

Figure 1. Regional Location Map

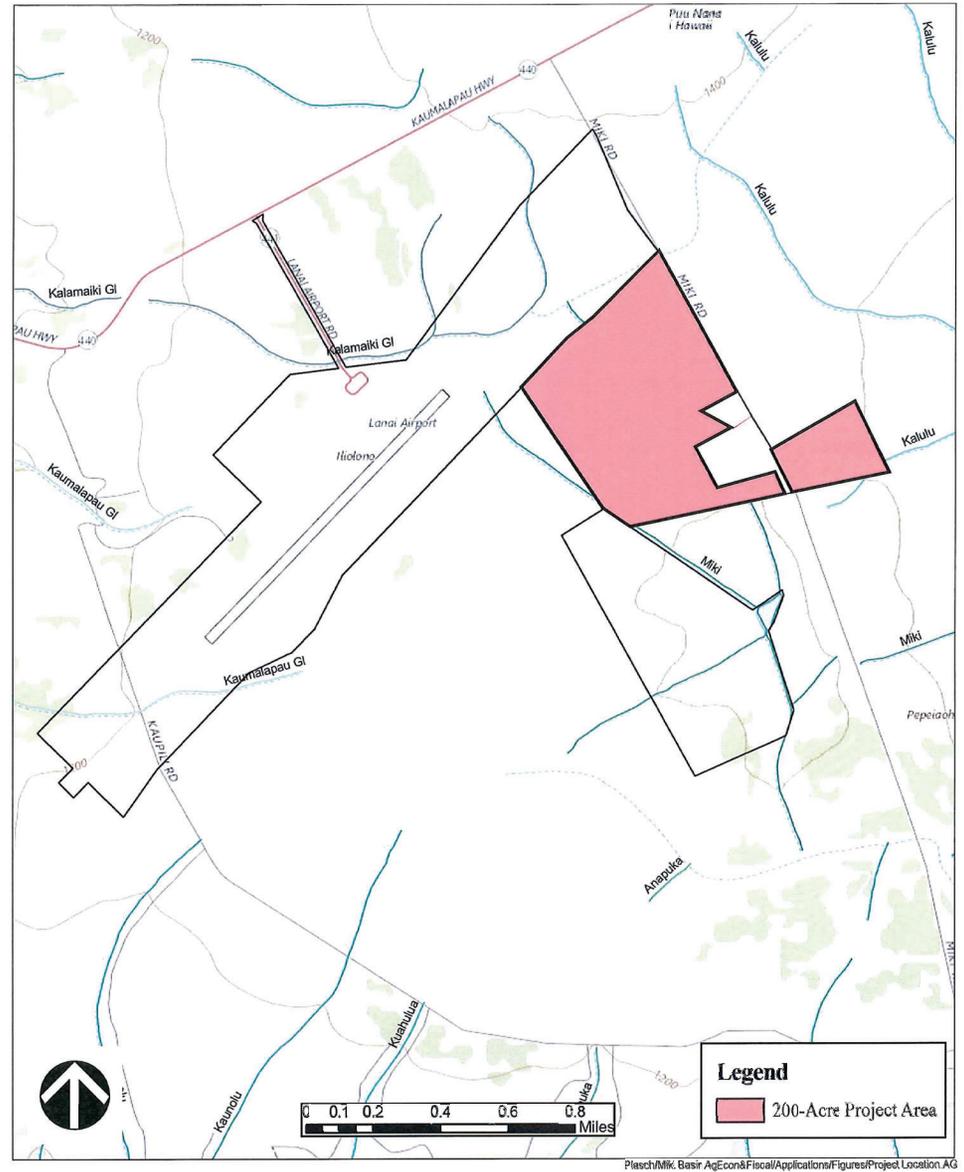


Figure 2. Project Location Map

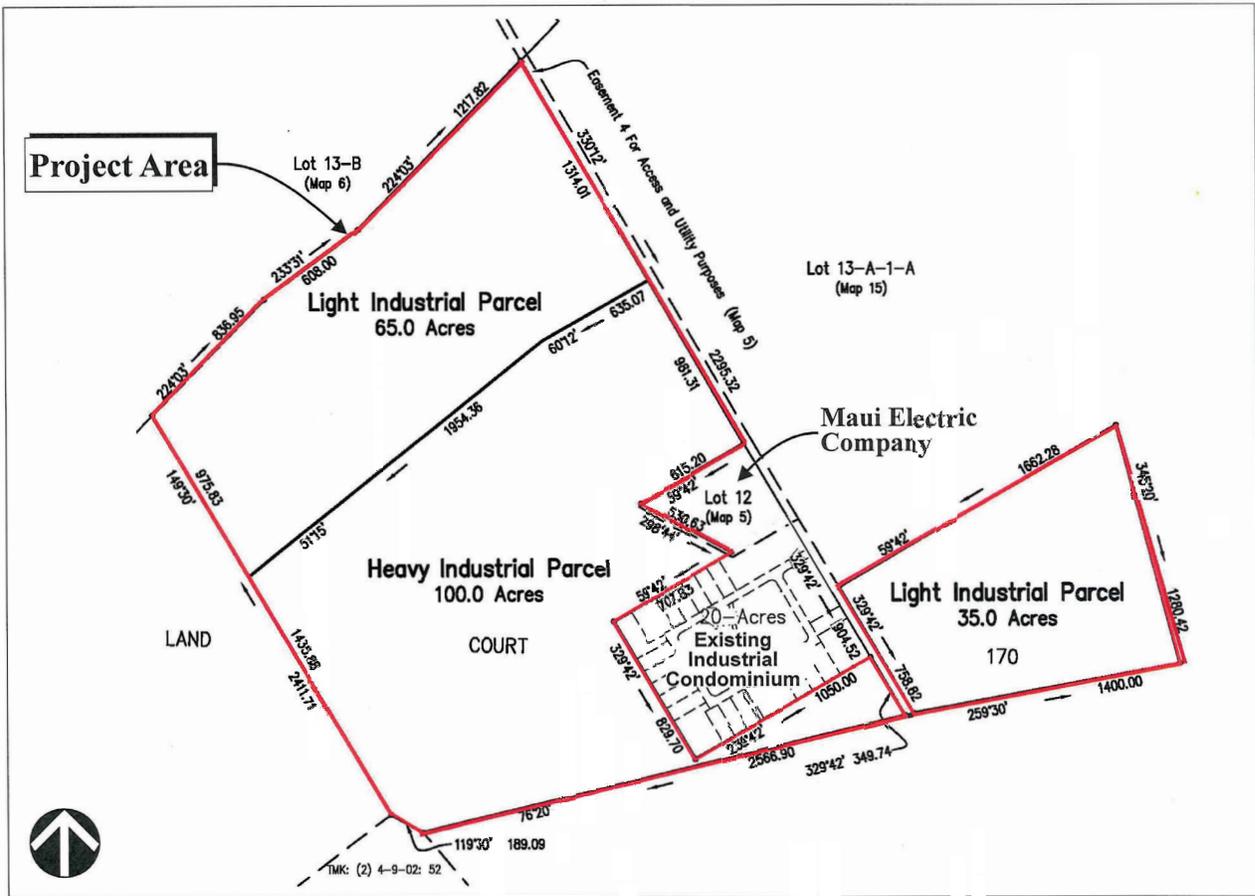


