

**BIOLOGICAL RESOURCES
SURVEY**

APPENDIX

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BIOLOGICAL RESOURCES SURVEY

for the

CENTRAL MAUI SANITARY LANDFILL FACILITY EXPANSION PROJECT

PU'UNĒNĒ, MAUI, HAWAII

by

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**FLORA AND FAUNA SURVEY
CENTRAL MAUI SANITARY LANDFILL FACILITY EXPANSION PROJECT
PU'UNĒNĒ, MAUI, HAWAII**

INTRODUCTION

The Central Maui Sanitary Landfill Facility Expansion Project lies on approximately 40 acres of land adjacent to the current Landfill Facility along Pūlehu Road (TMK (2) 3-8-013:019 por.). It is situated on recently fallow land surrounded by sugar cane fields. This biological resources study was initiated by the County of Maui, Department of Environmental Management in compliance with environmental requirements of the planning process.

SITE DESCRIPTION

The project area lies on gently to moderately sloping land below the existing landfill facility at elevations ranging from 280 feet down to 210 feet. Vegetation consists of low and scattered herbaceous species with some bare ground. Soils are characterized as Waiakoa Silty Clay Loam, 3 – 15% slopes (WeB and WeC) and Molokai Silty Clay Loam, 3 – 7% slopes (MuB) (Foote et al, 1972) which are deep, well-drained soils. Rainfall averages 17 inches per year with most occurring during the winter months.

SITE HISTORY

During the late 1800's this area was cleared for sugar cane production. The area has been plowed, planted, cultivated, burned, and harvested in continuous cycles for over 100 years. The original native vegetation was replaced by sugar cane and increasing numbers of agricultural weeds.

Presently this site is nearly devoid of native vegetation and wildlife species.

SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna survey of the proposed Central Maui Sanitary Landfill Facility Expansion Project which was conducted in April 2016. 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 flora and fauna in this part of the island.

BOTANICAL SURVEY REPORT

SURVEY METHODS

A walk-through botanical survey method was used for covering the entire project area. Notes were made on plant species, distribution and abundance as well as on terrain and substrate.

DESCRIPTION OF THE VEGETATION

The final crop of sugar cane had been recently harvested and the land was lying fallow. The vegetation was low in stature with much bare ground. Seven non-native species were common throughout the project area. These included resprouting sugar cane (*Saccharum officinarum*), nut sedge (*Cyperus rotundus*), buffelgrass (*Cenchrus ciliaris*), Guinea grass (*Megathyrsus maximus*), little bell (*Ipomoea triloba*), Castor bean (*Ricinus communis*) and Mexican poppy (*Argemone mexicana*). A total of 54 plant species were recorded during the survey. Just two hardy native plant species were sparingly present, 'ilima (*Sida fallax*) and 'uhaloa (*Waltheria indica*). The remaining 52 species were non-native agricultural grasses and weeds.

DISCUSSION AND RECOMMENDATIONS

The vegetation throughout the project area is dominated by non-native species that are of no particular environmental interest or concern. Just two common indigenous plants, 'ilima and 'uhaloa were found growing in small numbers. No federally listed Endangered or Threatened plant species (USFWS, 2016) were found, nor do any plants that are candidates for such status occur on the project area. No special plant habitats occur on or near the project and no potential wetlands occur in this dry upland site.

This project is not expected to have any significant negative impacts on the botanical resources in this part of Maui. No recommendations regarding botanical resources are deemed necessary or appropriate.

PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically within each of two groups: Monocots and Dicots. Taxonomy and nomenclature of the plants 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).

