Appendix B
Biological Resource Assessment, SWCA Environmental Consultants, June 2015

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Biological Resources Assessment for Honouliuli Wastewater Treatment Plant Upgrade and Expansion Project

Prepared for

AECOM

Prepared by

SWCA Environmental Consultants

June 2015

BIOLOGICAL RESOURCES ASSESSMENT FOR HONOULIULI WASTEWATER TREATMENT PLANT UPGRADE AND EXPANSION PROJECT

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1. INTRODUCTION

AECOM is preparing a draft environmental impact statement (DEIS) pursuant to Chapter 343, Hawai‘i Revised Statutes (HRS), and Title 11, Chapter 200, Administrative Rules, State of Hawai‘i Department of Health (DOH). The City and County of Honolulu Department of Environmental Services proposes to upgrade the Honouliuli Wastewater Treatment Plant (Honouliuli facility) on the Island of O‘ahu to provide secondary treatment and to expand the facility to accommodate future projected wastewater flow.

This upgrade will include the potential relocation of non-process facilities from the Sand Island Wastewater Treatment Plant to the Honouliuli facility. These facilities support island-wide wastewater treatment plants and wastewater pump stations. Although the final environmental assessment/environmental impact statement preparation notice submitted for this project and published in *The Environmental Notice* in July 2010 discusses potential impacts associated with proposed upgrades to and/or expansion of the Honouliuli major conveyance system in addition to the Honouliuli facility, itself, the current Honouliuli facility plan focuses only on the Honouliuli facility (AECOM 2010). The alternatives considered in the DEIS include only upgrades and expansions of the Honouliuli facility.

AECOM has asked SWCA Environmental Consultants (SWCA) to conduct a biological resources assessment to support the DEIS for the proposed project and to prepare a report that summarizes findings and provides recommendations to minimize impacts to sensitive natural resources. The survey area for this assessment consists of the existing Honouliuli facility at 91-1000 Geiger Road and the expansion property to the north and east, adjacent to the Coral Creek Golf Course (Figure 1).

1.1. Location and Vicinity

The survey area is at 91-1000 Geiger Road in ‘Ewa Beach on the Island of O‘ahu. The survey area consists of two components: the currently operating Honouliuli facility and its expansion area, which is proposed on predominately undeveloped land immediately to the north and east (see Figure 1). The survey area is accessed by Geiger Road. It is bounded by the Coral Creek Golf Course to the east, the O‘ahu Railway and Land easement to the north, and Roosevelt Avenue/Geiger Road to the west and south. A portion of the expansion area is currently leased to Steel Tech Inc., a local construction company, as a storage area. Soils in the survey area are classified primarily as Mamala stony silty clay loam, 0%–12% slopes (MnC). Small percentages of Honouliuli clay, 0%–2% slopes (HxA); ‘Ewa silty clay loam, 0%–2% slopes; and Waialua silty clay, 0%–3% slopes (WkA) occur in the southeast corner of the survey area.

2. METHODS

SWCA reviewed available scientific and technical literature regarding natural resources in and near the survey area. This literature review encompassed a thorough search of refereed scientific journals, technical journals and reports, environmental assessments and environmental impact statements, relevant government documents, and unpublished data that provide insight into the natural history and ecology of the area. SWCA also reviewed available geospatial data, aerial photographs, and topographic maps of the survey area.

SWCA Biologist Jason Cantley conducted flora and fauna pedestrian surveys of the entire survey area on November 16, 2014. Vegetation types and observed fauna were documented and described. Moreover, special attention was given to the documentation of threatened, endangered, or candidate species.