Figure 3. Site Plan

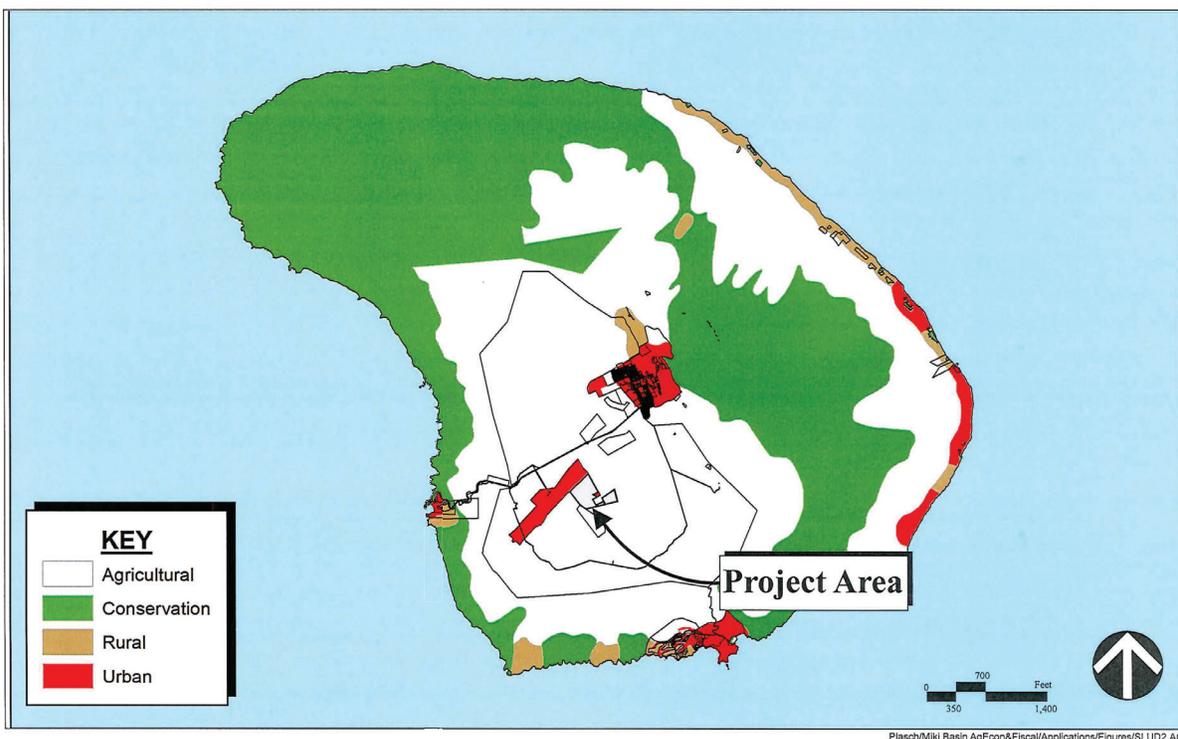


Figure 4. State Land Use District Classification Map for Island of Lāna'i

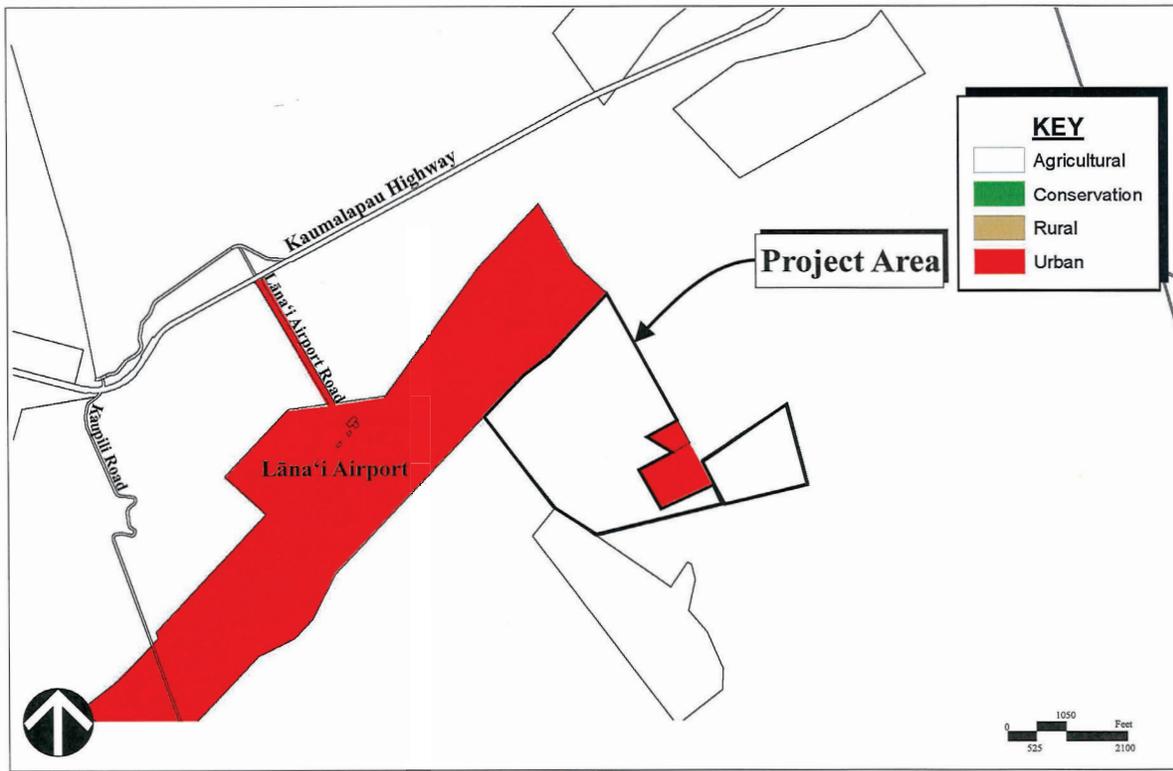