Polynesian = all those plants brought to Hawaii during the course of Polynesian migrations

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

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
MONOCOTS			
CYPERACEAE (Sedge Family)			
<i>Cyperus rotundus</i> L.	nut sedge	non-native	common
POACEAE (Grass Family)			
<i>Cenchrus ciliaris</i> L.	buffelgrass	non-native	common
<i>Cenchrus purpureus</i> (Schumach.) Morrone	Napier grass	non-native	rare
<i>Chloris barbata</i> (L.) Sw.	swollen fingergrass	non-native	uncommon
<i>Chloris gayana</i> Kunth	Rhodes grass	non-native	uncommon
<i>Digitaria insularis</i> (L.) Mez ex Ekman	sourgrass	non-native	rare
<i>Echinochloa crus-galli</i> (L.) P. Beauv.	barnyard grass	non-native	rare
<i>Eleusine indica</i> L.	wiregrass	non-native	rare
<i>Eragrostis pectinacea</i> (Michx.) Nees	Carolina lovegrass	non-native	rare
<i>Megathyrsus maximus</i> (Jacq.) Simon & Jacobs	Guinea grass	non-native	common
<i>Melinis repens</i> (Willd.) Zizka	Natal redtop	non-native	rare
<i>Saccharum officinarum</i> L.	sugar cane	non-native	common
DICOTS			
AMARANTHACEAE (Amaranth Family)			
<i>Amaranthus spinosus</i> L.	spiny amaranth	non-native	rare
<i>Amaranthus viridis</i> L.	smooth amaranth	non-native	rare
<i>Atriplex subereta</i> Verd.	saltbush	non-native	uncommon
<i>Kali tragus</i> (L.) Scop.	Russian thistle	non-native	uncommon
APIACEAE (Parsley Family)			
<i>Ciclospermum leptophyllum</i> (Pers.) Sprague	fir-leaved celery	non-native	rare
APOCYNACEAE (Dogbane Family)			
<i>Asclepias physocarpa</i> (E.Mey.) Schlect.	balloon plant	non-native	rare
ASTERACEAE (Sunflower Family)			
<i>Bidens pilosa</i> L.	Spanish needle	non-native	rare
<i>Eclipta prostrata</i> (L.) L.	false daisy	non-native	rare
<i>Emilia fosbergii</i> Nicolson	red pualele	non-native	rare
<i>Sonchus oleraceus</i> L.	pualele	non-native	rare
<i>Tridax procumbens</i> L.	coat buttons	non-native	rare
<i>Verbesina encelioides</i> (Cav.) Benth. & Hook.	golden crown-beard	non-native	uncommon
<i>Xanthium strumarium</i> L.	kīkania	non-native	rare
CLEOMACEAE (Cleome Family)			
<i>Cleome gynandra</i> L.	wild spider flower	non-native	rare
CONVOLVULACEAE (Morning Glory Family)			
<i>Ipomoea triloba</i> L.	little bell	non-native	common
CUCURBITACEAE (Gourd Family)			
<i>Lagunaria siceraria</i> (Molina) Standl.	long gourd	non-native	rare
<i>Momordica charantia</i> L.	bitter melon	non-native	uncommon
EUPHORBIACEAE (Spurge Family)			
<i>Euphorbia heterophylla</i> L.	kaliko	non-native	rare
<i>Euphorbia hypericifolia</i> L.	graceful spurge	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
<i>Ricinus communis</i> L.	Castor bean	non-native	common
FABACEAE (Pea Family)			
<i>Chamaecrista nictitans</i> (L.) Moench	partridge pea	non-native	rare
<i>Crotalaria incana</i> L.	fuzzy rattlepod	non-native	uncommon
<i>Crotalaria retusa</i> L.	rattlepod	non-native	rare
<i>Leucaena leucocephala</i> (Lamarck) de Wit	<i>koa haole</i>	non-native	uncommon
<i>Macroptilium atropurpureum</i> (DC.) Urb.	siratiro	non-native	uncommon
<i>Neonotonia wightii</i> (Wight & Arnott) Lackey	glycine	non-native	rare
<i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.)	<i>kiawe</i>	non-native	rare
<i>Samanea saman</i> (Jacq.) Merr.	monkey pod	non-native	rare
<i>Senna occidentalis</i> (L.) Link	coffee senna	non-native	rare
MALVACEAE (Mallow Family)			
<i>Malva parviflora</i> L.	cheese weed	non-native	uncommon
<i>Sida fallax</i> Walp.	<i>'ilima</i>	indigenous	rare
<i>Sida rhombifolia</i> L.	arrow-leaved sida	non-native	rare
<i>Waltheria indica</i> L.	<i>'uhaloa</i>	indigenous	rare
NYCTAGINACEAE (Four-o'clock Family)			
<i>Boerhavia coccinea</i> Mill.	scarlet spiderling	non-native	uncommon
ONAGRACEAE (Evening Primrose Family)			
<i>Ludwigia octovalvis</i> (Jacq.) Raven	primrose willow	non-native	rare
PAPAVERACEAE (Poppy Family)			
<i>Argemone mexicana</i> L.	Mexican poppy	non-native	common
PORTULACACEAE (Purslane Family)			
<i>Portulaca oleracea</i> L.	pig weed	non-native	rare
SOLANACEAE (Nighthshade Family)			
<i>Datura stramonium</i> L.	Jimson weed	non-native	rare
<i>Nicandra physalodes</i> (L.) Gaertn.	apple of Peru	non-native	rare
<i>Solanum americanum</i> Mill.	pōpolo	indigenous	rare
<i>Solanum lycopersicum</i> L.	cherry tomato	non-native	rare
ZYGOPHYLLACEAE (Creosote Bush Family)			
<i>Tribulus terrestris</i> L.	puncture vine	non-native	rare