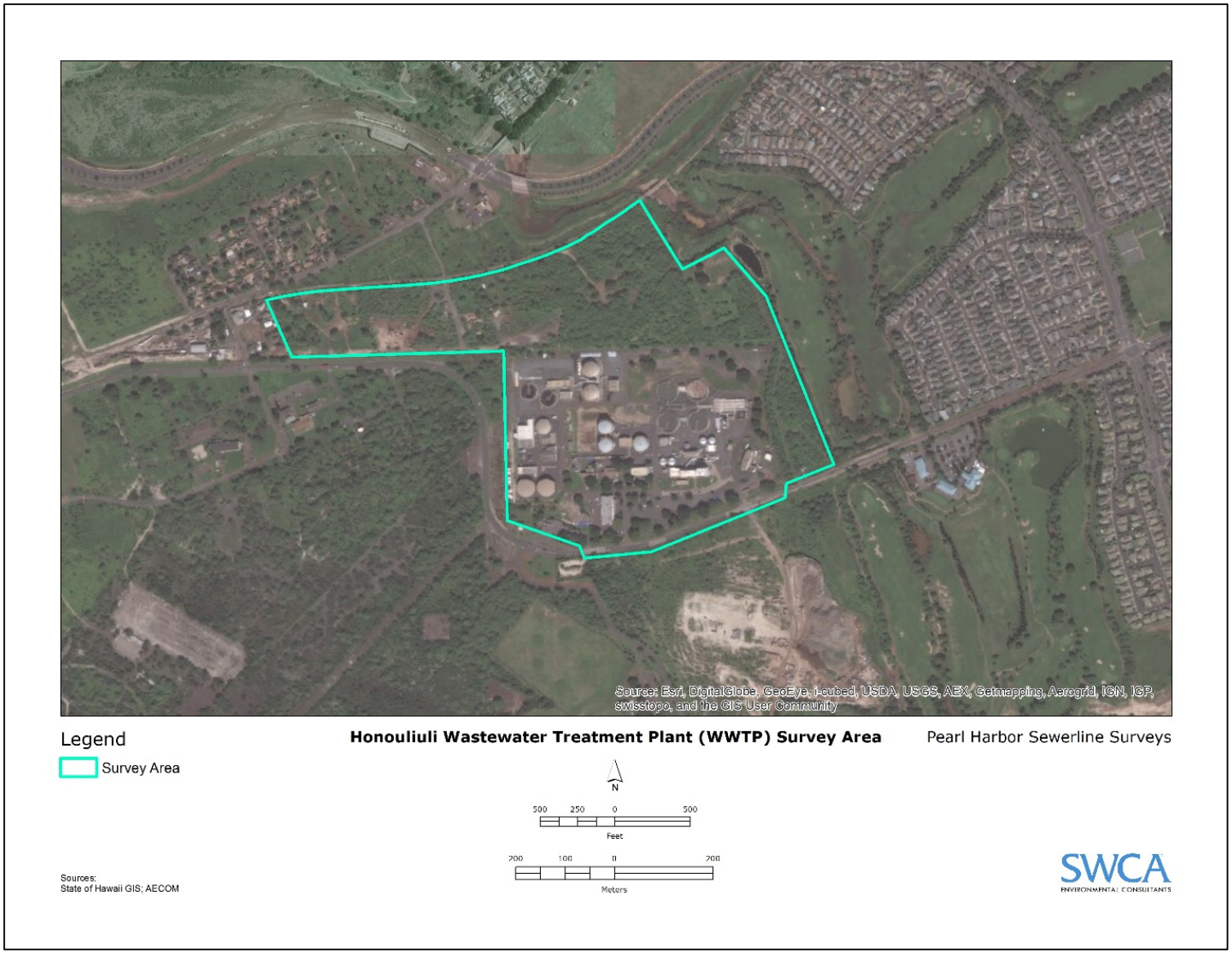

Figure 1. Survey area location.

2.1. Flora

Common plant species and vegetation types, as well as rare or listed species, were recorded during the flora survey. Areas more likely to support native plants (e.g., rocky outcrops and shady areas) were more intensively examined. A comprehensive list of all plant species present in the survey area was not within the scope of this survey.

Plants recorded during the survey are indicative of the season ("rainy" vs. "dry") and the environmental conditions at the time of the survey. As environmental conditions change, it is likely that species and plant abundances also undergo temporal or seasonal changes.

2.2. Fauna

Fauna surveys occurred *before* 11 am or *after* 4 pm when wildlife was most likely to be active. Field observations of birds were conducted using 8 × 30–millimeter binoculars. Visual and auditory observations were included in the survey. All observed birds, mammals, reptiles, amphibians, fish, and invertebrate species were noted during the survey.

Field surveys for the endangered Hawaiian hoary bat or ʻōpeʻapeʻa (*Lasiurus cinereus semotus*) were not conducted; however, areas of suitable habitat for foraging and roosting were noted when present.

2.3. Aquatic and Marine Flora and Fauna

Surveys for aquatic flora and fauna were not performed under this scope of work; however, a literature review of available data was done to determine species likely to be present in the Mamala Bay area.

2.4. Aquatic Environment

SWCA intensively reviewed available literature and previous field surveys of the potentially affected areas. SWCA identified amphidromous, estuarine, and itinerant marine species because they are the primary focus of discussion and assessment due to their importance to traditional Hawaiian gathering practices and lore, significance as indicators of ecosystem health, and the available literature concerning their biology.

3. RESULTS

In general, the plant and animal species assemblages are typical of those found in disturbed and urban areas on Oʻahu. The survey area does not encompass any designated or proposed critical habitat for threatened or endangered species.

No state or federally listed threatened, endangered, or candidate plant species were observed in the survey area during the survey. The survey area does not contain critical habitat for threatened or endangered species.

3.1. Flora

In all, 79 plant taxa were recorded during the flora survey (Appendix A). Of these, four are native to the Hawaiian Islands: ʻaʻaliʻi (Dodonaea viscosa), hinahina (*Vitex rotundifolia*), maʻo hau hele (*Hibiscus*

brackenridgei), and ʻuhaloa (*Waltheria indica*). Hinahina, ʻaʻaliʻi, and ʻuhaloa are not federally listed and are not considered endangered or at risk of extinction. However, maʻo hau hele, the Hawaiian state flower, is a federally listed species and was observed next to a facility building in a cultivated and maintained garden. The maʻo hau hele likely originated from a cultivated source and was not naturally occurring. Two additional species observed were of known Polynesian introduction: niu (*Cocos nucifera*) and kou (*Cordia subcordata*).

Overall, the vegetation in the expansion area is highly disturbed by past and current land uses. Open areas with extensive patches of bare ground exist in the northern portion, which is likely due to grazing by ungulates, vehicle traffic, and the deposition of trash and large debris. Metal scraps and debris are present in the western portion of the expansion area. Extensive graveled and asphalted areas also occur in the northern section of the expansion area. Existing vegetation is primarily characterized as a kiawe (*Prosopis pallida*) forest that covers approximately 47.8 acres, with sparse Guinea grass (*Urochloa maxima*) cover in the understory due to the presence of leaf litter, dry conditions, and grazing by ungulates (Figure 2). The kiawe trees range from 4.5 to 8.0 m (15 to 26 feet) tall and comprise roughly 70% of the tree cover throughout the expansion area. Large koa haole (*Leucaena leucocephala*) and Manila tamarind (*Pithecellobium dulce*) trees sparsely scattered throughout the kiawe forest make up most of the remaining tree cover. Two herbaceous species—lion's ear (*Leonotis nepetifolia*) and golden crown-beard (*Verbesina encelioides*)—are widely distributed throughout the understory. Other non-native herbaceous and shrub species scattered sparsely throughout the expansion area or in isolated patches include khaki weed (*Alternanthera pungens*), spiny amaranth (*Amaranthus spinosus*), wild bean (*Macroptilium lathyroides*), hairy abutilon (*Abutilon grandifolium*), *Sida ciliaris*, and *Sida rhombifolia*. The non-native, parasitic western field dodder (*Cuscuta campestris*) was also found climbing in larger trees throughout the expansion area.