Figure 5. State Land Use District Classification Map for Project Area

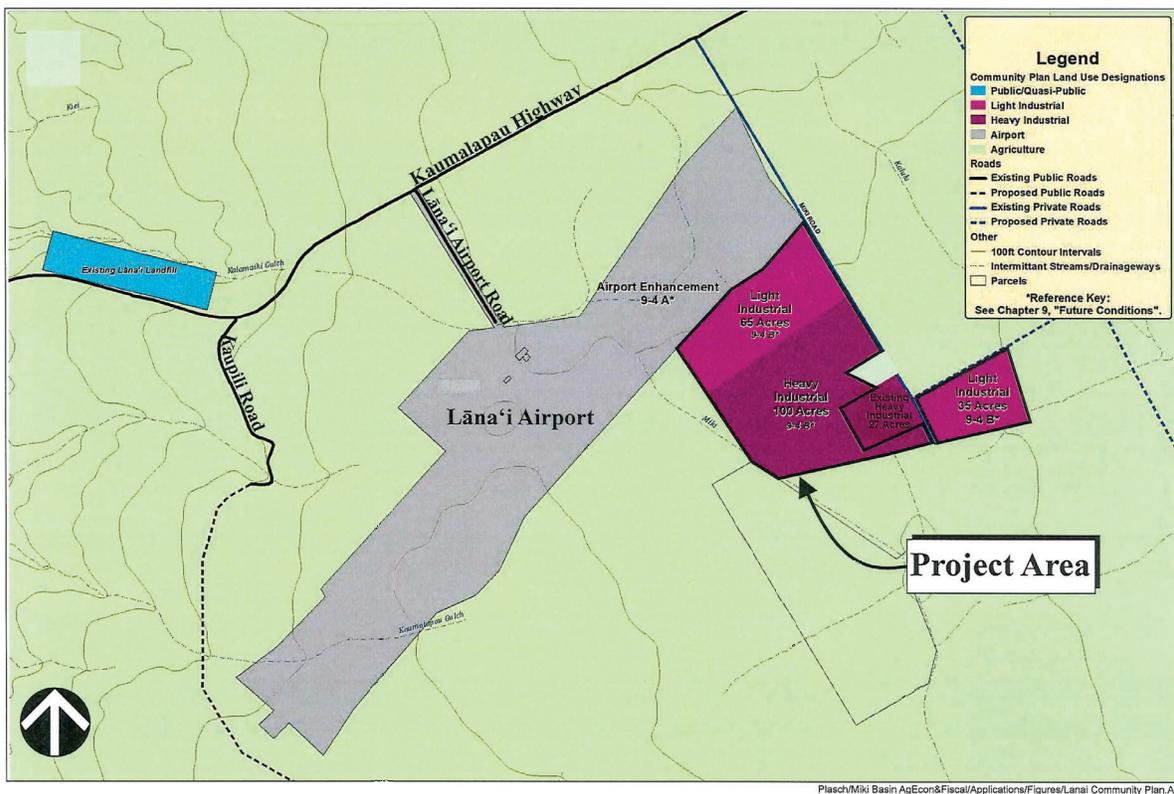


Figure 6. Lāna'i Community Plan Map