FAUNA SURVEY REPORT

SURVEY METHODS

A walk-through survey method was conducted in conjunction with the botanical survey. All parts of the project area were covered. Field observations were made with the aid of binoculars and by listening to vocalizations. Notes were made on species, abundance, activities and location as well as observations of trails, tracks, scat and signs of feeding. In addition an evening visit was made to the area to record crepuscular activities and vocalizations and to see if there was any evidence of occurrence of the Hawaiian hoary bat (*Lasiurus cinereus semotus*) in the area.

RESULTS

MAMMALS

No mammals were seen during two site visits. Several common non-native mammal species, however, could be occasionally expected to utilize this habitat. These include the mongoose (*Herpestes auropunctatus*), cats (*Felis catus*), domestic dogs (*Canis familiaris*), rats (*Rattus* spp.) and mice (*Mus domesticus*). The rodent species can be difficult to detect because of the dense vegetation. Taxonomy and nomenclature follow Tomich (1986).

A special effort was made to look for the native Hawaiian hoary bat by making an evening survey of the area. When present in an area these bats can be easily identified as they forage for insects, their distinctive flight patterns clearly visible in the glow of twilight. No evidence of such activity was observed though visibility was excellent. In addition a bat detecting device was used at two locations, set to the frequency of 27,000 to 28,000 Hertz which is the typical range within which these bats are known to echolocate for flying insect prey. No activity was detected using this device.

BIRDS

Birdlife was rather sparse due to the lack of habitat diversity. Just six species of non-native birds were observed during two site visits. Taxonomy and nomenclature follow American Ornithologists' Union (2014). Three species were uncommon, zebra dove (*Geopelia striata*), common myna (*Acridotheres tristis*) and spotted dove (*Streptopelia chinensis*). The remaining three species were of rare occurrence. A few other non-native birds might occasionally be seen here but the habitat is not suitable for Hawaii's native forest birds, water birds or sea birds.

INSECTS

Insect life was rather modest in species diversity and in total numbers. A total of 15 species were observed in seven insect Orders during two site visits. Taxonomy and nomenclature follow Nishida et al (1992). One species, the house fly (*Musca domestica*), was abundant throughout the project area. Two other non-native insects were common, the Cuban koa haole psyllid (*Heteropsylla cubana*) and the long tail blue butterfly (*Lampides boeticus*). Four other species were uncommon and eight species were rare in this habitat. One native dragonfly, the indigenous globe skimmer (*Pantala flavescens*) was observed.

