Biological surveys for the gen-tie route from a solar electrical generating facility in Waiawa, central O'ahu[1]

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Introduction

Waiawa Solar Power LLC, a subsidiary of Clearway Energy Group LLC, is proposing to construct and operate a 36 MW solar electrical generating facility, including a substation and battery storage (the "Project") on approximately 200 ac (82 ha) of former agriculture land in Waiawa, central O'ahu (see Figure 1). The Project site is located east of the H-2 (Veterans Memorial Freeway) with access from Ka Uka Boulevard via Mililani Memorial Park Road to Waiawa Prison Road (Figure 2) or, alternatively during operation, off Waihona Street in the Pearl City Industrial Park. An earlier report (*AECOS*, 2019) provided results and discussion of a natural resources survey of the site itself. This report covers the proposed gen-tie line, extending approximately 2.1 mi (3.4 km) westward from the northwest side of the Project site to connect with the HECO (Hawaiian Electric Co.) electrical grid near the Ka Uka Blvd, H-2 freeway off-ramp.

Site Description

The Project and a majority of the gen-tie route lie within a 1,567-ac (634-ha) parcel (TMK: 9-6-004: 024) owned by Kamehameha Schools (KS) and formerly used to grow sugar cane. Ample evidence remains of this past agricultural use in the form of large irrigation pipes, ditches, and concrete field channels. The land is not presently in productive agricultural use and has not been since 1982.

[1] Prepared for G70, Honolulu. This report to become part of the public record for the subject project.
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Figure 1. Waiawa Solar Power, LLC Project site (red-brown) with gen-tie route extending westward on central O'ahu.

Located on the leeward slope of the Ko'olau mountain, the Project site is sloping land of the interfluve between Waiawa Stream and an unnamed gulch tributary to Pānakauahi Gulch, the latter tributary to Waiawa Stream. Steep sloping