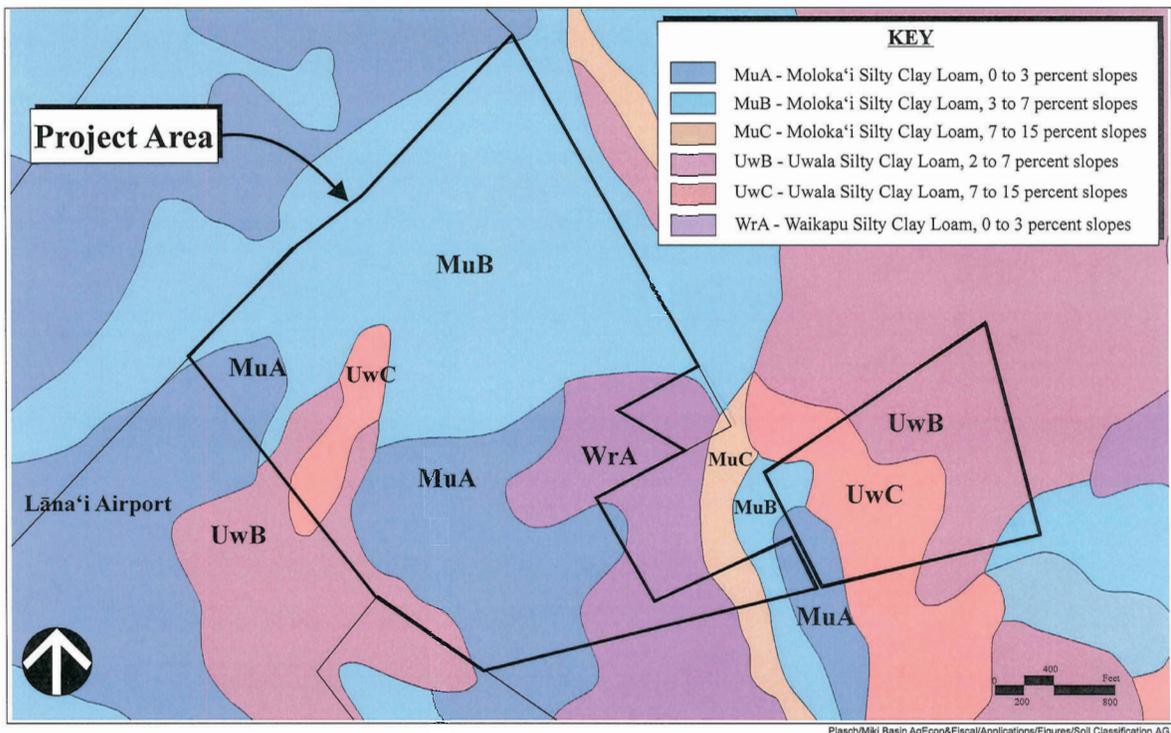


Figure 7. Soil Classification Map

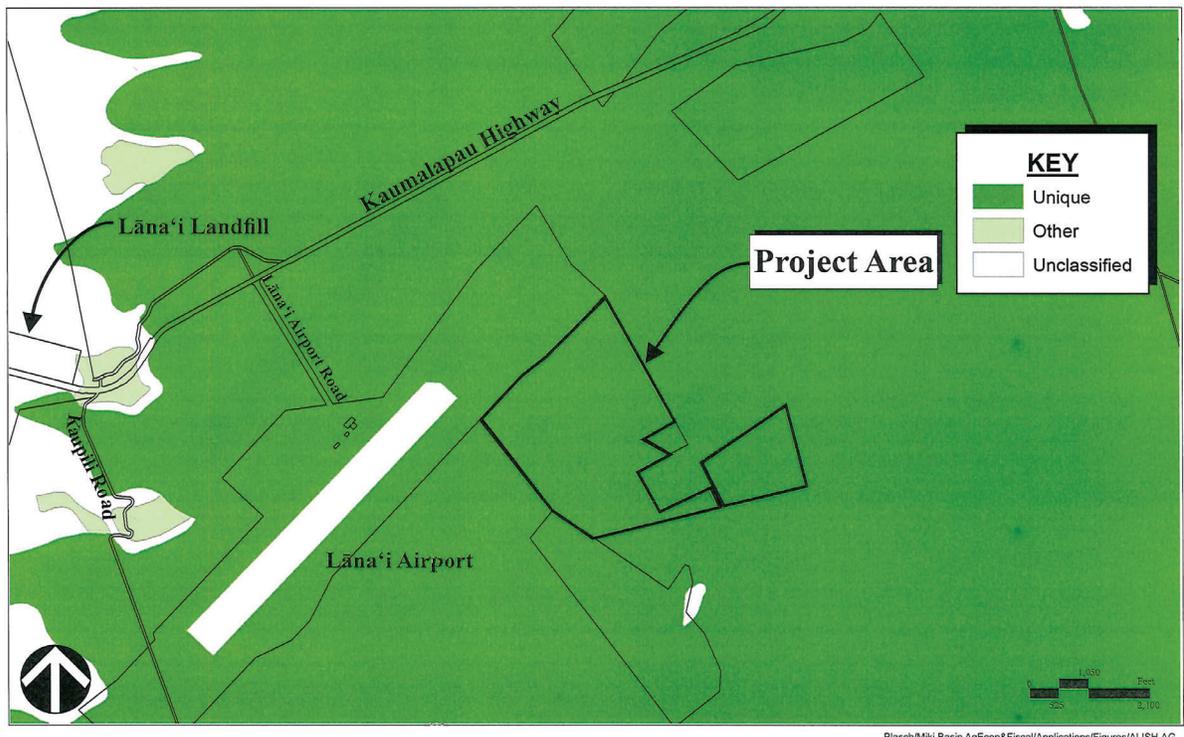
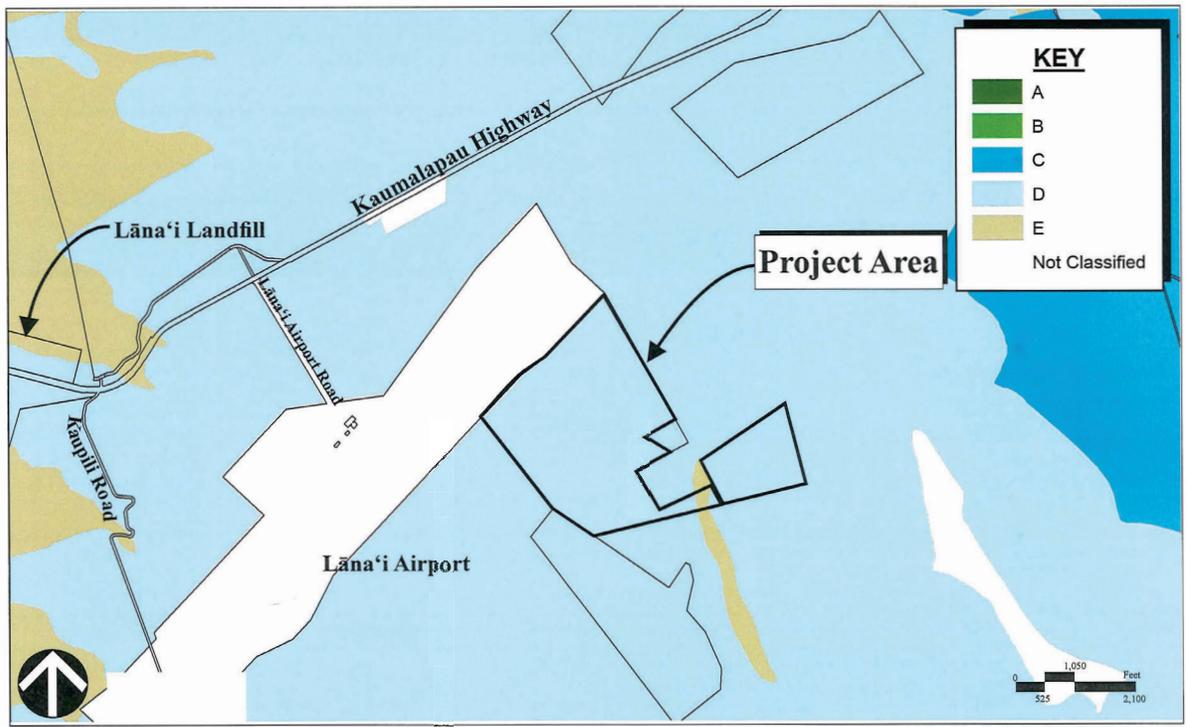


