoried on the property, 44 (88%) are introduced and 6 (12%) are native. Of the natives, all 6 are indigenous, that is they are native to the Hawaiian Islands and elsewhere. These are the 'ilima, 'uhaloa, popolo, hala, mīlo, and 'ae 'ae.

None of the plants observed during the survey is a threatened or endangered species or a species of concern (U.S. Fish and Wildlife Service, 2008). The survey area has been impacted over time by agricultural and vehicular use and its biological resources have been altered from its native state. No wetlands were encountered during this survey. None of the three essential criteria for defining a federally recognized wetland were present within the study site. Those being: hydrophytic vegetation, hydric soils, and wetland hydrology.

The proposed Pu'uene Heavy Industrial Subdivision and access easements are not expected to have significant negative impacts on the botanical resources of the site or the general region.

The client received comments from the USFWS regarding Blackburn Sphinx Moth host plants possibly occurring on the site. The recommendation to carry out the plant survey during or after the rainy season was noted. Host plants such as the introduced tree tobacco were observed very infrequently during the survey. Only a few small plants were seen over the entire subject property. Surrounding areas in Kihei and along the highway in Pu'uene had an abundance of tree tobacco during the same dates as the survey was carried out. The area encompassed by our survey does not appear to be an optimum area for BSM host plants. As such, it is our opinion that a follow up survey in the spring is not warranted under the circumstances.

The reservoir easement borders the existing reservoir for much of its length. If this alignment is chosen for the easement, there should be a buffer between the reservoir and easement roadway during construction to protect the emergent native vegetation and native waterfowl present at the reservoir.

LITERATURE CITED

- Evelhuts, N.L. and L.G. Eldredge, editors. 1999-2002. Records of the Hawaii Biological Survey. Bishop Museum Occasional Papers Nos. 58-70.
- Federal Register. 2002. Department of the Interior, Fish and Wildlife Service, 50 CFR 17. Endangered and Threatened Wildlife and Plants. Review of Species That Are Candidate or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Recycled Petition; Annual Description of Progress on Listing Actions. *Federal Register*, 67 No. 14 (Thursday, June 13, 2002): 40657-40679.
- Footle, D.E., E.L. Hill, S. Nakamura, and F. Stephens. 1972. Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai. State of Hawaii. U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C.
- Macdonald, G.A. and A.T. Abbott. 1970. Volcanoes in the sea. the geology of Hawaii. 5th printing. University of Hawaii Press.
- Natural Resource Conservation Service. 2011. Accessed August 25, 2011. <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>
- Staples G. W. and D. R. Herbst. 2005. A Tropical Garden Flora: Plants cultivated in the Hawaiian Islands and other tropical places. Bishop Museum Press.
- U.S. Fish and Wildlife Service. 2008. Hawaiian Islands Plants: Updated April 14, 2008 Listed and Candidate Species, as Designated under the U.S. Endangered Species Act. 21pp.
- Wagner, W.L. and D.R. Herbst. 1999. Supplement to the Manual of the flowering plants of Hawaii, pp. 1855-1918. In: Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1990. Manual of the flowering plants of Hawaii. Revised Edition. 2 vols. University of Hawaii Press and Bishop Museum Press, Honolulu.

TABLE 1. PLANT SPECIES LIST

The following checklist is an inventory of all the plant species observed within the survey area of the proposed Pu'uene Heavy Industrial Subdivision [TMK (2) 3-8-08:19] and various easements required for access to the proposed subdivision during a site visit (August 16-17, 2011). The plant names are arranged alphabetically by family and then by species into two groups: Monocots and Dicots. The taxonomy and nomenclature of the flowering plants (Monocots and Dicots) are in accordance with Wagner *et al.* (1990), Wagner and Herbst (1999) and Staples and Herbst (2005). Recent name changes are those recorded in the Hawaii Biological Survey series (Evetius and Eldredge, eds., 1999-2002) and the BISH native-naturalized checklist March 2010.

For each species, the following name is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name(s), when known.
3. Where the plant was observed; marked as in either the coastal or mauka sections of the project area or both.
4. Biogeographic status. The following symbols are used:

A = Alien species introduced to the Hawaiian Islands by humans, intentionally or accidentally.

I = Indigenous species native to the Hawaiian Islands and also found elsewhere in the world.

E = Endemic species found only in the Hawaiian Islands.

SCIENTIFIC NAME	COMMON NAME	STATUS
MONOCOTS		
ARACEAE		
<i>Colocasia esculenta</i> (L.) Schott	Kalo, taro	A
MUSACEAE		
<i>Musa</i> sp. L.	banana	A
PANDANACEAE		
<i>Pandanus tectorius</i> Parkinson ex Z	hala, screw-pine	I
POACEAE		
<i>Cenchrus ciliaris</i> L.	buffel grass	A
<i>Chloris barbata</i> (L.) Sw.	swollen finger grass	A
<i>Cynodon dactylon</i> (L.) Pers	manicna	A
<i>Eragrostis amabilis</i> (L.) Wight & Arn. Ex Nees	java grass	A
<i>Panicum maximum</i> L.	guinea grass	A