DISCUSSION AND RECOMMENDATIONS

The wildlife within and around this project area is composed nearly entirely of non-native species. Of a total of 6 birds and 15 insects, just one indigenous dragonfly was recorded. This dragonfly is found throughout the tropics worldwide and is one of the commonest native insects in Hawaii.

No Endangered or Threatened native animals were found during the survey, nor were any found that are candidates for such status. No special wildlife habitats were found either.

As a result of these findings, it is determined that there is little of environmental concern with regard to animal life within the proposed project. The development of this project is not expected to have a significant negative impact on the native wildlife resources in this part of Maui.

While no protected seabirds were found on the property, the Endangered ua'u (*Pterodroma sanwicensis*) and Threatened 'a'o (*Puffinus newelli*) are known to overfly the area at dawn and dusk to their burrows high in the mountains between the months of March and November. In late fall young birds fledge from their burrows to take their first tentative flights out to sea. These inexperienced birds are easily confused and distracted by bright lights and often crash to the ground where they are particularly vulnerable to being run over by vehicles or killed by predators.

It is recommended that any significant outdoor lighting such as street lights or flood lights that are incorporated into the project design be shielded to direct the light downward so that it is not visible from above.

ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged in descending abundance within two groups: 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).

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

migratory = spending a portion of the year in Hawaii and a portion elsewhere. In Hawaii the migratory birds are usually in the overwintering/non-breeding phase of their life cycle.

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.

COMMON NAME	SCIENTIFIC NAME	STATUS	ABUNDANCE
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MAMMALS

NONE

BIRDS

<i>Acridotheres tristis</i> L.	common myna	non-native	uncommon
<i>Geopelia striata</i> L.	zebra dove	non-native	uncommon
<i>Streptopelia chinensis</i> Scopoli	spotted dove	non-native	uncommon
<i>Carpodacus mexicanus</i> Muller	house finch	non-native	rare
<i>Cardinalis cardinalis</i> L.	northern cardinal	non-native	rare
<i>Francolinus francolinus</i> L.	black francolin	non-native	rare

COMMON NAME	SCIENTIFIC NAME	STATUS	ABUNDANCE
INSECTS			
Order ARANAE - true spiders			
ARANEIDAE (Orb Weaver Family)			
<i>Araneus diadematus</i> Clerck	European garden spider	non-native	rare
Order COLEOPTERA - beetles			
COCCINELLIDAE (Lady Beetle Family)			
<i>Coccinella septempunctata brucki</i> Multsant	seven-spot lady beetle	non-native	rare
Order DIPTERA - flies			
CULICIDAE (Mosquito Family)			
<i>Culex quinquefasciatus</i> Say	southern house mosquito	non-native	uncommon
MUSCIDAE (Housefly Family)			
<i>Musca domestica</i> L.	housefly	non-native	abundant
<i>Musca sorbens</i> Wiedemann	dung fly	non-native	rare
Order HEMIPTERA - true bugs			
PSYLLIDAE (Psyllid Family)			
<i>Heteropsylla cubana</i> Crawford	Cuban koa haole psyllid	non-native	common
Order HYMENOPTERA - bees, wasps			
APIDAE (Honey Bee Family)			
<i>Apis mellifera</i> L.	honey bee	non-native	rare
<i>Xylocopa sonorina</i> Smith	Sonoran carpenter bee	non-native	rare
FORMICIDAE (Ant Family)			
<i>Pheidole megacephala</i> Fabricius	big-headed ant	non-native	uncommon
VESPIDAE (Vespid Wasp Family)			
<i>Polistes aurifer</i> Saussure	golden paper wasp	non-native	rare
Order LEPIDOPTERA - butterflies, moths			
LYCAENIDAE (Gossamer-winged Butterfly Family)			
<i>Brephidium exilis</i> Boisduval	western pygmy blue butterfly	non-native	rare
<i>Lampides boeticus</i> L.	long tail blue butterfly	non-native	common
NYMPHALIDAE (Brush-footed Butterfly Family)			
<i>Danaus plexippus</i> L.	monarch butterfly	non-native	rare
PIERIDAE (White and Sulphur Butterfly Family)			
<i>Eurema nicippe</i> Cramer	sleepy orange butterfly	non-native	uncommon
Order ODONATA - dragonflies, damselflies			
LIBELLULIDAE (Skimmer Dragonfly Family)			
<i>Pantala flavescens</i> Fabricius	globe skimmer	indigenous	rare