Figure 8. ALISH Map



Piasch/MKI Basin Ag/Econ&Fiscal/Applications/figures/Land Study Bureau.AG

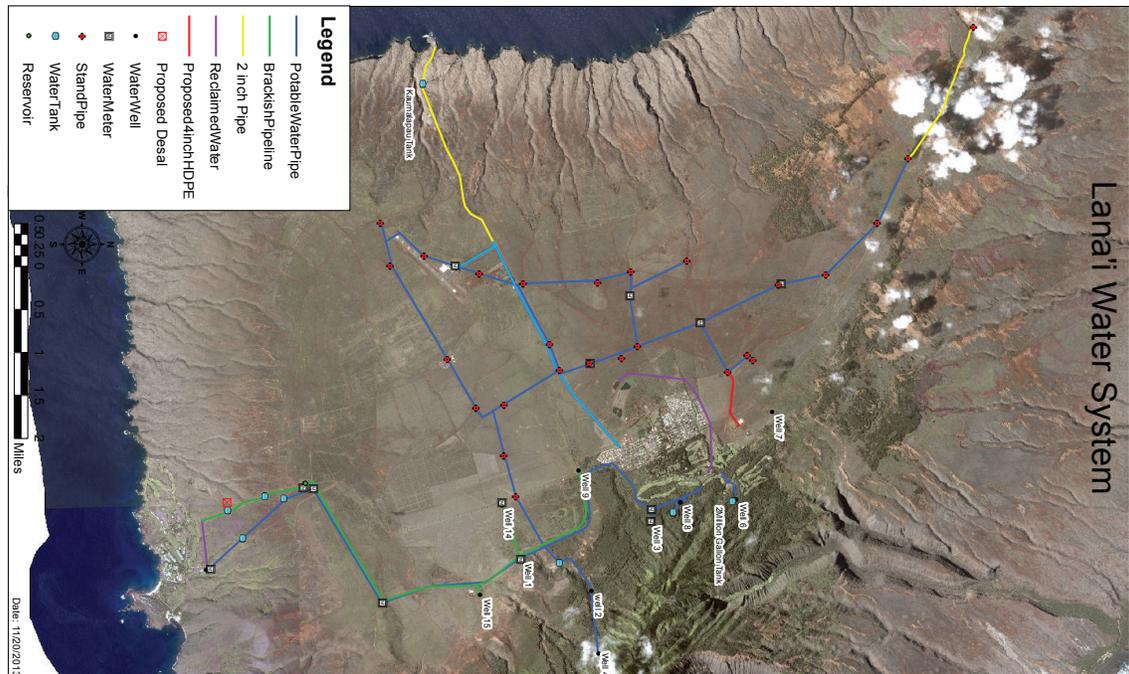




Figure 11. Acreage in Crop, Hawaii: 1960 to 2017

APPENDIX

APPENDIX

STATE AND COUNTY GOALS, OBJECTIVES, POLICIES AND GUIDELINES RELATED TO AGRICULTURAL LANDS

1. HAWAII STATE CONSTITUTION (Article XI, Section 3):

...to conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands...

2. HAWAII STATE PLAN (Chapter 226, Hawaii Revised Statutes, as amended):

Section 226-7 Objectives and policies for the economy--agriculture.

- (a) Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:
 - (1) Viability in Hawaii's sugar and pineapple industries.
 - (2) Growth and development of diversified agriculture throughout the State.
 - (3) An agriculture industry that continues to constitute a dynamic and essential component of Hawaii's strategic, economic, and social well-being.
- (b) To achieve the agricultural objectives, it shall be the policy of the State to:
 - (2) Encourage agriculture by making best use of natural resources.
 - (10) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.
 - (16) Facilitate the transition of agricultural lands in economically nonfeasible agricultural production to economically viable agricultural uses.

Section 226-103 Economic priority guidelines.

- (c) Priority guidelines to promote the continued viability of the sugar and pineapple industries:
 - (1) Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries.
- (d) Priority guidelines to promote the growth and development of diversified agriculture and aquaculture:
 - (1) Identify, conserve, and protect agricultural and aquacultural lands of importance and initiate affirmative and comprehensive programs to promote economically productive agricultural and aquacultural uses of such lands.
 - (10) Support the continuation of land currently in use for diversified agriculture.

Section 226-104 Population growth and land resources priority guidelines.

- (b) Priority guidelines for regional growth distribution and land resource utilization:

A-1

- (2) Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.

3. AGRICULTURAL STATE FUNCTIONAL PLAN (1991)

(Functional plans are guidelines for implementing the State Plan. They are approved by the Governor, but not adopted by the State Legislature.)

Objective H: Achievement of Productive Agricultural Use of Lands Most Suitable and Needed for Agriculture.

Policy H(2): Conserve and protect important agricultural lands in accordance with the Hawaii State Constitution.

Action H(2)(a): Propose enactment of standards and criteria to identify, conserve, and protect important agricultural lands and lands in agricultural use.

Action H(2)(c): Administer land use district boundary amendments, permitted land uses, infrastructure standards, and other planning and regulatory functions on important agricultural lands and lands in agricultural use, so as to ensure the availability of agriculturally suitable lands and promote diversified agriculture.

4. COUNTY OF MAUI 2030 GENERAL PLAN, COUNTYWIDE POLICY PLAN (2010)

Countywide goals, objectives, policies and actions

F. Strengthen the Local Economy

Objective

- 2. Diversify and expand sustainable forms of agriculture and aquaculture.

Policies

- b. Prioritize the use of agricultural land to feed the local population, and promote the use of agriculture lands for sustainable and diversified agricultural activities.
- e. Support ordinances, programs, and policies that keep agricultural land and water available and affordable to farmers.

Implementing Actions

- c. Create agricultural parks in areas distant from genetically modified crops.

J. Promote Sustainable Land Use and Growth Management

Objective

- 2. Improve planning for and management of agricultural lands and rural areas.

Policies

- a. Protect prime, productive, and potentially productive agricultural lands to maintain the islands' agricultural and rural identities and economies.

A-2

- c. Discourage developing or subdividing agriculturally designated lands when non-agricultural activities would be primary uses.

Implementing Actions

- a. Inventory and protect prime, productive, and potentially productive agricultural lands from competing non-agricultural land uses.

5. COUNTY OF MAUI, LĀNA‘I COMMUNITY PLAN (2016)

C. ENVIRONMENT AND NATURAL RESOURCES

3. Goals, Policies, Actions

Policies

- 4. Recognize and support agricultural forestry and game BMPs as key elements to maintain preserve and protect Lana island water and marine resources

6. REFERENCES

Act 25, S.B. No. 1158, April 15, 1993.

County of Maui. *County of Maui 2030 General Plan, Countywide Policy Plan*. Adopted by Ordinance No. 3732, effective on March 24, 2010.

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**FLORA AND
FAUNA STUDY**

APPENDIX

C

FLORA AND FAUNA STUDY
MIKI BASIN 200 ACRE INDUSTRIAL DEVELOPMENT
KALULU AND KAUNOLŪ, LĀNA'I

by:
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Kokomo, Maui
April 2018

Prepared for:
Pūlama Lāna'i

FLORA AND FAUNA STUDY
MIKI BASIN 200 ACRE INDUSTRIAL DEVELOPMENT
KALULU AND KAUNOLŪ, LĀNA'I

INTRODUCTION

The Miki Basin 200 acre Industrial Development project is located on the inner slopes of Miki Basin and a small portion of Pālawai Basin in southwestern Lāna'i to the east of Lāna'i Airport. Miki Road runs through the project area and the project area also surrounds the Maui Electric Company Power Plant within the Basin. All of the lands within and around the project area are owned and managed by Pūlama Lāna'i.