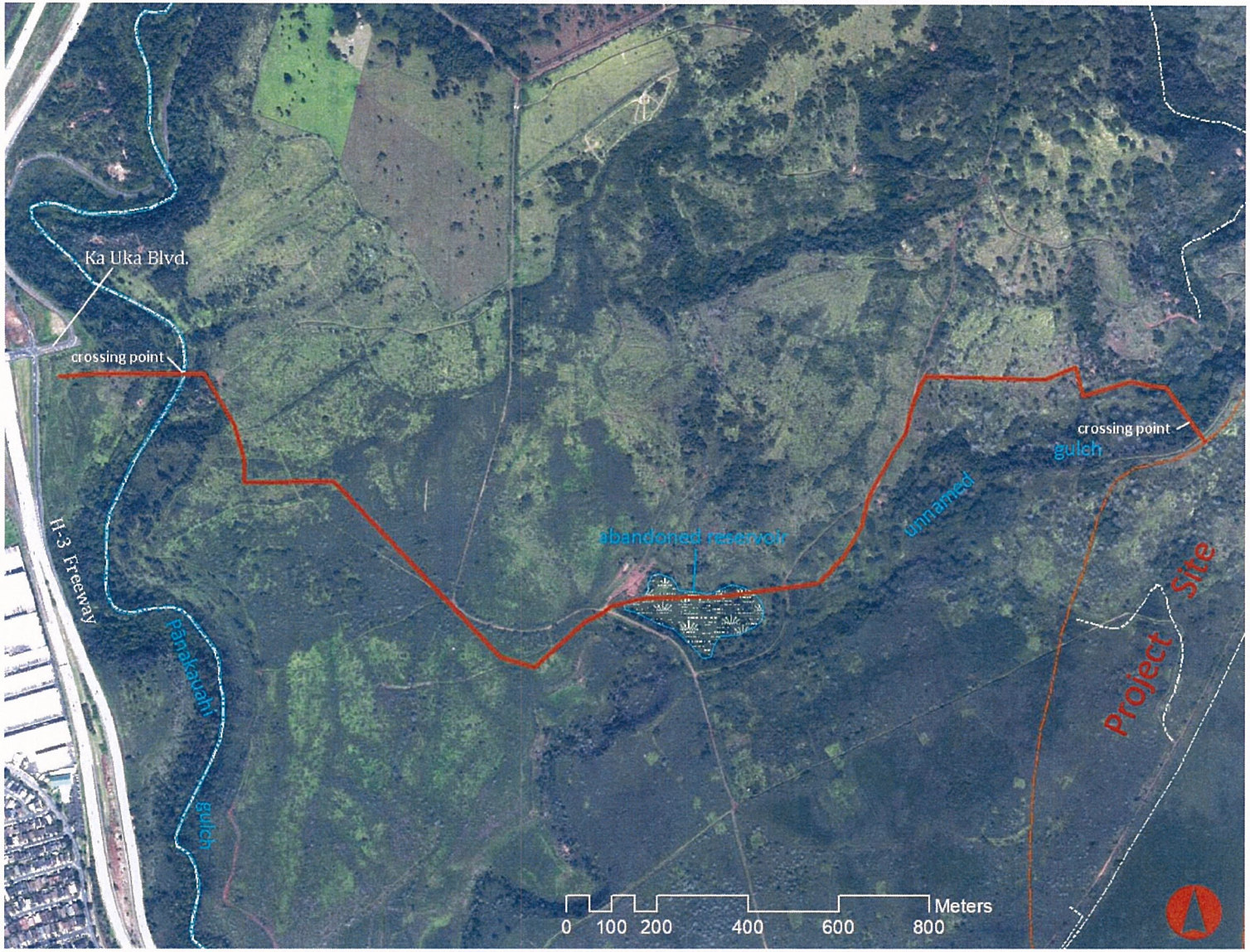

Figure 2. Waiawa Solar Power, LLC project area showing gen-tie route surveyed (solid red line) for this report.

land associated with bordering gulches are not included in the Project site. However, the gen-tie line must cross two gulches to reach the HECO grid tie-in point: Pānakauahi and a much less incised, unnamed gulch tributary to Pānakauahi. Unimproved roads, developed during the sugar cane era with some still being maintained, access various parts of the property.

Annual rainfall over the gen-tie route varies from approximately 38 in (96 cm) at the east (*mauka*) end to 32 in (81 cm) at Ka Uka Blvd. (Giambelluca, et al., 2013). Rainfall over the entire Project area is indicative of an island leeward environment of generally mesic conditions.

Methods

Biological surveys of the gen-tie route were conducted on September 10 and 11, 2019 covering the route (solid red line in Figure 2, above). The surveys entailed searches for natural resources of interest or concern along or near the route, with particular attention paid to native plants and animals, and especially those native species protected by statutory authority administered by the U.S. Fish and Wildlife Service and the State of Hawai'i, Department of Land and Natural Resources. Emphasis was on vascular plants and birds, with consideration given to mammals. The location of the Project on former cane lands at low elevation on O'ahu strongly suggests that non-vascular plants, invertebrates, fishes, amphibians, or reptiles of conservation interest or concern would not be present.

Plant Survey

For the botanical survey, a gen-tie route map was loaded into a handheld GNSS unit (Trimble GeoXH) to serve as a guide for the survey. The GNSS unit recorded the progress tracks of the botanists, providing real time feedback on location and adequacy of coverage of the pedestrian survey. Plant species were identified as they were encountered and notations used to develop a qualitative sense of abundance. Any plant not immediately recognized during the survey was photographed and/or a representative feature (flower, fruit) collected for later identification at the laboratory. (There were none).

Plant names used in the report follow *Manual of the Flowering Plants of Hawai'i* (Wagner, Herbst, & Sohmer, 1999) for native and naturalized flowering plants and *A Tropical Garden Flora* (Staples & Herbst, 2005) for crop and ornamental plants. More recent name changes for naturalized plants follow Imada (2012).