The existing vegetation at the Honouliuli facility is primarily a manicured landscape with non-native grasses and herbs. Cultivated trees occur sporadically as planted individuals across the landscape and include monkey pod (*Samanea saman*), cannonball tree (*Couroupita guianensis*) and *Ficus* sp. trees. Much of the ground area is maintained entirely by mowing within the fenced area. The mowed vegetation is characterized by numerous weedy species that are common in abundance throughout the survey area. These include buffelgrass (*Cenchrus ciliaris*), common sandbur (*Cenchrus echinatus*), Guinea grass, khaki weed (*Alternanthera pungens*), coat buttons (*Tridax procumbens*), hairy garden spurge (*Euphorbia hirta*), buffalo clover (*Alysicarpus vaginalis*), *Macroptilium atropurpureum* and *M. lathyroides*, and false mallow (*Malvastrum coromandelianum* subsp. *coromandelianum).* Many other species were uncommon or rare (see Appendix A).

Figure 2. Kiawe (*Prosopis pallida*) forest at the Honouliuli facility expansion area with sparse Guinea grass (*Urochloa maxima*) cover in the understory.

Figure 3. Monkey pod (*Samanea saman*) and *Ficus sp.* trees at the Honouliuli facility with a weedy manicured ground cover in the understory.

3.2. Fauna

3.2.1. Avifauna

Ten introduced and one indigenous bird species were recorded during the survey in the survey area which includes Honouliuli facility expansion area and the currently operating Honouliuli facility (Table 1). The common myna (*Acridotheres tristis*) was the most abundant bird observed during the survey with 35 sightings. The cattle egret (*Bubulcus ibis*), zebra dove (*Geopelia striata*), and spotted dove (*Streptopelia chinensis*) were also common. All of these species are common to the main Hawaiian Islands, particularly in urban or disturbed areas (Hawai'i Audubon Society 2005). Only one indigenous species, the Pacific golden-plover, was observed in this area. A number of ducks could have been hybrids of the native koloa and mallard ducks, both of which are protected under the Migratory Bird Treaty Act (MBTA).

Table 1. Birds Observed by SWCA in and near the Survey Area

Common Name	Scientific Name	Status*	Count	MBTA
Cattle egret	*Bubulcus ibis*	NN	15	X
Common myna	*Acridotheres tristis*	NN	35	
Domestic duck	*Anas platyrhynchos domesticus*	NN	1	
House finch	*Haemorhous mexicanus*	NN	3	X
House sparrows	*Passer domesticus*	NN	3	
Koloa hybrid	*Anas wyvilliana* x *platyrhynchos*	HN	6	X
Pacific golden-plover, kolea	*Pluvialis fulva*	IM	3	X
Saffron finch	*Sicalis flaveola*	NN	1	
Spotted dove	*Streptopelia chinensis*	NN	6	
Zebra dove	*Geopelia striata*	NN	10	
	Total	**10**		

**Notes*: HN = hybrid native permanent resident, NN = non-native permanent resident; IM = indigenous and migratory.

3.2.1.1. ENDANGERED BIRDS

No threatened or endangered birds were observed during surveys in the survey area. O'ahu supports the largest number of Hawaiian stilts (*Himantopus mexicanus knudseni*) in the state, with an estimated 35%–50% of the population residing on the island (U.S. Fish and Wildlife Service [USFWS] 2011). Hawaiian stilts favor open wetland habitats with minimal vegetative cover and water depths of less than 24 centimeters (9.4 inches), as well as tidal mudflats (Robinson et al. 1999). Portions of the survey area appear to hold standing water after periods of extended heavy rainfall, which could attract the Hawaiian stilt and other endangered water birds such as nēnē (*Branta sandvicensis*), Hawaiian coot (*Fulica alai*), Hawaiian moorhen (*Gallinula chloropus*), and Hawaiian duck (*Anas wyvilliana*). Additionally, nearby developments and golf courses contain water features that may be attractive to these species, which increases the likelihood of them being present in the survey area. It should be noted that it is very unlikely that nēnē, Hawaiian coot, Hawaiian moorhen, and Hawaiian duck would be present on the site as they are all listed as endangered and have small populations on Oahu.

The survey area does not contain suitable habitat for most endangered birds on O'ahu because most are known to occur at higher altitudes; however, pueo (*Asio flammeus sandwichensis*), which is listed as

endangered on O‘ahu by the State of Hawai‘i, occupies wet and dry forests, grasslands, shrublands, and urban areas and could be present in the survey area because it contains this type of habitat.

3.2.2. Hawaiian Hoary Bat

Hawaiian hoary bats are known to occur on O‘ahu in native, non-native, agricultural, and developed landscapes (U.S. Department of Agriculture 2009; USFWS 1998). Hawaiian hoary bats were not observed in the survey area; however, they have been documented roosting in trees that were present in the survey area, specifically coconut trees (*Cocos nucifera*), kiawe, christmasberry (*Schinus terebinthifolius*), and Chinese banyan (*Ficus macrocarpa*).

3.2.3. Other Mammals

Other fauna species observed during the survey were feral cats (*Felis catus*) and small Asian mongooses (*Herpestes javanicus*). It is likely that dogs (*Canis familiaris*) and cats (*Felis catus*) could enter the survey area due to the nearby residences. Other mammals that can be expected on-site include mice (*Mus musculus*) and rats (*Rattus* spp.).

3.2.4. Reptiles and Amphibians

No reptiles or amphibians were seen during the survey. None of the terrestrial reptiles or amphibians in Hawai‘i are native to the islands.

3.2.5. Invertebrates

Only one native invertebrate—the indigenous globe skimmer (*Pantala flavescens*)—was seen during the survey. Two species of butterflies were observed in the survey area during the survey: Gulf fritillary (*Agraulis vanillae*) and the western pygmy blue butterfly (*Brephidium exilis*). Both are non-native to the Hawaiian Islands.