SITE DESCRIPTION

The project area is situated on gently to moderately sloping lands that were part of a large pineapple plantation. These lands have lain fallow for 25 years since the plantation closed in 1992 and are now overgrown with a dense grassland and shrubs. Soils consist of three series characterized as Waikapū silty clay loam, 0 – 3% slopes, Moloka'i silty clay loam, 3 – 7% slopes and Uala silty clay loam, 7 – 15% slopes which are all variants of deep, well-drained soils of the upland plateau of Lāna'i, (Foote et al, 1972). Rainfall averages about 20 inches per year with winter maximums (Armstrong, 1983). Elevations range between 1,150 feet and 1,310 feet above sea level.

SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna study of the proposed Miki Basin 200 Acre Industrial Development Project that was conducted in April 2018. The objectives of the survey were to:

1. Document what plant and animal species occur on the property or may likely occur in the existing habitat.
2. Document the status and abundance of each species.
3. Determine the presence or likely occurrence of any native flora and fauna, particularly any that are federally listed as Threatened or Endangered. If such occur, identify what features of the habitat may be essential for these species.
4. Determine if the project area contains any special habitats which if lost or altered might result in a significant negative impact on the native flora and fauna in this part of the island.

BOTANICAL SURVEY REPORT

SURVEY METHODS

A walk-through botanical survey method was used to cover this 200 acre project area. All parts of this habitat were examined.

A complete inventory of all plant species was made with special attention focused on native plant species and whether any of these were federally protected Threatened or Endangered species that might require special attention or actions.

DESCRIPTION OF THE VEGETATION

The entire project area has lain fallow from agricultural use for 25 years, with some grazing occurring during a few of these years. The vegetation was a dense growth of grasses and shrubs. Thirty-nine plant species were recorded during the survey.

Two species were abundant throughout the project area, Guinea grass (*Megathyrsus maximus*) and lantana (*Lantana camara*). Another two species were common, sourgrass (*Digitaria insularis*) and Madagascar fireweed (*Senecio madagascariensis*). The remaining thirty-five species were either of uncommon or rare occurrence.

Just three common native plant species were found, 'ilima (*Sida fallax*), 'uhaloa (*Waltheria indica*) and 'a'ali'i (*Dodonaea viscosa*), all of which are widespread and common throughout Hawaii. These have persisted here in small numbers due to their hardy nature.

DISCUSSION AND RECOMMENDATIONS

The vegetation in this project area is dominated by hardy, invasive non-native species. Just three common native plant species, 'ilima, 'uhaloa and 'a'ali'i, were found here. None of these are of any conservation concern. No special habitats for native plants were found. Because of the above information, it is determined that there is nothing of special botanical concern with regard to this project. No recommendations with reference to plants are deemed necessary.

PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically. Taxonomy and nomenclature of the flowering plants (Monocots and Dicots) are in accordance with Wagner et al. (1999).

For each species, the following information is provided:

1. Scientific name with author citation.
2. Common English or Hawaiian name.
3. Bio-geographical status. The following symbols are used:

endemic = native only to the Hawaiian Islands; not naturally occurring anywhere else in the world.

indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).

non-native = all those plants brought to the islands intentionally or accidentally after western contact.

Polynesian = brought by the Hawaiians during Polynesian migrations.

4. Abundance of each species within the project area:

abundant = forming a major part of the vegetation within the project area.

common = widely scattered throughout the area or locally abundant within a portion of it.

uncommon = scattered sparsely throughout the area or occurring in a few small patches.

rare = only a few isolated individuals within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE	SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
MONOCOTS				MALVACEAE (Mallow Family)			
POACEAE (Grass Family)				<i>Indigofera suffruticosa</i> Mill.	'inikō	non-native	uncommon
<i>Andropogon virginicus</i> L.	broom sedge	non-native	uncommon	<i>Malvastrum coromandelianum</i> (L.) Garcke	false mallow	non-native	rare
<i>Bothriochloa pertusa</i> (L.) A. Camus	pitted beardgrass	non-native	uncommon	<i>Sida ciliaris</i> L.	bracted fanpetals	non-native	rare
<i>Cynodon dactylon</i> (L.) Pers.	Bermuda grass	non-native	rare	<i>Sida cordifolia</i> L.	flannel sida	non-native	rare
<i>Digitaria insularis</i> (L.) Mez ex Ekman	sourgrass	non-native	common	<i>Sida fallax</i> Walpers	'ilima	indigenous	uncommon
<i>Eragrostis pectinacea</i> (Michx.) Nees	Carolina lovegrass	non-native	rare	<i>Sida rhombifolia</i> L.	arrowleaf sida	non-native	rare
<i>Megathyrsus maximus</i> (Jacq.) Simon & Jacobs	Guinea grass	non-native	abundant	<i>Sidastrum micranthum</i> (St. Hil.) Fryx.	sand mallow	non-native	uncommon
<i>Melinis repens</i> (Willd.) Zizka	Natal redtop	non-native	rare	<i>Waltheria indica</i> L.	'uhaloa	indigenous	uncommon
DICOTS				OXALIDACEAE (Wood Sorrel Family)			
AMARANTHACEAE (Amaranth Family)				<i>Oxalis corniculata</i> L.	'ihi 'ai	Polynesian	rare
<i>Amaranthus spinosus</i> L.	spiny amaranth	non-native	rare	POLYGALACEAE (Milkwort Family)			
<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	Mexican wormseed	non-native	rare	<i>Polygala paniculata</i> L.	root beer plant	non-native	rare
<i>Dysphania carinata</i> (R.Br.) Mosyakin & Clemants	keeled wormseed	non-native	uncommon	SAPINDACEAE (Soapberry Family)			
APOCYNACEAE (Dogbane Family)				<i>Dodonaea viscosa</i> Jacq.	'a'ali'i	indigenous	rare
<i>Asclepias physocarpa</i> (E. Mey.) Schlechter	balloon plant	non-native	uncommon	SOLANACEAE (Nightshade Family)			
ASTERACEAE (Sunflower Family)				<i>Solanum linnaeanum</i> Hepper & P. Jaeger	apple of Sodom	non-native	uncommon
<i>Ageratum conyzoides</i> L.	maile hohono	non-native	rare	VERBENACEAE (Verbena Family)			
<i>Conyza bonariensis</i> (L.) Cronq.	hairy horseweed	non-native	uncommon	<i>Lantana camara</i> L.	lantana	non-native	abundant
<i>Emilia fosbergii</i> Nicolson	red pualele	non-native	rare	<i>Verbena littoralis</i> Kunth	ha'u ōwī	non-native	rare
<i>Heterotheca grandiflora</i> Nutt.	telegraph weed	non-native	uncommon				
<i>Senecio madagascariensis</i> Poir.	Madagascar fireweed	non-native	common				
<i>Verbesina encelioides</i> (Cav.) Benth. & Hook.	golden crown-beard	non-native	uncommon				
BRASSICACEAE (Mustard Family)							
<i>Lepidium virginicum</i> L.	Virginia pepperwort	non-native	rare				
CARYOPHYLLACEAE (Pink Family)							
<i>Polycarpon tetraphyllum</i> (L.) L.	four-leaved allseed	non-native	rare				
CONVOLVULACEAE (Morning Glory Family)							
<i>Ipomoea cairica</i> (L.) Sweet	koali 'ai	non-native	rare				
<i>Ipomoea obscura</i> (L.) Ker-Gawl.)	-----	non-native	rare				
<i>Ipomoea triloba</i> L.	little bell	non-native	rare				
EUPHORBIACEAE (Spurge Family)							
<i>Euphorbia hirta</i> L.	hairy spurge	non-native	rare				
FABACEAE (Pea Family)							
<i>Chamaecrista nictitans</i> (L.) Moench	partridge pea	non-native	uncommon				
<i>Desmanthus pernambucanus</i> (L.) Thellung	slender mimosa	non-native	rare				