SCIENTIFIC NAME	COMMON NAME	STATUS
POACEAE		
<i>Paspalum urvillei</i> Steud.	wassy grass	A
<i>Saccharum officinarum</i> L.	ko, sugar cane	A
DICOTS		
AMARANTHACEAE		
<i>Amaranthus spinosus</i> L.	pakai kuku, spiny amaranth	A
<i>Amaranthus viridis</i> L.	shchaka, pakopakai, slender amaranth	A
ASTERACEAE		
<i>Eclypta prostrata</i> (L.) L.	false daisy	A
<i>Echtrachia californica</i>	california poppy	A
<i>Pluchea indica</i> (L.) Less	sourbush, marsh fleabane	A
<i>Tridax procumbens</i> L.	coat buttons	A
<i>Verbesina encalyoides</i> (Cav.) Benth. & Hook.	golden crown beard	A
CHENOPODIACEAE		
<i>Chenopodium murale</i> L.	Lamb's quarters	A
CONVOLVULACEAE		
<i>Ipomoea aquatica</i> Forsk.	Water morning glory	A
<i>Ipomoea obscura</i> (L.) Ker-Gawl.	Obscure morning glory	A
<i>Merremia aegyptia</i> (L.) Urb.	Hairy merremia	A
CUCURBITACEAE		
<i>Momordica charantia</i> L.	bitter melon	A
EUPHORBIACEAE		
<i>Chamaecyparis hirta</i> (L.) Millsp.	hairy spurge, garden spurge	A
<i>Chamaecyparis hypericifolia</i> (L.) Millsp.	graceful spurge	A
<i>Euphorbia heterophylla</i> L.	kaliko	A

SCIENTIFIC NAME	COMMON NAME	STATUS
EUPHORBACEAE		
<i>Ricinus communis</i> L.	castor bean	A
FABACEAE		
<i>Albizia lebbek</i> (L.) Benth.	Sida tree	A
<i>Chamaecrista nictitans</i> subsp. <i>penellaria</i> var. <i>glabrata</i> (Vogel) H.S. Irwin & Barneby	Partridge pea	A
<i>Crotalaria incana</i> L.	fuzzy rattlepod	A
<i>Crotalaria pallida</i> Aiton	smooth rattlepod	A
<i>Desmanthus pennanicus</i> (L.) Thell.	Slender or virgale trifoliate	A
<i>Leucaena leucocephala</i> (Lam.) de Wit	Koa hoale	A
<i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.) Kunth	Kiawe, mesquite	A
<i>Samanea saman</i> (Jacq.) Merr.	Monkey pod	A
LAMIACEAE		
<i>Leonotis nepetalifolia</i> (L.) R. Br.	Lion's ear	A
MALVACEAE		
<i>Abutilon grandifolium</i> (Willd.) Sweet	Hairy abutilon	A
<i>Malva parvifolia</i> L.	Cheese weed	A
<i>Malvastrum coccineum</i> subsp. <i>coccineum</i> (L.) J. R. Howell	False mallow	A
<i>Sida fallax</i> Walp.	Ilima	I
<i>Sida spinosa</i> L.	nila	A
<i>Thespesia populnea</i> (L.) Sol. ex Correa	nila	I
MYRTACEAE		
<i>Syzygium cumini</i> (L.) Streets	Java plum	A
NYCTAGINACEAE		
<i>Baobab</i> <i>baobab</i> L.	baobab	A

SCIENTIFIC NAME	COMMON NAME	STATUS
PLANTAGINACEAE		
<i>Bacopa monnieri</i> (L.) Pennell	*Ac'be	I
SOLANACEAE		
<i>Datura stramonium</i> L.	Jimson weed	A
<i>Nicotiana glauca</i> L.	tabacco	A
<i>Physalis angulata</i> L.	Husk tomato	A
<i>Solanum americanum</i> Mill.	popolo	I
<i>Solanum lycopersicum</i> var. <i>cerasiforme</i> (Dunal) D.M. Spooner, G.J. Anderson & R.K. Jansen	tomato, cherry tomato	A
STERCULIACEAE		
<i>Waltheria indica</i> L.	uhaloo	I

Appendix: Site Photographs

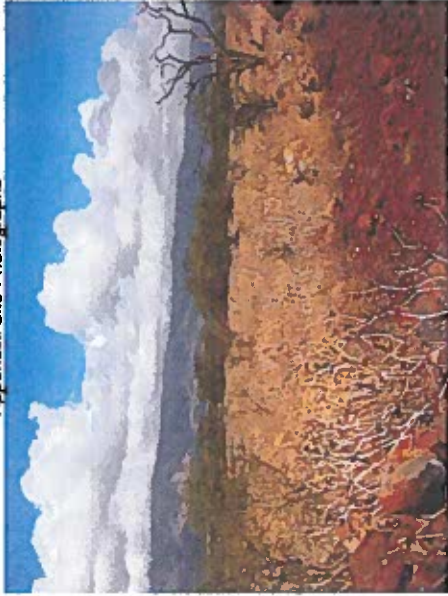


Figure 1. Vegetation of the 86-acre subject property is dominated by kawa trees and buffelgrassland.



Figure 2. Lands adjacent to the southern section of the subject property are currently cultivated in sugar cane.



Figure 3. Vegetation along the Reservoir easement.



Figure 4. Roadside vegetation along portion of State Roadway Easement.