3.3. Aquatic and Marine Flora and Fauna

Surveys for aquatic flora and fauna were not performed under this scope of work; however, a literature review of available data was done to determine species likely to be present in the Mamala Bay area.

The National Oceanic and Atmospheric Administration (NOAA 2014) lists seven protected marine animals: humpback whales (*Megaptera novaeangliae*), spinner dolphins (*Stenella longirostris*), Pacific white-sided dolphins (*Lagenorhynchus obliquidens*), Hawaiian monk seals (*Monachus schauinslandi*), hawksbill sea turtles (*Eretmochelys imbricata*), leatherback sea turtles (*Dermochelys coriacea*), and green sea turtles (*Chelonia mydas*). The Hawaiian monk seal, green sea turtle, spinner dolphin, and humpback whale may occur in Mamala Bay in limited numbers on occasion.

3.4. Aquatic Environment

3.4.1. Groundwater and Surface Water

Streams from the Wai‘anae Mountains are intermittent and discharge only during freshets (Nichols et al. 1997). The natural drainage of the ‘Ewa Plain is mostly infiltrated. The area does not have many surface streams discharging into the ocean or Mamala Bay. There are no perennial streams close to the Honouliuli facility; however, Kaloi Gulch, which is part of the natural drainage system, runs along the eastern border of the survey area.

Kaloi Gulch originates at the southeastern end of the Wai‘anae Mountains as a culmination of several gulches along the southeastern side of the Wai‘anae Mountains. The drainage basin at the south boundary of ‘Ewa Villages, which is adjacent to the northern boundary of the Honouliuli facility expansion area, was calculated to be 20.2 square kilometers (7.78 square miles) with a 100-year flood interval between 199.6 and 203.8 cubic meters (m^3) per second (7,050 and 7,200 cubic feet per second) (Belt Collins & Associates 1987). Near the Honouliuli facility, Kaloi Gulch is at an elevation slightly below the surrounding lands, and throughout the lower ‘Ewa Plain, the gulch consists mostly of a human-made ditch. A human-made outlet exists on either side of One‘ula Beach Park, but these appear to rarely have surface water.

The Honouliuli facility discharges into Mamala Bay, which is south of the facility between Ko‘Olina and Pearl Harbor. It is classified as a Class A marine water and is permitted for recreational use, aesthetic enjoyment, and propagation of fish, shellfish, and wildlife (Hawai‘i Administrative Rules [HAR] 11-54). Mamala Bay is on the DOH’s Section 303D list, which is a list of waters that do not meet the state’s water quality standards for one or more parameters. Mamala Bay was placed on this list for non-attainment of total nitrogen and chlorophyll *a* (DOH 2014). The closest site monitored by DOH is in ‘Ewa Beach and is monitored for *Enterococci* and *Clostridium perfringens* periodically. Monitoring results from 2009 to 2014 were reviewed, and results were within the water quality standards for both parameters. No other water quality data were available near Mamala Bay.

The Honouliuli facility is within the Pearl Harbor sector of a Department of Land and Natural Resources aquifer. It is located above the underground injection control well line, which is a boundary between the exempted aquifer and underground source of drinking water. Groundwater near the Honouliuli facility is a source of drinking water; however, no public wells are located within 1-mile of the survey area.

3.4.1.1. WETLANDS

The National Wetland Inventory (NWI) indicates the presence of wetlands on land adjacent to the survey area on the north and east sides; however, no wetlands were identified in the survey area. The presence of facultative, facultative upland, and facultative wetland plant species in the survey area was noted. These species can occur in wetland and non-wetland environments and do not necessarily indicate the presence of wetlands in the survey area. Three criteria—wetland hydrology, hydric soils, and the presence hydrophytic vegetation—must be met to make a wetland determination. Wetland hydrology and hydric soils were not analyzed under this scope of work.

3.4.2. Water Quality and Effluent

The effluent from the Honouliuli facility is conveyed 2,670 meters (m) (8,760 feet) offshore to a depth of approximately 61 m (200 feet) where it is dispersed by a 533-m-long (1,750-foot-long) diffuser pipe at

the Barbers Point Deep Ocean Outfall. Because the effluent is of a lower density than seawater, it rises into the water column where ocean currents dilute and disperse it.

The current effluent discharge rate at the Barbers Point Deep Ocean Outfall is approximately 1 m^3 per second (22.8 million gallons per day [mgd]) (Table 2) (Shuai et al. 2014). The average daily flow to the Honouliuli facility was 1.13 m^3 s^{-1} (25.8 mgd) in 2012. This annual average is expected to rise to 1.7 m^3 s^{-1} (39.6 mgd) by 2035 and to 1.95 m^3 s^{-1} (44.4 mgd) by 2050 (AECOM 2010). The peak flow capacity of the Barbers Point Deep Ocean Outfall is 4.9 m^3 s^{-1} (112 mgd).

Table 2. Current parameters at the Barbers Point Deep Ocean Outfall

Wastewater Treatment Plant	Average Flow Rate (m^3 s^{-1})	Average Concentration of Total Suspended Solids (grams m^{-3})	Average Solid Loading Rate (grams s^{-1})
Honouliuli facility	0.99	44.7	44.2

Source: Shuai et al. (2014)

Under the current conditions, the effluent contains not only the primary treated sewage, but some fraction of secondary treated sewage (the amount depending on the export of recycled water (R-1 water) which is used for irrigation, from the Honouliuli facility to the Hawai‘i Water Recycling Facility [HWRF], as well as the brine byproduct of the reverse osmosis system used to produce R-O industrial freshwater supplied to customers).