FAUNA SURVEY REPORT

SURVEY METHODS

A fauna survey was conducted in conjunction with the flora survey. All parts of the project area were covered. Observations were made with the assistance of binoculars. Notes were made of species, numbers and status as well as on tracks, scat and signs of feeding. An inventory was made of all of the animal species encountered.

In addition, an evening survey was conducted to observe crepuscular activities and calls, and to determine any occurrence of the Endangered Hawaiian hoary bat (*Lasirius cinereus semotus*) in the project area.

RESULTS

MAMMALS

Just one mammal species was observed in the project area. A herd of about 20 axis deer were seen and trails, tracks and feeding damage were everywhere. Nomenclature and taxonomy follow (Tomich, 1986).

A special effort was made to look for evidence indicating the presence of ʻōpeʻapeʻa or Hawaiian hoary bat by conducting an evening survey at two locations within the project area. A bat detecting device (Batbox III D) was employed, set to frequency of 27,000 Hertz that these bats are known to use when echolocating for flying insects. No bats were detected with the use of this device.

Other non-native mammals likely to frequent this area include rats (*Rattus* spp.), mice (*Mus domesticus*), feral cats (*Felis catus*) and occasionally domestic dogs (*Canis familiaris*).

BIRDS

Birdlife was of moderate occurrence in the project area. Twelve species were observed during three site visits, but none were particularly common. Taxonomy and nomenclature follow the American Ornithologists' Union (2018). Eight bird species were of modest occurrence, cattle egret (*Bubulcus ibis*), zebra dove (*Geopelia striata*), nutmeg mannikin (*Lonchura punctulata*), gray francolin (*Francolinus pondicerianus*), northern mockingbird (*Mimus polyglottos*), common myna (*Acridotheres tristis*), Eurasian sky lark (*Alauda arvensis*) and Pacific golden-plover (*Pluvialis fulva*). The other four species were of rare occurrence.

Two native bird species were recorded, the indigenous and migratory kōlea or Pacific golden-plover and the endemic pueo or Hawaiian owl (*Asio flammeus sandwichensis*).

A few other non-native bird species may occasionally occur in this area, but this habitat is unsuitable for Hawaii's native forest birds or seabirds.

INSECTS

Insect life was rather sparse in this habitat during three site visits. Twelve non-native species were recorded, representing five insect Orders. Just one species was common throughout the project area, the monarch butterfly (*Danaus plexippus*). Two other species were uncommon, the cabbage butterfly (*Pieris rapae*) and the short-horned grasshopper (*Oedaleus abruptus*). Taxonomy and nomenclature follow Nishida et al (1992).

No native insect species were seen.

DISCUSSION AND RECOMMENDATIONS

The fauna recorded in this project area is largely non-native in character. Axis deer are abundant throughout the area and have significantly modified the habitat by reducing plant species to a few hardy dominants. This in turn has a somewhat limiting effect on resource availability for other mammals, birds and insects.

No Endangered Hawaiian bats were detected in the project area during the survey. They are rare on Lānaʻi but could occur in this area occasionally. The U.S. Fish and Wildlife Service has guidelines that ensure that these bats are not harmed should they show up.

Just two bird species were native to Hawaii, the kōlea and the pueo. The kōlea breed and raise their young in the arctic and then migrate to tropical places like Hawaiʻi to overwinter. Many thousands of kōlea come to Hawaii every winter. Kōlea are quite common and have no endangered or threatened status.

The pueo is a race of the short-eared owl species that is endemic to Hawaii. It occurs on all the islands but is rare on Oʻahu. It is wide ranging in grasslands and shrublands on Lānaʻi. It carries no federal endangered or threatened status.

Two indigenous seabirds the Endangered ʻuaʻu and the Threatened ʻaʻo, while not nesting in the project area, do fly over it during dusk to access their burrows high in the mountains and again at dawn to head out to sea. Young birds taking their first fledging flights are inexperienced fliers. They often are disoriented by bright lights and crash into light structures where they become vulnerable to injury and predators. It is recommended that any significant outdoor lighting associated with the proposed project be hooded to direct the light downward to mitigate this threat.

No other recommendations with reference to fauna are deemed necessary.

ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged in descending abundance within three groups: Mammals, Birds and Insects. For each species the following information is provided:

1. Common name
2. Scientific name

3. Bio-geographical status. The following symbols are used:

endemic = native only to Hawaii; not naturally occurring anywhere else in the world.

indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).

migratory = bird species that spend the fall and winter months in Hawaii and the spring and summer months breeding in the arctic.

non-native = all those animals brought to Hawaii intentionally or accidentally after western contact.