Avian Survey

For the avian survey, sixteen avian count stations were sited roughly equidistant from each other along the proposed route for the gen-tie line. A single eight-minute avian point-count was made at each of the count stations. Field observations were made with the aid of Leica 8 X 42 binoculars and by listening for vocalizations. The avian point-counts were conducted in the early morning hours. Time not spent counting at point-count stations was used to search the vicinity for species and habitats not encountered at the point-count stations. Weather conditions were ideal, with unlimited visibility, no precipitation, and winds between 1 and 15 kilometers per hour.

The avian phylogenetic order and nomenclature used in this report follows the AOU *Check-List of North and Middle American Birds* 2018, and the Sixtieth Supplement to the American Ornithological Society's *Check-List of North American Birds* (Chesser et al., 2018, 2019).

Mammalian Survey

The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all terrestrial vertebrate mammalian species detected within the survey area. Mammal scientific names follow *Mammal species of the world: a taxonomic and geographic reference* (Wilson and Reeder, 2005).

Results

Vegetation

The vegetation along the Project gen-tie route can be categorized in two major types that occur somewhat blended together across the landscape: (a) a *koa haole* (*Leucaena leucocephala*) shrub-scrub (Figure 3A); and (b) a Guinea grass (*Megathyrsus maximus*) grassland (Figure 4). Tree growth approaches a third type in a few locations: (c) a secondary forest; although typically, trees occur widely distributed or in small clusters or copses. The forest at the eastern end in the unnamed gulch is marked by tall albizia (*Falcateria moluccana*) trees (Figure 3B). Elsewhere, Java plum (*Syzigium cumini*) and Christmasberry (*Schinus terebinthefolius*), with Chinaberry (*Malia azedarach*), common guava (*Psidium guajava*), *kiawe* (*Prosopis pallida*), and Formosan koa (*Acacia confusa*) form small copses along the gen-tie route. A distinctive riparian forest occurs in Pānakauahi Gulch (described below on p. 11).

Figure 3A (upper). *Koa haole* shrub-scrub vegetation with relatively sparse Guinea grass (from *AECOS*, 2019). Figure 3B (lower) Albizia forest floor with tall Guinea grass and *koa haole*.

Vegetation types (a) and (b) extend broadly over the entire route. Guinea grass is a subdominant species in the *koa haole* shrubland (see Fig. 3A, above), although in places where the *koa haole* is particularly dense, the stature of the grass can be low and coverage sparse. *Koa haole* and other trees and shrubs occur scattered within the otherwise open grassland where the stature of the grass can reach over 2 m (6 ft) and the size and density of the plants creating a nearly impenetrable field (see Figure 4). Both vegetation types can be characterized as dominating the ground to an extent that few other plant species occur within them, except where that ground has been regularly disturbed, as along roads.

Figure 4. A recent track made through the Guinea grass grassland. For scale, note avian biologist in distance at mid-photo.

Flora

A list of all the flowering plant species observed in the gen-tie route vicinity is given in Table 1. No ferns or conifers were found. A total of 49 species of vascular plants were recorded during our survey along the gen-tie route. The

Table 1. Plant species identified along the Waiawa Solar gen-tie route.