If the water column at the site of the diffuser is stratified, which can occur in warmer summer months, the upper extent of the plume can be held below the surface, making it essentially invisible. In general, as submergence increases (i.e., the top of the plume is held further below the sea surface), diffusion decreases. In the design of the Barbers Point diffuser, high dilution was considered to be more important than submergence of the sewage field with the concomitant reduction in visual impact.

There are three stages in the hydrodynamic fate of the sewage plume from the diffuser. First, the effluent rises as a buoyant plume. This process is governed by the difference in density between the effluent and the ambient seawater. The second phase of transport is horizontal spreading. The direction and velocity are determined by the ocean currents integrated along the depth gradient where the plume occurs. Finally, turbulent mixing continually dilutes and disperses the effluent.

If flow in the outfall delivery pipe and the diffuser is too low, deposition of solids in the system occurs. This can partly be avoided in the design of the diffuser. The diameter of the diffuser is reduced along its length to maintain adequate velocity of the effluent as the volume is reduced by loss to the ocean. Also, deposition of solids in the system can be controlled by maintaining a minimum flow. If the flow to the diffuser pipe is 5 m^3 s^{-1} (112 mgd), the velocity at the end of the diffuser pipe would be approximately 1.4 m s^{-1} (4.5 feet per second [fps]), but if the total effluent flow fell to 1 m^3 s^{-1} (23 mgd), the velocity at the end of the diffuser pipe would be only approximately 0.2 m s^{-1} (0.7 fps).

At the other end of the flow spectrum is the ability of the system to handle high flows resulting from stormwater runoff. Peak 1-hour storm flow from a large (2-year recurrence interval) 6-hour storm for 2010 is projected to be 3.6 m^3 s^{-1} (82.2 mgd). This would rise to 5 m^3 s^{-1} (114 mgd) by 2035 and to 5.5 m^3 s^{-1} (126 mgd) by 2050. The current design peak flow capacity for the system is 4.9 m^3 s^{-1} (112 mgd).

The Barbers Point Deep Ocean Outfall currently discharges effluent partly comprising primary treated sewage. The City and County of Honolulu were required to obtain a Clean Water Act 301(h) waiver

permit to allow this. As part of the maintenance of this permit, a continuous long-term monitoring study was required. This permit also covered three other wastewater treatment plants on O'ahu, and the monitoring has been ongoing at these sites as well. A concern triggering the requirement for this monitoring program was that discharged organic particles might cause organic enrichment of the sediment near the diffuser and reduce biodiversity. Early studies of the sediments near the Barbers Point Deep Ocean Outfall show that benthic fluxes of dissolved nutrients in the zone of initial dilution (ZID) were higher than control areas in the 2 years of the study (1984 and 1985), and that organic flocs of sewage origin were seen within 50 m (164 feet) of the diffuser (Smith and Dollar 1987). However, when the biodiversity of the sediment infauna was assessed, there was no difference between samples from the ZID and the control sites, although the biomass of infaunal organisms was greater. To assure that the effects of the outfall were not increasing, a long-term monitoring program was initiated. This program samples the sediments at and near the outfalls and determines the diversity and abundance of polychaete worms, micromollusks, and crustaceans. These have been quantified for over 20 years. Additionally, samples of fishes near the discharge plumes have been monitored for pathologies. The data from these samples are stored in the U.S. Environmental Protection Agency's Storet data storage system (EPA 2014), and annual summaries are available through the University of Hawai'i Water Resources Research Center site (University of Hawai'i at Manoa 2015). A more in-depth analysis of the polychaete results was recently published using samples taken from 1990 to 2010 (Shuai et al. 2014). The conclusions of the benthic sampling at the Barbers Point Deep Ocean Outfall is that there is more year-to-year variation at any one site than between the ZID and control sites.

In summary, the effects of the sewage effluent delivered to the ocean by the Barbers Point diffuser is negligible under the existing conditions, even though a substantial fraction of the effluent consists of primary treated sewage. The question of whether this might change under future conditions (elimination of primary treated effluent and increase volume) is addressed below. Tables 3 and 4 present the projected parameters for the Barbers point diffuser.

Table 3. Projections for the Barbers Point Diffuser (million gallons per day)

Flows MGD	**2000**	**2030**	**2150**
Dry weather infiltration	9.26 (0.41 $m^3 s^{-1}$)	13.29 (0.58 $m^3 s^{-1}$)	13.29 (0.58 $m^3 s^{-1}$)
Sanitary flow	19.64 (0.86 $m^3 s^{-1}$)	30.59 (1.34 $m^3 s^{-1}$)	45.73 (2.00 $m^3 s^{-1}$)
Sanitary flow peaking factor	2	2	2
WWI/I peak daily	12.52 (0.55 $m^3 s^{-1}$)	23.73 (1.04 $m^3 s^{-1}$)	23.73 (1.04) $m^3 s^{-1}$
WWI/I peak hourly	60.61 (2.66 $m^3 s^{-1}$)	108.41 (4.75 $m^3 s^{-1}$)	108.41 (4.75 $m^3 s^{-1}$)
Design Flows	**2000**	**2030**	**2150**
Average dry weather daily flow	28.90 (1.27) $m^3 s^{-1}$	43.88 (1.92 $m^3 s^{-1}$) $m^3 s^{-1}$	59.02 (2.59 $m^3 s^{-1}$)
Peak dry weather daily flow	48.54 (2.13 $m^3 s^{-1}$)	74.48 (74.48 $m^3 s^{-1}$)	104.76 (4.59 $m^3 s^{-1}$)
Average wet weather daily flow	41.42 (1.81 $m^3 s^{-1}$)	67.61 (2.96 $m^3 s^{-1}$)	82.76 (3.63 $m^3 s^{-1}$)
Peak wet weather daily flow	61.06 (2.68 $m^3 s^{-1}$)	98.21 (4.30 $m^3 s^{-1}$)	128.49 (5.63) $m^3 s^{-1}$
Peak wet weather hourly flow	109.15 (4.78 $m^3 s^{-1}$)	182.89 (8.01) $m^3 s^{-1}$	213.17 (9.33 $m^3 s^{-1}$)

Notes: Sanitary flow = average daily flow - dry weather infiltration; WWI/I = wet weather infiltration and inflow.