4. Abundance of each species within the project area:

abundant = many flocks or individuals seen throughout the area at all times of day.

common = a few flocks or well scattered individuals throughout the area.

uncommon = only one flock or several individuals seen within the project area.

rare = only one or two seen within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
MAMMALS			
CERVIDAE (Deer Family)			
<i>Axis axis</i> Erxleben	axis deer	non-native	abundant
BIRDS			
ALAUDIDAE (Sky Lark Family)			
<i>Alauda arvensis</i> L.	Eurasian sky lark	non-native	uncommon
ARDEIDAE (Heron Family)			
<i>Bubulcus ibis</i> L.	cattle egret	non-native	uncommon
CARDINALIDAE (Cardinal Family)			
<i>Cardinalis cardinalis</i> L.	northern cardinal	non-native	rare
CHARADRIIDAE (Plover Family)			
<i>Pluvialis fulva</i> Gmelin	kōlea, Pacific golden-plover	indigenous	uncommon
COLUMBIDAE (Dove Family)			
<i>Geopelia striata</i> L.	zebra dove	non-native	uncommon
ESTRILDIDAE (Estrildid Finch Family)			
<i>Lonchura punctulata</i> L.	nutmeg mannikin	non-native	uncommon
MIMIDAE (Mockingbird Family)			
<i>Mimus polyglottos</i> L.	northern mockingbird	non-native	rare
PHASIANIDAE (Pheasant Family)			
<i>Francolinus pondicerianus</i> Gmelin	gray francolin	non-native	uncommon
<i>Meleagris gallopavo</i> L.	Rio Grande turkey	non-native	rare
<i>Phasianus colchicus</i> L.	ring-necked pheasant	non-native	rare
STRIGIDAE (Owl Family)			
<i>Asio flammeus sandwichensis</i> Bloxam	Pueo, Hawaiian owl	endemic	rare
STURNIDAE (Starling Family)			
<i>Acridotheres tristis</i> L.	common myna	non-native	uncommon

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
INSECTS			
ARANAE - spiders			
ARANEIDAE (Orb Weaver Spider Family)			
<i>Araneus diadematus</i> Clerck	European garden spider	non-native	rare
DIPTERA - flies			
CALLIPHORIDAE (Calliphorid Fly Family)			
<i>Calliphora vomitoria</i> L.	bluebottle fly	non-native	rare
<i>Eucalliphora latifrons</i> Hough	blow fly	non-native	rare
SYRPHIDAE (Hoverfly Family)			
<i>Symosyrphus grandicornis</i> Macquart	Australian hoverfly	non-native	rare
HYMENOPTERA - bees, wasps, ants			
APIDAE (Honeybee Family)			
<i>Apis mellifera</i> L.	honeybee	non-native	uncommon
FORMICIDAE (Ant Family)			
<i>Pheidole megacephala</i> Fabricius	big-headed ant	non-native	rare
LEPIDOTERA - butterflies, moths			
CRAMBIDAE (Webworm Moth Family)			
<i>Spoladea recurvalis</i> Fabricius	beet webworm moth	non-native	rare
HESPERIIDAE (Skipper Butterfly Family)			
<i>Hylephila phyleus</i> Drury	fiery skipper	non-native	rare
LYCAENIDAE (Gossamer-winged Butterfly Family)			
<i>Lampides boeticus</i> L.	long-tailed blue butterfly	non-native	rare
NYMPHALIDAE (Brush-footed Butterfly Family)			
<i>Danaus plexippus</i> L.	monarch butterfly	non-native	common
PIERIDAE (White and Sulphur Butterfly Family)			
<i>Pieris rapae</i> L.	cabbage butterfly	non-native	uncommon
ORTHOPTERA - grasshoppers, crickets			
ACRIDIDAE (Grasshopper Family)			
<i>Oedaleus abruptus</i> Thunberg	short-horned grasshopper	non-native	uncommon

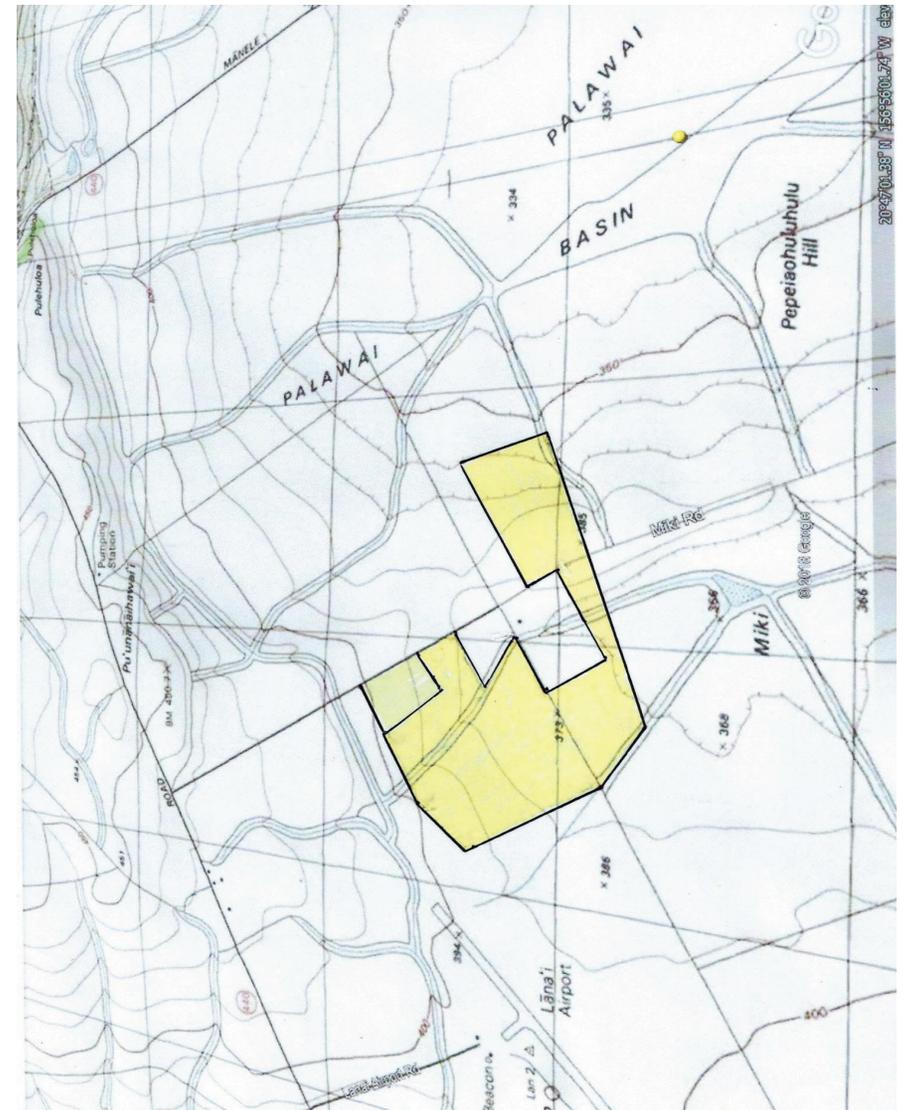


Figure 1. Miki Basin 200 acre Industrial Development Project Area in southwestern Lānaʻi