Figure 1. Project Area (40 acres) lies within the orange line TMK (2) 3-8-013:019 (part).

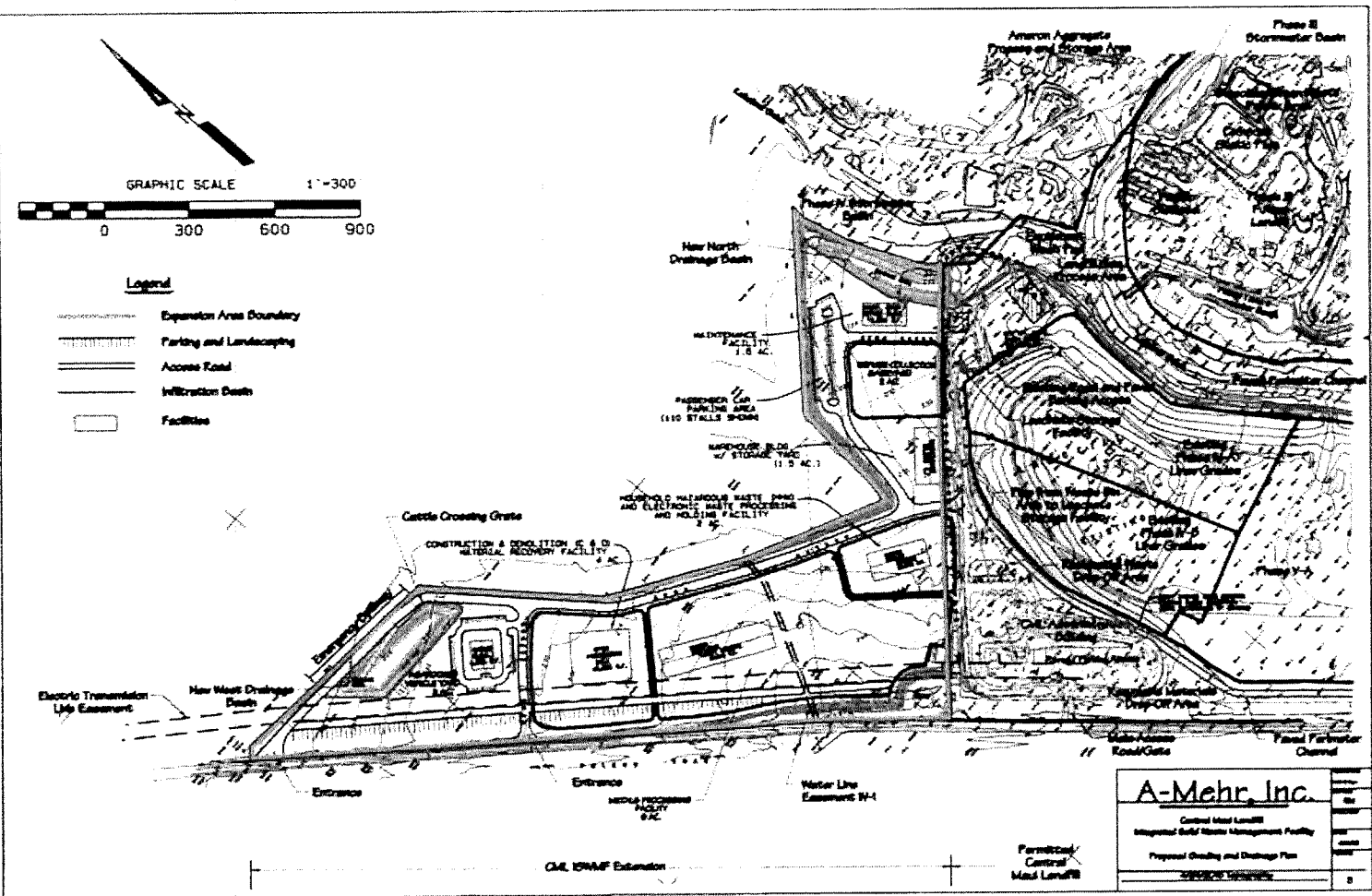




Figure 2. Project Area – view northwest from the Central Maui Landfill.

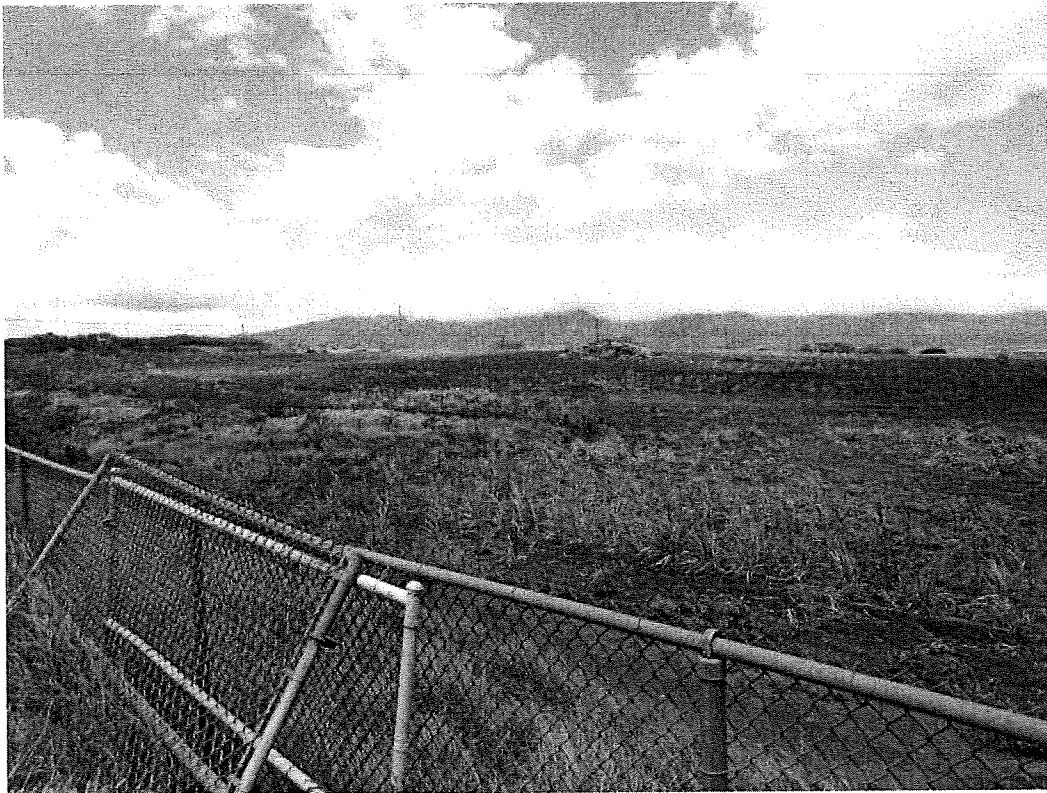


Figure 3. Project Area – view west from the Central Maui Landfill.



Figure 4. Project Area – view east from near Pulehu Road toward the Central Maui Landfill.



Figure 5. Project Area – view northeast from near Pulehu Road across the upper portion of the project.

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