Note that neither this table, nor Table 4, presents projections of volume, composition, or density of effluent produced from the diffuser.

Table 4. Waste Load Projections for Average Conditions at Barbers Point Deep Ocean Outfall

Parameter	Biochemical Oxygen Demand	Total Suspended Solids
Concentration (mg/ml)	280	300
Present waste load coefficient	0.19	0.20
Waste load 2007 (pounds/day)	62,580	67,050
Waste load 2030 (pounds/day)	80,898	86,676
Waste load 2150 (pounds/day)	127,275	136,366

Source: M & E Pacific (2008).

Note that neither this table, nor Table 3, presents projections of volume, composition, or density of effluent produced from the diffuser.

The volume of secondary effluent being discharged would be expected to increase by the amount of projected flow minus the amount going to the HWRF. There is insufficient Information on how much more R-1 water the HWRF may plan to accept. The HWRF brine water along with excess R-1 and reverse osmosis (RO) water will continue to be discharged through the outfall. HWRF currently takes 0.57 $m^3 s^{-1}$ (13 mgd) each day, of that 0.043 $m^3 s^{-1}$ (1 mgd) would be discharged as brine. Upgrades or improvements to the HWRF were not included in the scope of work, and therefore it is not known how the amount or quality may change.

4. DISCUSSION AND RECOMMENDATIONS

4.1. Flora

No naturally occurring threatened or endangered plants were found during the survey. One individual of ma‘o hau hele was observed. Because of its presence in a maintained garden on historically disturbed land, this individual was likely cultivated then planted as an ornamental. Therefore, this plant is not considered to be of conservation value because it does not originate from a naturally occurring, wild population. For these reasons, there are no legal ramifications impeding its removal. Although the ‘Ewa area is within the historical range of the endangered ko‘oloa‘ula (*Abutilon menziesii*), the species is not known to have been recently documented in survey area (personal communication, Greg Mansker, Horticulturist, Hawai‘i Department of Land and Natural Resources, October 31, 2014) and has not been seen during recent surveys in the vicinity (AECOS 2010, 2011; SWCA 2012, 2013). Approximately 95% of the plant species seen during the survey are not native to Hawai‘i. The native species present are common throughout the Hawaiian Islands. Therefore, the proposed project is not expected to have a significant, adverse impact on native botanical resources.

The removal of native vegetation should be avoiding, if possible. Additionally, some plants may provide food or habitat for endangered species listed in the fauna section below. These species should be considered when removing vegetation. Removal of shade trees is permitted; however, removal of trees taller than 4.6 m (15 feet) should be avoided between June 1 and September 15 to avoid impacts to the endangered Hawaiian hoary bat.

SWCA recommends that native Hawaiian plants be employed for landscaping around the survey area to the maximum extent possible. Potential native species that may be appropriate for landscaping at the survey area include koʻoloaʻula, kou, ʻilieʻe (*Plumbago zeylanica*), and ʻaʻaliʻi.

Additional information on selecting appropriate (non-invasive) plants for landscaping can be obtained from the following websites:

- http://www.nativeplants.Hawaii.edu/
- http://www.plantpono.org/non-invasive-plants.php
- http://www.hear.org/alternativestoinvasives/pdfs/mcaac_hpwra_a2i_list.pdf
- http://www.hear.org/oisc/oahuearlydetectionproject/pdfs/oedposterwhatnottoplant.pdf

4.2. Fauna

4.2.1. Federally Listed Species

No federally listed species were observed during the surveys; however, water features present in and near the survey area may attract the endangered Hawaiian stilt and other waterbirds. Additionally, Hawaiian hoary bats have been known to roost in vegetation observed in the survey area and could be present. The pueo could potentially be present within the survey area. The following recommendations could minimize impacts to waterbirds, pueo, and Hawaiian hoary bat.

Waterbirds

During construction, minor alterations of local topography in low-lying areas to prevent water from ponding could reduce attraction of Hawaiian stilt and other waterbirds. Additionally, the following best management practices would avoid and minimize impacts to the Hawaiian stilt and other waterbirds should they occur on-site before or during construction:

- In areas where Hawaiian waterbirds have been observed, nest searches will be conducted by a qualified biologist before work begins and after any subsequent delay in work of 3 or more days (during which birds may attempt nesting). Hawaiian stilts nest from middle February through late August, with variable peak nesting from year to year (Robinson et al. 1999).
- If a nest with eggs is discovered, work will cease within 46 m (150 feet) of the nest for a minimum of 70 days (10 weeks); if a nest with chicks is discovered, work will cease for a minimum of 49 days (7 weeks). These guidelines are intended to protect chicks, and may be shortened if monitoring is conducted often enough to note when chicks have fledged (usually 5–6 weeks after hatching). Work will not begin in the area until 2 weeks after chicks have fledged.
- If an endangered Hawaiian waterbird is found in the area during ongoing management activities, all activity within 15 m (50 feet) of the bird will cease; the bird will also not be approached within 15 m (50 feet). Work may continue after the bird leaves the area of its own accord.

Pueo

Suitable habitat for the state-listed pueo appears to be present in the survey area, so it is possible that they could be present. Mitigations measures can be taken to reduce disturbance to pueo. These include suspending work (particularly with machinery or vehicles) within 91 m (300 feet) of any area where distraction displays, vocalizations, or other indications of nesting by adult pueo are seen or heard, and only resume activity when it is apparent that the young have fledged or there is other confirmation that pueo nesting is no longer occurring. With these measures, there is not likely to be any adverse effect on the pueo.