Species listed by family

	Common name	Status	Abundance	Notes
	FLOWERING PLANTS			
	DICOTYLEDONES			
ANACARDIACEAE				
Schinus terebinthefolius Raddi	Christmas berry	Nat	C	
ASTERACEAE (COMPOSITAE)				
Ageratum conyzoides L.	*maile hohono*	Nat	R	<2>
Bidens alba (L.) DC.	---	Nat	R	<1>
Conyza bonariensis (L.) Cronq.	hairy horseweed	Nat	R	<1>
Emilia fosbergii Nicolson	Flora's paintbrush, *pualele*	Nat	R	<1>
BIGNONIACEAE				
Spathodea campanulata P. Beauv.	African tulip tree	Nat	U	
CUCURBITACEAE				
Momordica charantia L.	wild bitter melon	Nat	R	<1>
EUPHORBIACEAE				
Aleurites moluccana (L.) Willd.	*kukui*	**Pol**	U	<2>
Euphorbia hirta L.	garden spurge	Nat	R	<1>
Macaranga tanarius (L.) Müll. Arg.	---	Nat	O	
Phyllanthus sp.	---	Nat	U	<1.3>
FABACEAE				
Acacia confusa Merr.	Formosan koa	Nat	O	
Chamaecrista nictitans (L.) Moench	partridge pea	Nat	O	<1>
Crotalaria incana L.	fuzzy rattlepod	Nat	U	<1>
Desmanthus pernambucanus (L.) Thellung	virgate mimosa	Nat	U	<1>
Desmodium incanum DC.	Spanish clover	Nat	U	<1>
Falcataria moluccana (Miq.) Barneby & Grimes	albizia	Nat	A	
Mimosa pudica L.	sensitive plant	Nat	U	<1>
Neonotonia wightii (Wight & Arnott) Lackey	glycine vine	Nat	O	
Indigofera spicata Forsk.	creeping indigo	Nat	R	<1>
Indigofera suffruticosa Mill.	indigo	Nat	U	
Leucaena leucocephala (Lam.) deWit	*koa haole*	Nat	AA	
Macaranga tanarius (L.) Müll. Arg.	---	Nat	U	

Table 1 (continued).

Species listed by family

	Common name	Status	Abundance	Notes
FABACEAE (cont.)				
Pithecelobium dulce (Roxb.) Benth.	*'opiuma*	Nat	C	
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	*kiawe*	Nat	U	
LAMIACEAE				
Hyptis pectinata (L.) Poit.	comb hyptis	Nat	R	
MALVACEAE				
Malvastrum coromandelianum (L.) Garcke	false mallow	Nat	Uo	<1>
Sida ciliaris L.	---	Nat	C	<1>
Sida rhombifolia L.	Cuba jute	Nat	R	<1>
Sida spinosa L.	prickly sida	Nat	U	<1>
Waltheria indica L.	*'uhaloa*	**Ind**	O	
MELIACEAE				
Melia azedarach L.	Chinaberry	Nat	O	
MORACEAE				
Broussonetia papyrifera (L.) Venten	*wauke*	**Pol**	R	<2>
MYRTACEAE				
Melaleuca quinquenervia (Cav.) S.T. Blake	paperbark	Nat	U	
Pimenta dioica (L.) Merr.	allspice	Nat	O	<2>
Psidium guajava L.	common guava	Nat	U	
Syzigium cumini L.	Java plum	Nat	C	
OCHNACEAE				
Ochna thomasiana Engler & Gilg	Mickey Mouse plant	Nat	A	<2>
PASSIFLORACEAE				
Passiflora suberosa L.	running pop	Nat	R	
PHYTOLACCACEAE				
Rivina humilis L.	coral berry	Nat	R	
PROTEACEAE				
Grevillea robusta A. Cunn. ex R.Br.	silk oak	Nat	U	
RUTACEAE				
Murraya paniculata (L.) W. Jack	mock orange	Nat	R	
SAPOTACEAE				
Chrysophyllum oliviforme L.	satin leaf	Nat	AA	<2>
VERBENACEAE				
Lantana camara L.	lantana	Nat		

Table 1 (continued).