Hawaiian hoary bats

Although the chances of adversely affecting Hawaiian hoary bats as a result of the proposed project are likely small, the following measures are recommended as a conservative impact avoidance measure:

- Any fences that are erected as part of the project should have barbless top-strand wire to prevent entanglements of the Hawaiian hoary bat on barbed wire. No fences in the survey area were observed with barbed wire during the survey; however, if fences are present, the top strand of barbed wire should be removed or replaced with barbless wire.
- No trees taller than 4.6 m (15 feet) should be trimmed or removed as a result of this project between June 1 and September 15, when juvenile bats that are not yet capable of flying may be roosting in the trees.

Implementation of these guidelines, which have been promulgated by the USFWS (1998), is expected to avoid all direct impacts to Hawaiian hoary bats.

4.2.2. Migratory Bird Treaty Act

SWCA observed the following four bird species federally protected under the MBTA during this survey: the cattle egret, Hawaiian duck–mallard hybrids, house finch (*Haemorhous mexicanus*), and Pacific golden-plover. Construction in the survey area may temporarily displace some of these bird species, but long-term impacts are not expected. These birds (likely limited to a few individuals) are expected to find suitable foraging habitat in nearby areas. The temporary displacement of these individuals in the survey area is not expected to affect an individual's survival or the overall species' populations. The Pacific golden-plover was the only species observed known to migrate from Hawai'i to elsewhere. However, its presence should not be of concern, because they do not nest in Hawai'i. It is expected that these birds would return when construction is complete; no long-term impacts are expected.

4.3. Aquatic and Marine Flora and Fauna

Surveys were not specifically conducted for rare, threatened, or endangered fauna found in streams or coastal waters; however based on literature review, it is not expected that the proposed project impact will have this species.

4.4. Aquatic Environment

Impacts to water quality from construction or operations at the Honouliuli facility and from the Barbers Point Deep Ocean Outfall may occur. During proposed construction, storm runoff can carry increased sediment into surface waters, potentially impacting water and benthic habitat quality at the margins of the estuary. Construction and ground disturbance should comply with the conditions of the Clean Water Act as well as HAR 11-54 and HAR 11-55. Permitting under the National Pollution Discharge Elimination System program may be required, which may include filing a notice of intent with DOH for general permit coverage for Stormwater Discharges Associated with Construction Activities (HAR 11-55 Appendix C), Discharges of Hydrotesting Waters (HAR 11-55 Appendix F), and Discharges Associated with Construction Activity Dewatering (HAR 11-55 Appendix G). During construction, the contractor should develop a stormwater pollution prevention plan (SWPPP) that complies with the Clean Water Act, HAR 11-54, and HAR 11-55, and that implement best management practices to minimize impacts to water quality in the Kaloi Gulch and other surface waters. Based on long-term studies, temporal differences in benthic organisms within sites are larger than between ZID and control sites, indicating that

under current conditions, the effects of diffused effluent are negligible and will have no impact on coastal waters. Impacts to groundwater as a result of construction are unlikely to occur.

Upgrades at the Honouliuli facility will effect operations at the plant, resulting in increases in effluent flow volumes. Despite this increase in flow volumes, pollutant loading for biochemical oxygen demand (BOD) and total suspended solids (TSS) is expected to decrease as a result of upgrades from primary to secondary treatment; therefore, impacts to coastal waters should not be affected significantly. Groundwater and surface waters will not be impacted.

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APPENDIX A. CHECKLIST OF PLANT SPECIES OBSERVED AT HONOULIULI WASTEWATER TREATMENT FACILITY ON NOVEMBER 16, 2014

The following checklist is an inventory of all the plant species observed by the SWCA biologist on November 16, 2014, during surveys at the Honouliuli facility, on the Island of O‘ahu, Hawai‘i. The plant names are arranged alphabetically by family and then by species into three groups: Gymnosperms, Monocots, and Dicots. The taxonomy and nomenclature are in accordance with Palmer (2003), Evenhuis and Eldredge (2011), Wagner et al. (1999), Wagner and Herbst (2003), and Staples and Herbst (2005). Recent name changes are those recorded in Wagner et al. (2012)..

Table Notes

Status:

E = endemic = native only to the Hawaiian Islands.
I = indigenous= native to the Hawaiian Islands and elsewhere.
P = Polynesian = introduced by Polynesians.
X =introduced/ alien = all those plants brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact (Cook’s arrival in the islands in 1778).

Relative Site Abundance:

A = Abundant = forming a major part of the vegetation within the survey area.
C = Common = widely scattered throughout the area or locally abundant within a portion of it.
U = Uncommon = scattered sparsely throughout the area or occurring in a few small patches.
R = Rare = only a few isolated individuals within the survey area.

Scientific Name	Common and Hawaiian Name(s)	Status	Honouliuli Facility	
			Manicured Lawn	Facility Expansion Site
GYMNOSPERMS				
Cupressaceae				
Juniperus sp.	juniper	X	R	
MONOCOT				
Aloaceae				
Aloe vera (L.) Burm.f.	aloe	X	R	R
Agavaceae				
Cordyline fruticosa (L.) A. Chev.	tī, kī	X	R	
Arecaceae				
Cocos nucifera L.	niu, ololani, coconut	P/I?	R	
Muscaceae				
Musa X paradisiaca L.	banana	X	R	
Poaceae				
Axonopus compressus (Sw.) Beauv.		X	R	

Scientific Name	Common and Hawaiian Name(s)	Status	Honouliuli Facility	
			Manicured Lawn	Facility Expansion Site
Bothriochloa pertusa (L.) A.Camus	pitted beardgrass	X	U	
Cenchrus ciliaris L.	buffelgrass	X	C	A
Cenchrus echinatus L.	common sand burr	X	C	
Chloris barbata Sw.	swollen fingergrass	X	U	
Chloris radiata (L.) Sw.	radiate fingergrass	X	U	
Cynodon dactylon (L.) Pers.	Bermuda grass	X	U	
Melinis repens (Willd.) Zizka	Natal redtop, Natal grass	X	U	
Paspalum conjugatum P.J.Bergius	Hilo grass	X	R	
Paspalum dilatatum Poir.	dallis grass	X	R	
Urochloa maxima (Jacq.) R. Webster	Guinea grass	X	C	A
DICOT				
Acanthaceae				
Asystasia gangetica (L.) T.Anderson	Chinese violet	X	U	
Amaranthaceae				
Alternanthera pungens Kunth	khaki weed	X	C	R
Alternanthera sessilis (L.) R.Br. ex DC.	sessile joyweed	X	U	
Amaranthus spinosus L.	spiny amaranth	X	U	R
Amaranthus viridis L.	slender amaranth, pakai	X	U	
Anacardiaceae				
Schinus terebinthifolius Raddi	Christmas berry, wilelaiki	X		UC
Apocynaceae				
Plumeria sp.	plumeria	X	R	
Asteraceae				
Bidens pilosa L.	Spanish needles			U
Calyptocarpus vialis Less.	nodeweed	X	U	
Dyssodia tenuiloba (DC.) B. L. Rob.	Dahlberg daisy	X	R	
Pluchea carolinensis (Jacq.) G. Don	sourbush, marsh fleabane	X		R
Sonchus oleraceus L.	sow thistle, pualele	X	R	
Synedrella nodiflora (L.) Gaertn.	nodeweed	X	U	
Tridax procumbens L.	coat buttons	X	C	
Verbesina encelioides (Cav.) Benth. & Hook.	golden crown-beard	X		
Boraginaceae				
Carmona retusa (Vahl) Masam.	Fukien tea tree, Philippine tea tree	X	R	
Cordia subcordata Lam.	kou	P/I?	R	
Heliotropium procumbens var. *depressum* (Cham.) Fosberg		X	R	
Capparaceae				
Cleome gynandra L.	cleome	X	R	

Scientific Name	Common and Hawaiian Name(s)	Status	Honouliuli Facility	
			Manicured Lawn	Facility Expansion Site
Chenopodiaceae				
Chenopodium murale L.	goosefoot, pigweed, lamb's quarters	X	R	
Convolvulaceae				
Ipomoea obscura (L.) Ker Gawl.	morning glory	X	U	
Ipomoea triloba L.	little bell	X	U	
Merremia aegyptia (L.) Urb.	hairy merremia, koali kua hulu	X	R	
Cucurbitaceae				
Cucumis dipsaceus Ehrenb. ex Spach	hedgehog gourd, teasel gourd	X	R	
Momordica charantia L.	balsam pear, bitter melon	X	U	R
Cuscutaceae				
Cuscuta campestris Yunck.	western field dodder	X		U
Euphorbiaceae				
Euphorbia hirta L.	hairy garden spurge	X	C	
Euphorbia hypericifolia (L.) Millsp.	graceful spurge	X	U	
Euphorbia hyssopifolia (L.) Small			R	
Euphorbia prostrata Aiton	Prostrate spurge	X	R	
Ricinus communis L.	castor bean	X	R	
Fabaceae				
Alysicarpus vaginalis (L.) DC.	buffalo clover	X	C	
Cassia fistula L.	golden shower tree	X	R	
Delonix regia (Bojer ex Hook.) Raf.	royal poinciana	X	R	
Desmodium tortuosum (Sw.) DC.	Florida beggarweed	X	R	
Leucaena leucocephala (Lam.) de Wit	koa haole	X	R	C
Macroptilium atropurpureum (DC.) Urb.		X	C	
Macroptilium lathyroides (L.) Urb.	wild bean, cow pea	X	C	
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe, algaroba, mesquite,	X		A
Pithecellobium dulce (Roxb.) Benth.	Manila tamarind, ‘opiuma	X	U	C
Senna alata (L.) Roxb.	candle bush	X	R	U
Samanea saman (Jacq.) Merr.	monkeypod, rain tree	X	A	
Lamiaceae				
Leonotis nepetifolia (L.) R. Br	lion's ear	X	R	C
Lecythidaceae				
Couroupita guianensis Aubl.	cannonball tree	X	R	
Malvaceae				
Abutilon grandifolium (Willd.) Sweet	hairy abutilon, ma‘o	X	U	U
Hibiscus brackenridgei A. Gray	ma‘o hau hele	E	R	
Hibiscus rosa-sinensis L.	Hibiscus	X	R	

Scientific Name	Common and Hawaiian Name(s)	Status	Honouliuli Facility	
			Manicured Lawn	Facility Expansion Site
Malva neglecta Wallr.	common mallow	X	R	
Malvastrum coromandelianum subsp. *coromandelianum* (L.) Garcke	false mallow	X	C	
Sida acuta Burm. f.		X	U	U
Sida ciliaris L.		X	R	
Sida rhombifolia L.		X	U	R
Moraceae				
Ficus microcarpa L. f.	Chinese banyan	X	R	
Nyctaginaceae				
Boerhavia coccinea Mill.	scarlet spiderling	X	U	
Passifloraceae				
Passiflora foetida	love-in-a-mist	X	R	
Solanaceae				
Caspsicum sp. L.	chili pepper	X	R	
Solanum melongena L.	eggplant	X	R	
Rubiaceae				
Gardenia jasminoides J. Ellis	common gardenia	X	R	
Rutaceae				
Citrus x limon	lemon	X	R	
Murraya paniculata (L.) Jack	mock orange	X	R	
Sapindaceae				
Dodonaea viscosa Jacq.	ʻaʻaliʻi	I	R	
Sterculiaceae				
Waltheria indica L.	ʻuhaloa	I	U	
Verbenaceae				
Vitex rotundifolia L. *f.*	hinahina, beach vitex	I	R	