Species listed by family

	Common name	Status	Abundance	Notes
VERBENACEAE (cont.)				
Stachytarpheta australis Moldenke	---	Nat	U	<1>
Stachytarpheta jamaicensis (L.) Vahl	Jamaica vervain	Nat	O	<1>
FLOWERING PLANTS MONOCOTYLEDONES				
POACEAE				
Cynodon dactylon (L.) Pers.	Bermuda grass	Nat	U	<1>
Eleusine indica (L.) Gaertn.	wiregrass	Nat	R	<1>
Megathyrsus maximus (Jacq.) B.K. Simon & W.L. Jacobs	Guinea grass	Nat	AA	

Legend to Table 1

STATUS = distributional status for the Hawaiian Islands:
- **Ind** = indigenous; native to Hawaii, but not unique to the Hawaiian Islands.
- Nat = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.
- **Pol** = An early (pre-Cook) Polynesian introduction.

ABUNDANCE = occurrence ratings for plant species:
- -- - Species not present in specified area.
- R – Rare — seen in only one or perhaps two locations.
- U - Uncommon — seen at most in several locations
- O - Occasional — seen with some regularity
- C - Common — observed numerous times during the survey
- A - Abundant — found in large numbers; may be locally dominant.
- AA - Very abundant — abundant and dominant; defining vegetation type.

NOTES:
- <1> – Distribution limited to roadways (ruderal); abundance values thus pertain to a very limited portion of the survey area.
- <2> - Seen only in Pānakauahi Gulch riparian vegetation.
- <3> – Plant lacking key diagnostic characteristics (flower, fruit); identification, therefore, not confirmed.

observations included one indigenous native species: *'uhaloa* (*Waltheria indica*) and two early Polynesian introductions: *wauke* (*Broussonetia papyrifera*) and *kukui* (*Aleurites moluccana*), the latter two seen only in the riparian forest along Pānakauahi Gulch. No Hawaiian Islands endemics were encountered. *'Uhaloa* is a common and typically ruderal plant that here is moderately common along roads in the area. The remaining 46 species (94%) are non-native species. Some, like mock orange (*Murraya paniculata*) and Mickey Mouse plant (*Ochna*

thomasiana), are relatively recent escaped ornamentals that are clearly naturalized in this and other areas across the Island.

The flora in Pānakauahi Gulch is distinctive from that seen elsewhere along the survey route. Much of the gulch is forested. This forest, especially along the bottom of the gulch, is heavily invaded by satin leaf (*Chrysophyllum oliviforme*), saplings of which are extremely numerous. Trees common to this forest include silk oak (*Grevillea robusta*), Christmasberry, *kukui*, allspice (*Pimenta dioica*), and *Macaranga tanarius*. An abundant understory shrub is Mickey Mouse plant. Higher up the sides of the gulch and along the rim where the line descends from the east, the slopes are covered mostly by ironwood, Formosan koa (*Acacia confusa*), paperbark (*Melaleuca quinquenervia*), Java plum, Chinaberry, albizia, and satin leaf. An extensive ironwood forest marks much of the east-facing slope; an open field of Guinea grass characterizes much of this slope along the gen-tie route.

Avian Count Survey

A total of 725 individual birds of 19 species, representing 15 separate families, was recorded during station counts (Table 2). One species detected along the alignment, Pacific Golden-Plover (*Pluvialis fulva*) is an indigenous, migratory shorebird species. The remaining 18 species recorded during the course of this survey are alien to the Hawaiian Islands.

Table 2. Avian species detected
along the Waiawa Solar Power gen-tie route in September 2019.

Common Name	Scientific Name	ST	RA
	PHASIANIDAE - Pheasants & Partridges		
	Phasianinae - Pheasants & Allies		
Gray Francolin	*Francolinus pondicerianus*	A	0.13
	CHARADRIIFORMES		
	CHARADRIIDAE - Lapwings & Plovers		
	Charadriinae - Plovers		
Pacific Golden-Plover	*Pluvialis fulva*	IM	0.19
	COLUMBIFORMES		
	COLUMBIDAE - Pigeons & Doves		
Spotted Dove	*Streptopelia chinensis*	A	069
Zebra Dove	*Geopelia striata*	A	1.88